

Evolution of learning abilities: A theoretical model

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Abstract

The human has high individual and social learning abilities and strongly depends on both modes of learning. I study the effects of environmental change on learning abilities and the number of pieces of information learned individually (the amount of individual learning) and socially by analyzing a mathematical model. I show that the amount of individual learning decreases and that of social learning increases when the environment becomes more stable; both decrease when the environment becomes milder. I also show that the amount of individual learning increases when the individual learning ability increases or social learning ability decreases, while that of social learning increases when the individual or social learning ability increases. The evolution of high learning abilities can be triggered when the environment becomes severe, but high social learning ability can evolve only when high individual learning ability can simultaneously evolve with it.

Key words: Evolutionarily stable strategy (ESS); Convergence stability (CS); Continuously stable strategy (CSS); Environmental change; Human evolution; Enlargement of the brain