

Social Interaction Influences the Evolution of Cognitive Biases for Language

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Intuitively, learning two languages should be harder than learning one, yet bilingualism is prevalent in the world. How can we resolve this apparent mismatch between individual biases and population-level phenomena? Models of cultural evolution demonstrate that this link can be obscured by the process of cultural transmission (Kirby et al., 2007). However, recent extensions to these models predict that, if communicative coordination is associated with an evolutionary payoff, linguistic diversity will not emerge and learners should expect little linguistic variation in their input (Smith, Thompson & Kirby, 2011). These models use iterated learning with Bayesian agents that have a prior bias over the amount of variation to expect in their input. The strength of this bias is innately specified and is inherited from parents, with a small probability of mutation. Populations of agents reproduce according to a fitness payoff determined by communicative success.

Central to the model is the notion of communicative convergence: the assumption that a mature system of communication is one whose users have converged on monadic, or invariant, conventions. However, in reality most humans are exposed to a large amount of linguistic diversity and acquire communicative competence in multiple languages. While it may be traditional to view second language acquisition as a demanding task, children are adept at learning multiple languages simultaneously (De Groot, 2010).

We explore a range of alternative social models based on different metrics of communicative accuracy that determine the evolutionary payoff to individuals. These include metrics that privilege monolingualism, bilingualism, linguistic similarity (parity) and linguistic difference (exogamy). We also extend our framework to include a variable that determines the difficulty of acquiring communicative competence in a second language. By manipulating the communicative accuracy metric, different distributions of linguistic variation and prior biases emerge. We find various conditions that lead to the evolution of biases supporting bilingualism, and highlight implications for theories of language learning and language evolution.

De Groot, A. (2010). *Language and Cognition in Bilinguals and Multilinguals: An Introduction*. Psychology Press.

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