

## **Synonyms are Lost During Cultural Transmission without an Explicit Bias Against Synonyms**

While opinions differ as to the individual apparatus brought to bear during language learning is language-specific (Chomsky, 1965) or domain-general (Christian & Chater, 2008), features of language observed at higher than chance frequency across languages are generally considered to reflect properties of human cognition, and in particular biases in language learning and/or processing. One instance of this cross-linguistically widespread feature is a tendency to avoid unconditioned variation in natural languages: natural languages tend not to have many synonymous forms for the same meaning. How can we explain this feature of language? One possibility is that this feature of language is due to a cognitive bias against acquiring synonymous forms. For example, Markman and Wachtel (1988) found that children rejected a new label for an object that had been already named and preferred a one-to-one mapping; such biases are amplified through cultural transmission (Reali & Griffiths, 2009; Smith & Wonnacott, 2010).

Recent Bayesian models provide an account of the mutual exclusivity bias without explicitly incorporating such a learning bias (Tenebaum & Xu, 2000; Frank, Goodman & Tenebaum, 2009). Although those models that have provided insights into word learning at a developmental level, there is a lack of studies on the consequences of cultural transmission of Bayesian lexicon learning. Previous studies (Smith & Kirby, 2008) have shown that the effects after cultural transmission at a population level can differ greatly from those seen in individual development. This leads to an interesting question: what will the cultural transmission of vocabulary among Bayesian learners be like? If Bayesian learners without an explicit bias against synonyms can demonstrate a phenomenon of synonymy avoidance, then could cultural transmission of Bayesian word learning eventually lead to the cross-linguistically common tendency to avoid synonymous forms for the same meaning among the emergent language typology?

In the current study I investigate the cultural transmission of vocabulary under the framework of iterated Bayesian learning, aiming to further understand why natural languages tend not to have several competing forms for the same meaning. I investigate the effects of different learning strategies and linguistic inputs on individual learning trajectory and linguistic typology.

Simulation results show that at the developmental scale learners without an explicit prior against synonym languages prefer languages without synonyms. At the population level, unlike what has been found by Griffiths & Kalish (2007), the language typology does not converge to the prior over generations among the learners using the MAP (maximum a posterior) strategy but cultural transmission selects against languages with synonymies, regardless of the initial input languages. Further analysis suggests that transmission error allows the transition between different language hypotheses; when the transition happens, a synonymous language is more likely to lose synonyms than a non-synonymous language is to gain synonyms. This finding indicates the important role of stochasticity in language change and provides an alternate explanation for the lack of synonymies in natural language which does not require us to posit a bias against learning synonyms.

## References

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