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Proceedings of the Annual Meeting of the Cognitive Science Society

Title
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Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 44(44)

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Publication Date
2022

Peer reviewed

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The emergence of discrete and systematic communication in a continuous signal–meaning space

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Abstract

Language is simultaneously discrete (symbolic) and continuous (e.g., speech), and meaning-form associations are largely arbitrary. How and why did these properties emerge? To address this question, we study how people develop novel communication systems to refer to a continuous domain (color) using a continuous signal space (whistles). We conducted an experiment in which participants need to generalize from five learned signal-color pairings to a larger range of colors during an online communication game with another participant. We find that: (i) both discreteness and systematicity tend to emerge, such that signaling systems that reflect an underlying symbolic structure as well as systematic association with colors emerge more frequently; and (ii) these emergent systems achieve better communicative performance compared to emergent systems that exhibit only discreteness or only systematicity. These findings suggest a human cognitive bias not only toward symbolic communication, but also toward non-arbitrary meaning-form associations.

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