

Organisms cope with environmental uncertainty by guessing the future

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In uncertain environments, organisms not only react to signals, but also use molecular processes to make guesses about the future, according to a study by Markus Arnoldini et al. from ETH Zurich and Eawag, the Swiss Federal Institute of Aquatic Science and Technology. The authors report in *PLoS Computational Biology* that if environmental signals are unreliable, organisms are expected to evolve the ability to take random decisions about adapting to cope with adverse situations.

Most organisms live in ever-changing environments, and are at times exposed to adverse conditions that are not preceded by any signal. Examples for such conditions include exposure to chemicals or UV light, sudden weather changes or infections by pathogens. Organisms can adapt to withstand the harmful effects of these stresses. Previous experimental work with microorganisms has reported variability in stress responses between genetically identical individuals. The results of the present study suggest that this variation emerges because individual organisms take random decisions, and such variation is beneficial because it helps organisms to reduce the metabolic costs of protection without compromising the overall benefits.

The theoretical results of this study can help to understand why genetically identical organisms often express different traits, an observation that is not explained by the conventional notion of nature and nurture. Future experiments will reveal whether the predictions made by the mathematical model are met in natural systems.

More information: Arnoldini M, Mostowy R, Bonhoeffer S, Ackermann M (2012) Evolution of Stress Response in the Face of Unreliable Environmental Signals. PLoS ComputBiol 8(8): e1002627. [doi:10.1371/journal.pcbi.1002627](https://doi.org/10.1371/journal.pcbi.1002627)

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