



International Initiative for Theoretical Ecology

A think tank to promote our understanding of nature



@iite_info

@iite_info

https://iite.info

IITE - One Year On

Talk to IITE trustees at MMEE2019: Axel Rossberg , Gyuri Barabás , Géza Meszéna 

The International Initiative for Theoretical Ecology is an integrated platform to promote unity, visibility, teaching, funding, advancement and application of theoretical ecology. It aims to build and establish theory as a natural foundation of ecology. It also works to support and strengthen the spirit of pride and collaboration within the community.

IITE was founded in 2018. Join our supporters from the theoretical ecology community! 

Charity Status

IITE is now a Charitable Incorporated Organisation registered in England and Wales (reg. 1183900), which means:

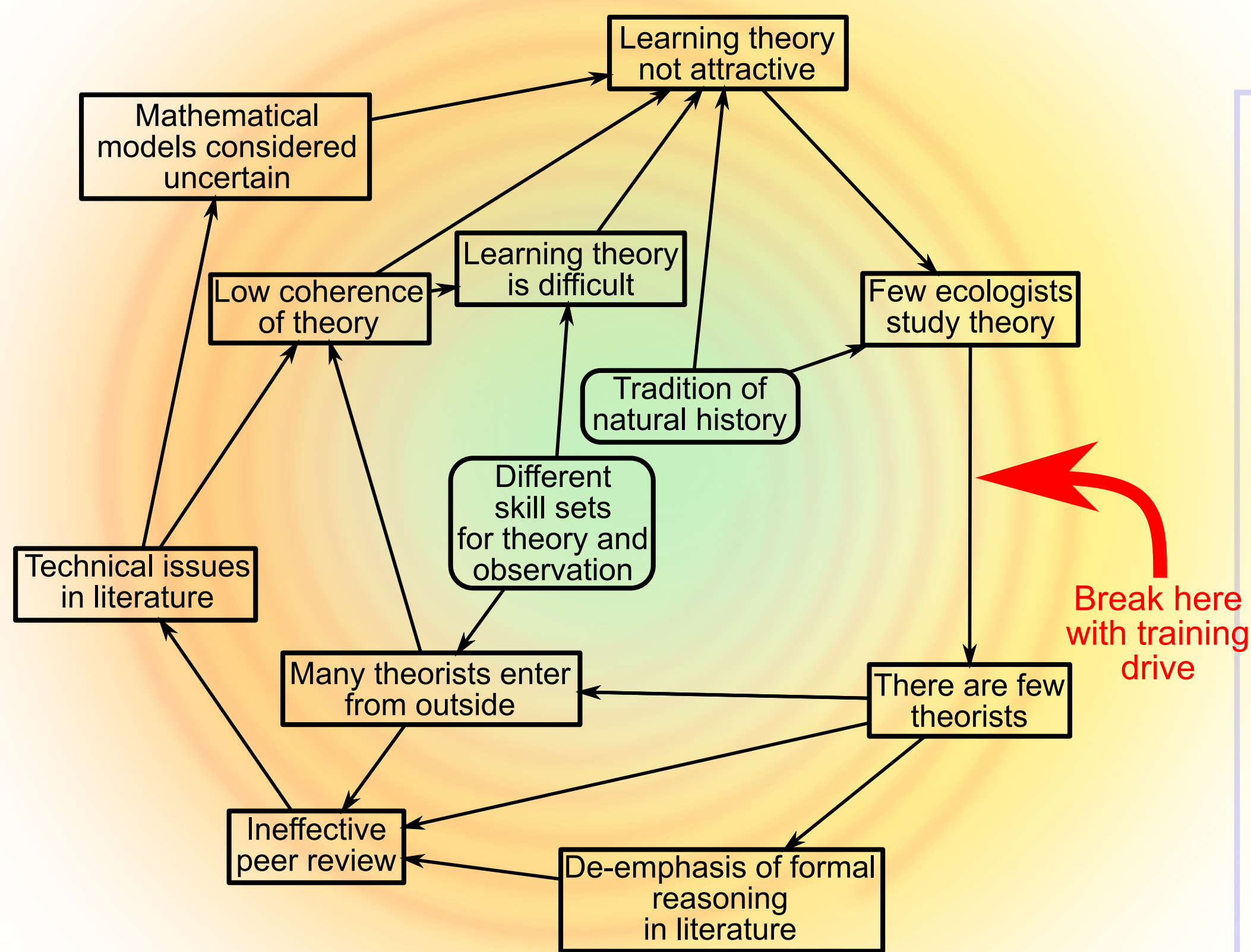
* IITE has a life on its own! *It belongs to you, the community of people interested in theoretical ecology.* We, the trustees are just currently looking after it.

* IITE can become partner in research projects and similar activities.

* IITE will soon be able to accept donations.

* IITE has limited financial liability, thus protecting those involved.

Let's Train More Theoretical Ecologists - Here Is Why



Powerful ecological theories

allow

more reliable forecasting

support

more effective policies

lead to

stronger protection of nature.

Wikipedia Initiative

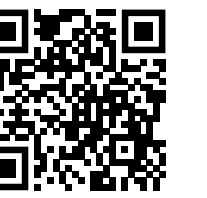
Theoretical community ecology consists of many models about ideas, phenomena and particular classes of systems that do not spring from a common narrative.

Joan Roughgarden, 2009
doi: 10.1007/s10539-009-9164-z

We are asking you all to develop this common narrative of theoretical ecology on *Wikipedia*. The advantages:

- * It's open access and information comes in digestible packages.
- * Cross-referencing is much simpler than in research papers.
- * Wikipedia encourages and supports debate about contents and style, should there be disagreement.
- * Wikipedia encourages you to be bold. If you think a published concept, model, method etc is important, just put it out there and let others react.

To get us started, we set up a new "Theoretical Ecology" Wikipedia category (because much of the material under "Ecological Theories" is not about theoretical ecology).



You'll see there isn't much yet, and this is the point: *please add to it!* To link a new or existing article to the Category, simply add the following, in a separate line, at the end

`[[Category:Theoretical ecology]]`

Would you like to take this even further, e.g. by adding a Theoretical Ecology Subportal to the Ecology Portal? Please go ahead!

Training Initiative

Dear Colleagues

12 July, 2019

TREE has recently published [an article](#) (attached) by IITE members and other theoretical ecologists from five continents that calls for a "global network of postgraduate theoretical [ecology] training programs". Please see the article for the rationale. In short: theoretical ecology is experiencing an Allee effect and we should overcome it.

How can we make this happen? After some discussion amongst us, a reasonable course of action appears to be a two-pronged strategy: summer schools and a network of MSc programs (optionally with courses open to PhD students). There will be synergies, because summer schools can help us test/demonstrate teaching methods and demand, and help explore funding routes, both of which helps building the MSc network. On the other hand, a network of MSc programs, as it emerges, will multiply teaching capacity for the summer schools and lend them further credibility.

We envisage the summer schools to be about 2 weeks long. They can be developed rather quickly and can make use of existing infrastructure for training programs offered by various organisations around the world. If you are interested in helping with development and/or delivery of summer schools, please let us know (contact@iite.info or axel@rossberg.net).

A network of MSc programs in theoretical ecology should build on experiences from related past and existing postgraduate programs around the world. There is much to be gained from joining forces, for example:

- To advertise and establish the degree and the profession of the Theoretical Ecologists as a brand recognized by both prospective students and employers.
- To improve the suitability of programs for non-academic career pathways, e.g. in the growing market of [impact investment](#).
- To jointly make a case to funders to subsidize programs that move from the margins of theoretical ecology (theoretical biology, complex systems, modelling, data science) towards its core.

We are planning to hold a workshop in the summer of next year to bring interested people together. Topics of the workshop could be: curriculum development, marketing, and financial support - all of which are closely related.

If you are interested in participating in this workshop or in pre/post workshop discussion, please drop me a line (axel@rossberg.net).

Any thoughts and comments are welcome.

Best wishes,
Axel

Dr. Axel G. Rossberg
International Initiative for Theoretical Ecology (<https://iite.info>)
and
Queen Mary University of London (<https://www.qmul.ac.uk/stbcs/staff/axelrossberg.html>)

IITE is a registered charity in England and Wales (1183900)

Trends in Ecology & Evolution

July 11, 2019

doi: 10.1016/j.tree.2019.06.004

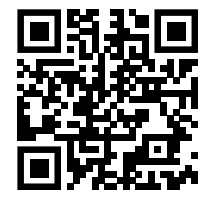
Axel G. Rossberg^{1,13,*}
György Barabás^{2,3,13}
Hugh P. Possingham^{4,5}
Mercedes Pascual^{6,7}
Pablo A. Marquet⁸ Cang Hui^{9,10}
Matthew R. Evans¹¹ and
Géza Meszéna^{3,12,13}

A tangled web of vicious circles, driven by cultural issues, has prevented ecology from growing strong theoretical roots. Now this hinders development of effective conservation policies. To overcome these barriers in view of urgent societal needs, we propose a global network of postgraduate theoretical training programs.

What is wrong with theoretical ecology?

Géza Meszéna

Blog post at iite.info - add your comments there



The status of theory within ecology is still uncertain. While it is no longer fashionable to declare ecological theory completely useless, many ecologist still harbour uneasy feelings toward it. They must have a point. We theoreticians should not just say that field ecologists don't understand maths. Theoretical ecology, as they see it, does not motivate them to learn it.

Theoretical ecology is generally considered as a collection of independent models. Usually, questions about relationships between the different models are not even asked. They are just different models with different assumptions, so the results are different, as well. It is a very rare situation, that one of the possible models matches reality in a very convincing way and allows us to make reliable predictions. While the so called "strategic" models [1] are supposedly wide in scope, but far from empirical details, the "tactical" ones may describe a specific situation, but fail to provide wider insight and predictive power. Neither of them build a connection between general concepts and specific field situations. Fundamental issues of ecology remain unresolved for decades, as one can support any proposal with models.

Many theoretical ecologists are excellent mathematicians and use their proficiency in a subfield of ecology. However, their results are not synthesized into the general culture of ecology. Ecology is still a verbal science; the subfields of, and the questions for, theoretical ecology are defined by the verbal (and often confusing) discourse. Current theoretical ecology books are usually collections of chapters written independently by different authors [2,3]. (Ted Case's "Illustrated guide" is the beautiful exception [4].) Chapters of Scheiner & Willig's book [5] are also written by different authors, but not independently: they had to obey a common structure. Still,

all chapters are verbal summaries of models and the chapters are related only through that structure.

We should do better. We need to have a different mind-set. It is not enough to teach and learn the very few most elementary models by themselves. We have to teach how to build a model and how to introduce any complications we wish to include with a reason. This way we develop the feeling that models describe reality - with the level of elaboration we want. Of course, fidelity of the model will depend on our detailed knowledge on the real thing - but this is the empirical side of the issue. This kind of familiarity with theory building allows us to assess whether the conclusion depends on this-or-that assumption/simplification, or not. We can develop a sense of related models. Model B can be a more specific version of Model A, so any conclusion from A automatically applies to B, independently of the added specifics. Or, B is an approximation of A, valid in a limit, etc. This way we can reach conclusions at very different levels. Some of them are very general and robust, others are more restricted in scope.

My personal motivation comes from the adaptive dynamics culture. Adaptive dynamics was to a large extent motivated by the theory of structured populations. This theory is the prime example for a high-level ecological framework theory. The point is that all complications of the life history of an organism contribute to the fitness in a mathematically well controlled way - which must be the starting point for a theory of evolution.

Note that it is very rare even in physics that we accept a model just because it fits data very convincingly. Sure, finding Neptune at the predicted place was a moment. Quantum physics became an established science when a single numerical prediction of quantum electrodynamics matched measurement with precision of 10 digits. Such things are rare and always related to the simplest possible situation. In the more typical case, we have a more-or-less accepted scientific framework - mostly learned from the simple cases and tested by many prior applications. We ask questions within

that framework. The first check of a new theory/model is whether it is consistent with the already established knowledge. If not, then it is wrong almost surely. (Well, rarely, we have to replace the framework.) The established knowledge has a structure. There are very general laws, and more specific ones, the latter ones have to be consistent with the former ones. Then, we have even more specific understandings on different classes of systems. All of this prior knowledge informs us when developing very specific assumptions and models about the specific system of interest.

While ecology is very different from physics, it also needs a kind of structured theoretical framework. The goal of ecology should be the fundamental understanding of ecosystems [6], instead of just to reproduce some observed correlations. For this purpose, we need a theoretical approach in line with that goal of fundamental understanding. We know how to model the simplest ecological situations. It works, and theoretical ecology should be built on this experience, instead of trying to describe (understand?) the more complicated systems with arbitrary models and (often vague) theories. A few of us have written a book that may illustrate our hope for an ecology based on a consistent theoretical framework [7].

- [1] Czárán, T.: Spatiotemporal models of population and community dynamics. Chapman & Hall, 1998
- [2] Hastings & Gross (Eds.): Encyclopedia of theoretical ecology. University of California Press, 2012
- [3] May & McLean (Eds.): Theoretical Ecology: Principles and Applications. Oxford University Press, 2007
- [4] Case, T. J.: An illustrated guide to theoretical ecology. Oxford University Press, 2000
- [5] Scheiner & Willig: The theory of ecology. The University of Chicago Press, 2011
- [6] Courchamp, Dunne, Le Maho, May, Thébaud & Hochberg: Fundamental ecology is fundamental. TREE 30: 9-16, 2015
- [7] Pásztor, Botta-Dukát, Magyar, Czárán & Meszéna: Theory-based ecology: a Darwinian approach, Oxford University Press, 2006



Fig. 1 Repeated powerful disturbances can have devastating effects on nature and society. Damage done by Hurricane Iselle at the Nanawale Forest Reserve, Pahoehoe, Hawaii. Credit: JODI JACOBSON/GETTY

disturbances plays a role becomes clear from the analogy of a water trough that is slowly refilled through a fountain. Even if filling a bucket by dipping it into the trough will recovery time. Both assumptions, they show, can lead to overoptimistic conclusions. The trough will eventually run dry whether we fill one bucket every minute or if we