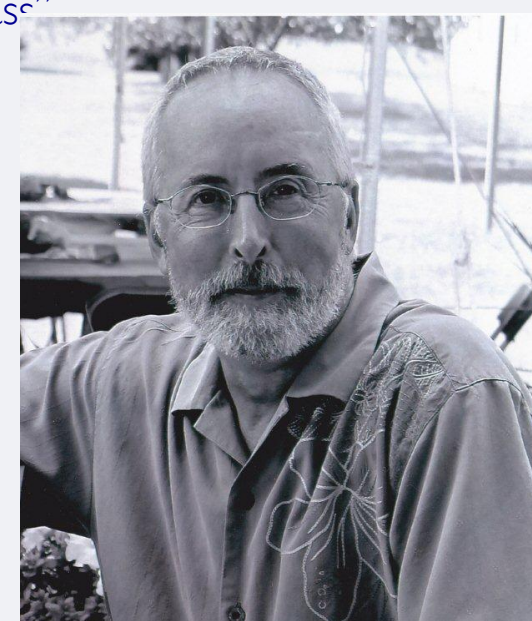
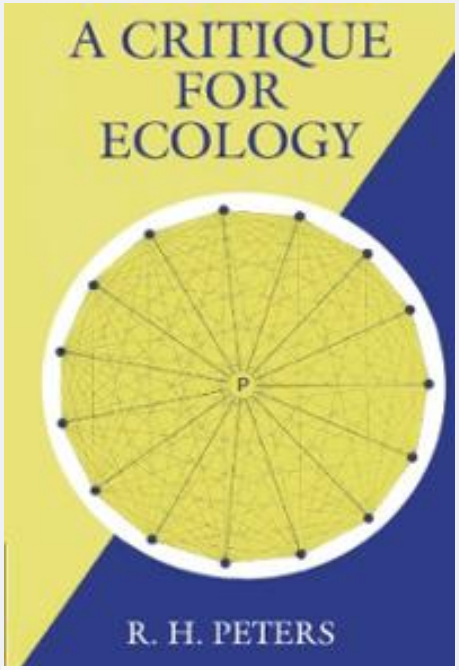
2) Major Areas of Ecological Inquiry

- 1970s: Idea that **interspecific competition - or in other words 'limiting similarity' (i.e. the minimal niche difference between two competing species that would allow them to coexist) -** is the only or even primary factor structuring communities
- 'Heady optimism of the 1970s' exemplified by Bob May (1977) – "limits to similarity are probably the major factor determining how many species there are."
- By the late 1970s, this idea was challenged…
- New Directions
- Rise of a more 'pluralistic' approach to ecology: recognizing that multiple factors may interact to determine the distribution and abundance of species
- "The difficulty with plurality is that it can quickly lead us into a morass"

-Gary Mittelbach, Community Ecology 2012



The Quest for Predictive Ecology



Rob Peters, McGill 1946-1996

- "In my research, I have become obsessed with the inability of Ecology to provide more than the lore of natural history that I enjoyed as a child, or even to recognize the deficiencies. I have therefore set out…to build a predictive ecology as a major contribution to a scientific revolution."
- Severely criticized or dismissed by those who felt he questioned the approach and utility of their work… those primarily fascinated by the identification of mechanisms, or in 'understanding';
- "Predictive power is the touchstone of science, is the ultimate criterion against which every scientific hypothesis can be tested." –Peters 1980

Are there general laws in ecology?

John H. Lawton

Lawton, J. H. 1999. Are there general laws in ecology? – Oikos 84: 177–192.

The dictionary definition of a law is: "Generalized formulation based on a series of events or processes observed to recur regularly under certain conditions; a widely observable tendency". I argue that ecology has numerous laws in this sense of the word, in the form of widespread, repeatable patterns in nature, but hardly any laws that are universally true. Typically, in other words, ecological patterns and the laws, rules and mechanisms that underpin them are contingent on the organisms involved, and their environment. This contingency is manageable at a relatively simple level of ecological organisation (for example the population dynamics of single and small numbers of species), and re-emerges also in a manageable form in large sets of species, over large spatial scales, or over long time periods, in the form of detail-free statistical patterns – recently called 'macroecology'. The contingency becomes overwhelmingly complicated at intermediate scales, characteristic of community ecology, where there are a large number of case histories, and very little other than weak, fuzzy generalisations. These arguments are illustrated by focusing on examples of typical studies in community ecology, and by way of contrast, on the macroecological relationship that emerges between local species richness and the size of the regional pool of species. The emergent pattern illustrated by local vs regional richness plots is extremely simple, despite the vast number of contingent processes and interactions involved in its generation. To discover general patterns, laws and rules in nature, ecology may need to pay less attention to the 'middle ground' of community ecology, relying less on reductionism and experimental manipulation, but increasing research efforts into macroecology.

Are there general laws in ecology?

John H. Lawton

"..contingency …makes it difficult, indeed virtually impossible, to find patterns that are universally true in ecology. **This, plus an almost suicidal tendency for many ecologists to celebrate complexity and detail at the expense of bold, first-order phenomena.** Of course details matter. But we should concentrate on trying to see where the woods are, and why, before worrying about the individual trees."

Ecology starts to come of age…

- Surge in popularity and growth at universities.
- Search for general explanations has become more successful (?)

What changed?

- 1) New foci: applied ecology, conservation biology, climate change
- 2) Computational and statistical tools enabling broad-scale synthetic research

Today's Discussion: 3) Ecological Approaches

http://uvic470ecology.weebly.com/

Welcome to 470 Advanced Ecology

Week 1 (January 6-9th) - Ecological Aims and Approaches

T: L - Course Introduction

W: L - What is ecology? Major areas of inquiry and approaches

Required reading:

- *Kingsland 'Defining ecology as a science' In: Foundations of Ecology - Classic Papers with Commentary. L.A. Real and J.H. Brown Eds.*

F: D - How are ecological discoveries made?

Required readings:

- *1) Sagarin 2010 Observational approaches in ecology open new ground in a changing world*
- *2) Lindenmayer and Likens 2011 Losing the culture of ecology*
- *3) McGill 2013 The one true route to good science is..... Dynamic Ecology blog*
- *4) Duffy 2013 The importance of diverse approaches in ecological research Dynamic Ecology blog*

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definingscience.kingsland.1991.pdf
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3) Ecological Approaches and Tools

Theory (Conceptual, Mathematical models)

Empirical Approaches:

- Observations
- Experiments

Tools:

- Computational
- Stable isotopes
- Meta-analysis

'Big Science'