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# 'EVOLUTION WILL PUNISH YOU IF YOU'RE SELFISH AND MEAN'

Contact(s): [Layne Cameron](#), [Christoph Adami](#)

Two Michigan State University evolutionary biologists offer new evidence that evolution doesn't favor the selfish, disproving a theory popularized in 2012.

"We found evolution will punish you if you're selfish and mean," said lead author Christoph Adami, MSU professor of microbiology and molecular genetics. "For a short time and against a specific set of opponents, some selfish organisms may come out ahead. But selfishness isn't evolutionarily sustainable."

The paper appears in the current issue of [Nature Communications](#) and focuses on game theory, which is used in biology, economics, political science and other disciplines. Much of the last 30 years of research has focused on how cooperation came to be, since it's found in many forms of life, from single-cell organisms to people.

In 2012, a scientific paper unveiled a newly discovered strategy – called zero-determinant – that gave selfish players a guaranteed way to beat cooperative players.

"The paper caused quite a stir," said Adami, who co-authored the paper with Arend Hintze, molecular and microbiology research associate. "The main result appeared to be completely new, despite 30 years of intense research in this area."

Adami and Hintze had their doubts about whether following a zero determinant strategy (ZD) would essentially eliminate cooperation and create a world full of selfish beings. So they used high-powered computing to run hundreds of thousands of games and found ZD strategies can never be the product of evolution. While ZD strategies offer advantages when they're used against non-ZD opponents, they don't work well against other ZD opponents.

"In an evolutionary setting, with populations of strategies, you need extra information to distinguish each other," Adami said.

So ZD strategies only worked if players knew who their opponents were and adapted their strategies accordingly. A ZD player would play one way against another ZD player and a different way against a cooperative player.

"The only way ZD strategists could survive would be if they could recognize their opponents," Hintze said. "And even if ZD strategists kept winning so that only ZD strategists were left, in the long run they would have to evolve away from being ZD and become more cooperative. So they wouldn't be ZD strategists anymore."

Both Adami and Hintze are members of [MSU's BEACON Center for the Study of Evolution in Action](#). The research is supported by the National Science Foundation, the MSU High Performance Computing Center and the MSU Institute for Cyber Enabled Research.