# Robots hold key to evolution of language

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They may look like toys, but these robots have helped to back one theory of the origins of language.

The robots communicated to identify the 'food'

Sometime between seven million years ago, when we shared our last common ancestor with chimps, and 150,000 years ago, when anatomically modern humans emerged, true language came into being.

One idea of how it emerged from the "primordial soup" of communication in the animal kingdom, whether primitive signalling between cells, the dance of bees, territorial calls and birdsong, goes as follows.

Early humans had a few specific utterances, from howls to grunts, that became associated with specific objects. Crucially, these associations formed when information transfer was beneficial for both speaker and listener. And in this way, the evolution of cooperation was crucial for language to evolve.

But this theory has been impossible to prove, given the lack of time machines or lack of fossil evidence of ancient tongues.



Now backing for the role of cooperation has come from experiments with robots - both real and virtual - that possess evolving software. The study is described today by a group including Dario Floreano of Ecole Polytechnique of the Fédérale de Lausanne, in Switzerland, and Laurent Keller of the University of Lausanne, in the journal Current Biology.

In the new work, the researchers studied the changing behaviour of 100 "colonies" of 10 virtual robots over 500 generations, during which their software was mutated and mixed - the equivalent of breeding - so that more successful traits were passed down to future generations.

Part of the work was also done with real robots, shown here. The breeding robots could forage in a virtual environment containing "food" and "poison" sources that could only be told apart at close range.

Theoretically, the efficiency of food foraging could be increased if the robots transmitted information to one another about the location of poison but in the case of food, there is a downside to announcing finds because rival robots could then compete for the same resource.

This is a neat way to represent the pressures facing social animals in real-world conditions, where communication may be costly or harmful to the individual, but beneficial to the group.

The team could make the simulation even more realistic by having different tribes of robots, where each tribe contained robots that were more similar (in terms of software) than robots of rival tribes.

The team found that communication evolves rapidly when colonies contain genetically similar (related) individuals, or when evolutionary selection pressure works primarily on the "group" level.

The only scenario in which communication did not result in higher foraging efficiency was

Promotions

when colonies were composed of robots of low relatedness, when the rule was, in effect, every robot for herself.

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