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Researchers at MSU study altruism

Theory that genetic similarity wins out over kinship is right, they say

MATTHEW MILLER • MRMILLER@LSJ.COM • OCTOBER 18, 2010

Self-sacrifice is not a uniquely human behavior.

Vampire bats will regurgitate blood from a successful hunt to feed their hungry fellows. Vervet monkeys shriek out alarm calls when predators approach, alerting others but making themselves more likely to end up in a predator's belly. There even are bacteria that will produce toxin until they explode, dying in order to kill those who might compete with their kin.

The question, from an evolutionary standpoint, is why.

As Charles Darwin put it in The "Descent of Man," "He who was ready to sacrifice his life, as many a savage has been, rather than betray his comrades, would often leave no offspring to inherit his noble nature."

But the matter may be less about leaving offspring and more about ensuring that one's genes get passed on, even if those genes happen to be the copies that exist in a child, a sister or a cousin.

The idea is called kin selection theory or inclusive fitness theory, and recent work from researchers at Michigan State University's Bio/computational Evolution in Action Consortium (BEACON) suggests that one of its essential predictions is right. Organisms will evolve to be altruistic toward their relatives, but when presented with more accurate information on who shares their genes, genetic similarity wins out over kinship.

Risk To Helping

"The long-standing theory is that the reason why relatives are nice to each other, the reason why a brother might risk his life to save another brother, is there's actually a gene inside of one brother that's trying to help out copies of itself," said Jeff Clune, a postdoctoral fellow at Cornell University who earned his doctorate at MSU in the spring. Clune is the lead author of the paper, published last month in the Proceedings of the Royal Society.

AT A GLANCE

• Michigan State University announced earlier this year that it received a five-year, $25 million grant from the National Science Foundation to establish a center for the study of evolution in the natural and digital worlds.

• Learn more about the Bio/computational Evolution in Action CONsortium, or BEACON, at www.beacon.msu.edu.

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But, from an evolutionary perspective, there is a risk to helping relatives, a chance that they won't have certain genes in common. The British evolutionary biologist J.B.S. Haldane once remarked that he wouldn't die to save his brother "but I would to save two brothers or eight cousins" (though Clune pointed out that three brothers or nine cousins would be necessary to make the math work).

1 | 2 Next Page

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Digital Organisms

The MSU researchers weren't working with flesh-and-blood creatures, but with digital organisms, strings of computer code that self-replicate and mutate and compete for the CPU cycles that allow them to reproduce more quickly. It's the process of evolution carried over into an environment where, for reasons of speed and flexibility, it's possible to do experiments that would be out of reach in the natural world.

In these experiments, the creatures were given the ability to be altruistic. They were not instructed to do so. But given information as to which other organisms were relatives, they evolved to act altruistically toward them.

Then the researchers gave them a better option, allowing them to know which other organisms were similar to them genetically.

"What we found is that organisms will switch away from being nice to family members and only target altruism toward those who are very highly genetically similar, even if they're not related to each other," Clune said.

Biological Altruism

It was, according to Robert Pennock, a principal researcher at BEACON and a co-author of the paper, "experimental verification of what evolutionary science has said we should expect should happen."

Biological altruism is not necessarily the same thing as altruism in human contexts. Bacteria might evolve to sacrifice themselves when it gives their genes a better chance of surviving to reproduce, but they can't make a conscious choice to do so.

Pennock, who was trained as a philosopher, said: "My interest as a philosopher here has to do with how we have the capabilities that we have, intellectually and in this case ethically." But he added that knowing how we have the capability to do something says nothing about what we should do.

"The science can't tell you what you should do," he said. "The science tells you what your capacities are."

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