

Why did people evolve to be cooperative? And why in a principled way?

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Aside from the obvious, what is it that separates Mother Theresa from Sean Penn?

Both have tried to perform charitable acts -- Mother Theresa worked for decades in the slums of Calcutta and Penn was among those who traveled to New Orleans to rescue victims of Hurricane Katrina.

But while Mother Theresa is today recognized as a near saint, Penn was widely mocked for bringing an entourage -- including his publicist and personal photographer -- to document the rescues.

The difference, Martin Nowak, Professor of Mathematics and of Biology and Director of the Program for Evolutionary Dynamics (PED), Moshe Hoffman, a research scientist at PED, and Erez Yoeli, a visiting scholar at PED and a researcher at the Federal Trade Commission, might argue, could be chalked up to what the public perceives as differences in motivation -- while Mother Theresa was seen as purely altruistic, Penn's actions suggested the rescues were little more than a publicity stunt.

To understand why it matters to us what Mother Theresa's motives were, Nowak, Hoffman and Yoeli have developed a first-of-its-kind model, dubbed the "envelope game," that can help researchers understand not only how cooperation evolved, but but why people care so much about others motives. The model is described in a recently-published paper published in the *Proceedings of the National Academy of Sciences*.

"For years, people have been asking those of us who study cooperation about the motive that is behind an action," Nowak said. "The question was how do you get at that -- how do you formulate a game theory where the motive makes a difference?"

The solution, Hoffman explained, was to add a new wrinkle to the traditional "cooperation game" used by researchers -- one that offers players the chance to consider the costs of cooperation.

"What's new about this game is that rather than simply deciding whether to cooperate or defect, you now have a new choice, which is whether to open this envelope," Hoffman said. "Inside the envelope it tells you the cost of cooperation -- it's either high or low. Basically, the envelope is a metaphor for considering the cost of cooperation before making a decision, and someone who's very principled about cooperation, or a genuine altruist, they would never open the envelope."

As outlined by Nowak, Hoffman and Yoeli, the game now works this way: before deciding whether to cooperate, one player has the option of opening an envelope telling them whether the cost of cooperation is high or low. Based on that information, that player can choose whether to cooperate or not, and the second player -- who knows whether their counterpart looked in the envelope -- can then decide whether to repeat the interaction, with a new envelope, or end the relationship.

"What's innovative about this model is we're able to capture this notion that people care whether or not you're principled," Hoffman said. "What we see in real life is that people only choose to continue a relationship with those who don't open the envelope, because someone who is a genuine altruist...they just cooperate without looking."

Where prior models were predicated solely on whether the players chose to cooperate or defect, this new model, Hoffman said, introduced this additional factor, "and what that represents is whether or not you're thinking about the cost of cooperation."

The model can also help to explain why a well-intentioned New Orleans rescue mission ultimately became fodder for criticism.

"Previous models of cooperation would predict that people would cooperate with him because he's doing good," Hoffman said. "Those models had a hard time capturing the fact that while he's cooperated, it's kind of a dirty form of cooperating. This new model allows us to differentiate because even though he's cooperating, he's someone who cooperates while opening the envelope."

That's not to suggest, Nowak said, that that sort of cooperation is bad.

"It's simply a different type of interaction," he said. "Because this model is the first of its kind, and it feels so different from all the other models, it took us some time to analyze it, and what we found is that there will be some situations in which you would only cooperate with a person if they don't open the envelope, there may be other strategies -- such as a business relationship -- where you can continue to cooperate regardless of whether the other person looks. What we wanted to analyze is which equilibrium is chosen by evolution and under what circumstances."

That analysis, Hoffman said, revealed the conditions under which people are more like to trust those who do not open the envelope -- that is, those who are true altruists -- more than those who do.

"That analysis found that it needs to be the case that cooperating is usually very cheap, but once in a while it becomes very costly, meaning you're very tempted to defect, but defecting really hurts the other player. If that happens, that's exactly when we would expect people to care if you're principled or if you're a genuine cooperator, or if you open the envelope."

If bringing a camera crew to document your rescue efforts in New Orleans is the real-world equivalent of looking in the envelope, Hoffman said, "the public knows that person is cooperating when it's not costly, but that they would probably defect if they were really tempted, so that person can't be trusted to be a stable cooperator."

Authentic altruists, he continued, never look in the envelope, meaning they cooperate regardless of the cost.

"She's not looking when the cost is low, so when it ends up being very costly, we know we can rely on her," he said. "So Mother Theresa, even if she's cooperating just as much as Sean Penn, in some sense she's more trustworthy to cooperate even in cases where it would be really costly for her to do so."

Understanding how motives affect cooperation, Hoffman said, is more than just an academic exercise -- the model describe in the paper also offers insights into a host of real-world situations ranging from politics to the boardroom, and beyond, clarifying when we should care about motives as well as whether policymakers should respect these considerations.

Though earlier models might suggest that a politician who changes positions based on polls is merely responding to his or her constituents, Hoffman said this new model explains why they are so often branded as flip-floppers.

"People say they aren't genuine," he said. "Our model suggests that people might be thinking, 'Well, they support this position now, but what about a year from now, when it's not as popular?'"

The new model could also be applied to the business world, Yoeli said, where managers could benefit from demonstrating their principles to customers, investors, and employees. Yoeli adds that the model suggests when we should care if businesses are principled: when firms' temptation to misuse our data or reduce the quality of their products varies considerably over time and users will have already given up their sensitive information or be locked into the firms' products.

The model also sheds light onto laws banning practices like selling organs or prostitution. According to Yoeli, this model suggests that laws banning the sale of organs enable policymakers or voters to signal their trustworthiness at the cost to those who are in need of a kidney. Thus, by helping us understand why we don't allow the sale of kidneys, we can better see how bad this policy is and that it ought to be changed.

"I don't think this is the best model for capturing everything about cooperation," Hoffman said. "If what you want to understand is why people reciprocate, or why people do good in the first place, the models of reciprocal altruism are very, very insightful. But this is the only model that can capture why we care about the motives of other or why people want to be principled."

Most importantly, the authors hope, this model can bring principled behavior and authentic altruism out of the domain of philosophy and theology and provide an evolutionary explanation for these phenomena.

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1. Moshe Hoffman, Erez Yoeli, Martin A. Nowak. **Cooperate without looking: Why we care what people think and not just what they do.** *Proceedings of the National Academy of Sciences*, 2015; 201417904 DOI: [10.1073/pnas.1417904112](https://doi.org/10.1073/pnas.1417904112)
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