

Altruism in social insects is a family affair

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The contentious debate about why insects evolved to put the interests of the colony over the individual has been reignited by new research from the University of Leeds, showing that they do so to increase the chances that their genes will be passed on.

A team led by Dr Bill Hughes of the University's Faculty of Biological Sciences studied 'kin selection' – the theory that an animal may pass on its genes by helping relatives to reproduce, because they share common genes, rather than by reproducing itself.

The concept of 'kin selection' was developed in 1964 by the evolutionary biologist Bill Hamilton, first proposed by Charles Darwin to explain, for example, why sterile workers evolved in social insect groups and why a honeybee would sacrifice its life to defend the colony. Charles Darwin recognized that such altruistic behaviour in highly social insect groups was at odds with his theory of natural selection, and Bill Hamilton's theory of kin selection showed that this behaviour can evolve because it still fulfills the drive to pass on genes - but through relatives instead.

As such, high relatedness between insects has generally been seen as essential for the evolution of highly social behaviour and until recently, kin selection was widely accepted by the scientific community.

But this paradigm was challenged in 2005 by the eminent academic E.O. Wilson, the founder of sociobiology, who pointed out that relatedness is rather low in some of today's social insects. He suggested that highly social behaviour evolves solely because individuals do better when they

cooperate than when they live a solitary life - a controversial theory which not only conflicted with 45 years of scientific research, but which also sparked a highly charged debate between Wilson and Richard Dawkins, author of *The Selfish Gene*.

Dr Hughes and colleagues at the Universities of Sydney and Sussex tested the two alternative theories by examining the level of relatedness between females in colonies of bees, wasps and ants, determined by DNA fingerprinting techniques, and using statistical methods to look at levels of monogamy in the ancestral social insects when they evolved up to 100 million years ago.

If females were monogamous, mating with one male, this would mean the members of the colony are highly related, and so Hamilton's theory would be correct. If they were polygamous, with the female mating with many males, relatedness would be lower and so Wilson may be right after all.

The research, published in the current issue of the prestigious academic journal, *Science*, found that in every group studied ancestral females were found to be monogamous, providing the first evidence that kin selection is fundamental to the evolution of social insects.

Dr Hughes said: "We have produced the first conclusive evidence that kin selection explains the evolution of social insects and that Wilson's hypothesis is most probably wrong. By challenging something that we have based all our understanding on for 45 years, Wilson has forced us all to examine the theory again and assess the logic of the arguments. In a recent media interview, he issued a challenge to the scientific community to prove his theory wrong and whilst many felt it was, there hasn't been any hard evidence until now."

Source: University of Leeds

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