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Simulated robots and the evolution of reciprocity

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A recommendation of

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Of the various forms of cooperative and altruistic behavior, reciprocity remains the most contentious. Humans certainly exhibit reciprocity – under certain circumstances – and various non-human animals behave in ways suggesting that they do as well. Thus, evolutionary biologists have sought to explain why non-relatives might engage in altruistic transactions when a substantial delay occurs between helping and compensation; i.e. an individual may be a donor today and a beneficiary tomorrow, or vice-versa. This quest, aided by game theory and computer modeling late in the past century, identified some strategies for reciprocal behavior that could work – in theory. But when biologists looked for confirmation of these strategies in animals they found little evidence that stood up to rigorous testing. In a recent paper André and Nolfi [1] offer a compelling reason for this observed rarity of reciprocity: Reciprocal behavior that animals might exhibit is a bit more complex than any of the game theoretic strategies, and even the simplest forms of realistic behavior would entail several nearly simultaneous mutations, an unlikely occurrence. André and Nolfi [1] relied on neural networks to test actors, robots that could evolve helping and reciprocal behavior from a basal level of selfishness. In an extensive series of simulations, they found that reciprocal behavior did not take hold in a population, largely because the various intermediates to full reciprocity were eliminated before the subsequent mutations occurred. The findings are satisfying given our current knowledge of animal behavior, but questions remain. Notably, how does one account for those rare cases in which reciprocity does meet all the criteria? The authors suggest some possibilities, but an analysis will await their next study.

References

[1] André J-B, Nolfi S. 2016. Evolutionary robotics simulations help explain why reciprocity is rare in nature. *Scientific Reports* 6: 32785. doi: 10.1038/srep32785