Experimental evolution of human cognition through bionic simulation

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The evolution of the cognitive mechanisms underpinning human culture remains one of the largest questions in evolutionary biology and cognitive science. Traditionally, it has been investigated through computer simulations and laboratory experiments on the psychology of the individual. Here, we develop a form of human-in-the-loop computation for studying the dynamics of human culture, language, social learning, and collective memory: conducting evolutionary simulations with bionic agents in massive online experiments. Simulating evolution with bionic agents brings the methods of experimental evolution to the study of human cognition, just as Dallinger did to the study of the biological evolution of unicellular organisms in the 1880s. This approach combines the detailed accounts of human behavior from experimental psychology with the large-scale, population-level view of theoretical simulations. We demonstrate the utility of the approach in a series of three studies — on the Rogers' paradox in the genetic evolution of social learning, gene-culture co-evolution in individual learning, and the evolution of memory.

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