

Is evolution more intelligent than we thought?

Published:

18 December 2015



Could evolution learn from previous experience?

Evolution may be more intelligent than we thought, according to a University of Southampton professor.

[Professor Richard Watson](#) says new research shows that evolution is able to learn from previous experience, which could provide a better explanation of how evolution by natural selection produces such apparently intelligent designs. By unifying the theory of evolution (which shows how random variation and selection is sufficient to provide incremental adaptation) with learning theories (which show how incremental adaptation is sufficient for a system to exhibit intelligent behaviour), this research shows that it is possible for evolution to exhibit some of the same intelligent behaviours as learning systems (including neural networks).

In an opinion paper, published in *Trends in Ecology and Evolution*, Professors Watson and Eörs Szathmáry, from the Parmenides Foundation in Munich, explain how formal analogies can be used to transfer specific models and results between the two theories to solve several important evolutionary puzzles.

Professor Watson says: “Darwin’s theory of evolution describes the driving process, but learning theory is not just a different way of describing what Darwin already told us. It expands what we think evolution is capable of. It shows that natural selection is sufficient to produce significant features of intelligent problem-solving.”



Professor Richard Watson

For example, a key feature of intelligence is an ability to anticipate behaviours that that will lead to future benefits. Conventionally, evolution, being dependent on random variation, has been considered ‘blind’ or at least ‘myopic’ – unable to exhibit such anticipation. But showing **that evolving systems can learn from past experience** means that evolution has the potential to anticipate what is needed to adapt to future environments in the same way that learning systems do.

“When we look at the amazing, apparently intelligent designs that evolution produces, it takes some imagination to understand how random variation and selection produced them. Sure, given suitable variation and suitable selection (and we also need suitable inheritance) then we’re fine. But can natural selection explain the suitability of its own processes? That self-referential notion is troubling to conventional evolutionary theory – but easy in learning theory.

“Learning theory enables us to formalise how evolution changes its own processes over evolutionary time. For example, by evolving the organisation of development that controls variation, the organisation of ecological interactions that control selection or the structure of reproductive relationships that control inheritance – natural selection can change its own ability to evolve.

“If evolution can learn from experience, and thus improve its own ability to evolve over time, this can demystify the awesomeness of the designs that evolution produces. **Natural selection can accumulate knowledge that enables it to evolve smarter.** That’s exciting because it explains why biological design appears to be so intelligent.”