

Environmental complexity promotes biodiversity

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A new study published in the journal *American Naturalist* helps explain how spatial variation in natural environments helps spur evolution and give rise to biodiversity.

The study, led by McGill University [evolutionary biologist](#) Ben Haller in collaboration with IIASA Evolution and Ecology Program Leader Ulf Dieckmann and IIASA researcher Rupert Mazzucco, suggests that a varied environment spurs the evolution of new species and promotes [biodiversity](#) by creating places of refuge—"refugia"—for new organisms to evolve.

The model represents asexual organisms that reproduce like plants. To investigate how environmental variation affects evolution, Haller modeled an environment with complex [spatial structure](#). "We wanted to look at more realistic environments, with more random variation in environmental conditions from place to place," says Haller. While simpler than a real-world environment, the resultant model provides a much more realistic basis for studying biodiversity formation than has been possible before.

In addition to the new "refugium effect," the study shows that too much variation can end up being detrimental for biodiversity. "It's a little like the story of Goldilocks and the Three Bears," says Haller. "For promoting biodiversity, you can have too little variation, or too much variation, or the variation can be just right."

The study also shows that the scale of landscape variation, in comparison with a species' dispersal distance, changes how much biodiversity can emerge.

The new work provides a better basis for understanding how biodiversity evolves. While many people laud the idea of preserving biodiversity, says Haller, much remains unknown about what an environment needs in order to maintain or produce biodiversity. "It's very hard to conserve something that you don't even understand," says Haller.

Haller started the work as part of his participation in IIASA's Young Scientists Summer Program, working with Dieckmann and Mazzucco.

More information: B.C. Haller, R. Mazzucco, U. Dieckmann. (2013). Evolutionary branching in complex landscapes. *American Naturalist* 182(4), E127–E141. [DOI: 10.1086/671907](https://doi.org/10.1086/671907)

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