

Diet learning and the evolution of cultural inheritance

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Social learning can give rise to cultural inheritance which forms an additional inheritance system next to genetic inheritance. Its evolution can be seen as a major transition in evolution. Using a spatial individual-based model we study the evolution of social learning and therewith the emergence of culture. We focus on diet learning in group foragers as a context in which cultural inheritance could have evolved. We model a rich environment in which foragers learn what to eat and focus on how environmental complexity can structure behavioural opportunities and lead to self-organizing processes. Our results show that social influences on learning arise as obligate side-effects of grouping. In patchy environments this can give rise to both traditional inheritance and cumulative cultural processes. Cultural phenomena therefore arise “for free” as soon as individuals learn by trial-and-error in groups. This shows the role of self-organizing processes in generating novelty in evolution. These self-organized processes set the context in which more sophisticated forms of social learning can evolve. By including copying behaviour in our model, we studied its adaptive influence and evolution. Results show that copying is not a fixed strategy and its adaptive value depends on resource distributions in the environment. On the one hand copying leads to collective problem solving within lifetimes. On the other hand it generates cumulative cultural diet optimization over lifetimes. Preliminary results of evolutionary simulations show that copying behaviour evolves because it allows for these adaptive processes. However copying also tends to reduce variation in groups and thus reduces the efficacy of natural selection. We conclude that self-organization plays a large role in the transition to cultural inheritance by means of generating obligate social influences on learning as side-effects of grouping. Moreover, this self-organized baseline affects the evolution of cognitively more sophisticated forms of social learning.