Ecological Dynamics

Introduction

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Northeastern University
http://blackboard.neu.edu

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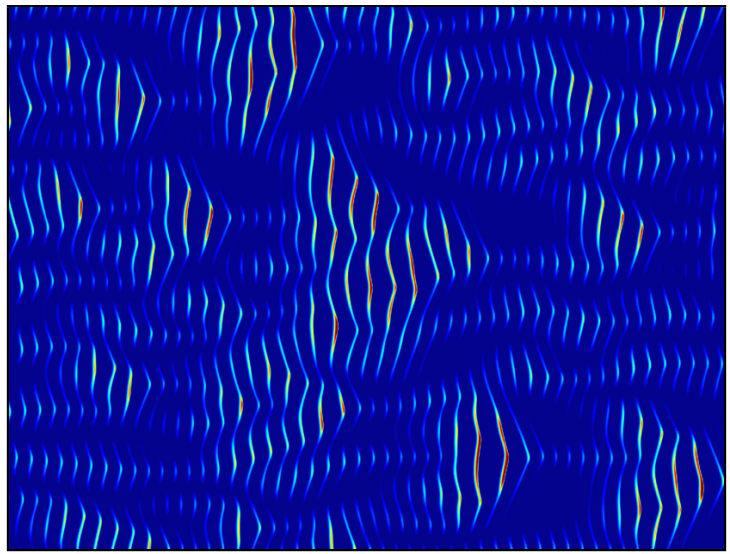
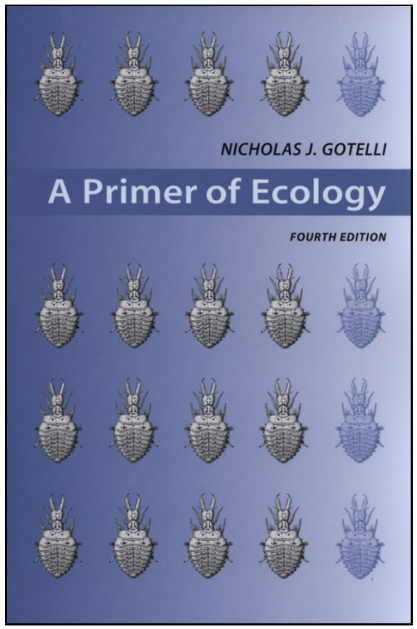


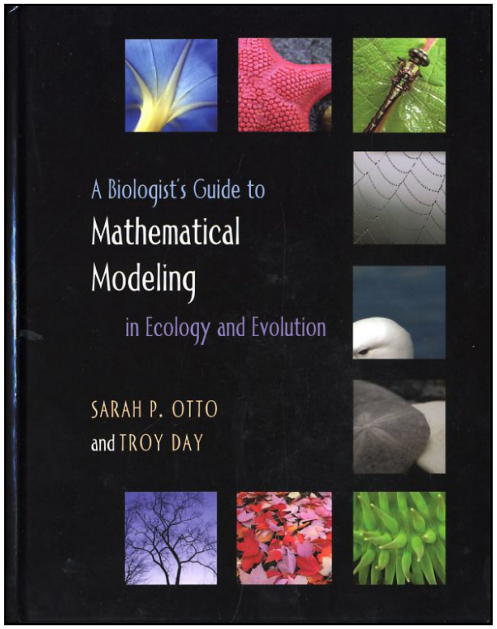
Instructor information

- **Instructor**: Dr. Tarik C. Gouhier
- **Office**: Holmes 071 (Boston) & Marine Science Center 61 (Nahant)
- **Email**: tarik.gouhier@gmail.com
- **Office hours**: Immediately following lectures on Mon and Thursday

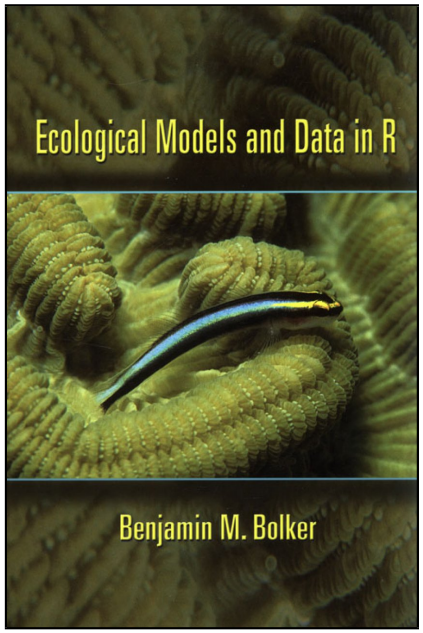
Textbooks



Gotelli (2001)
Required

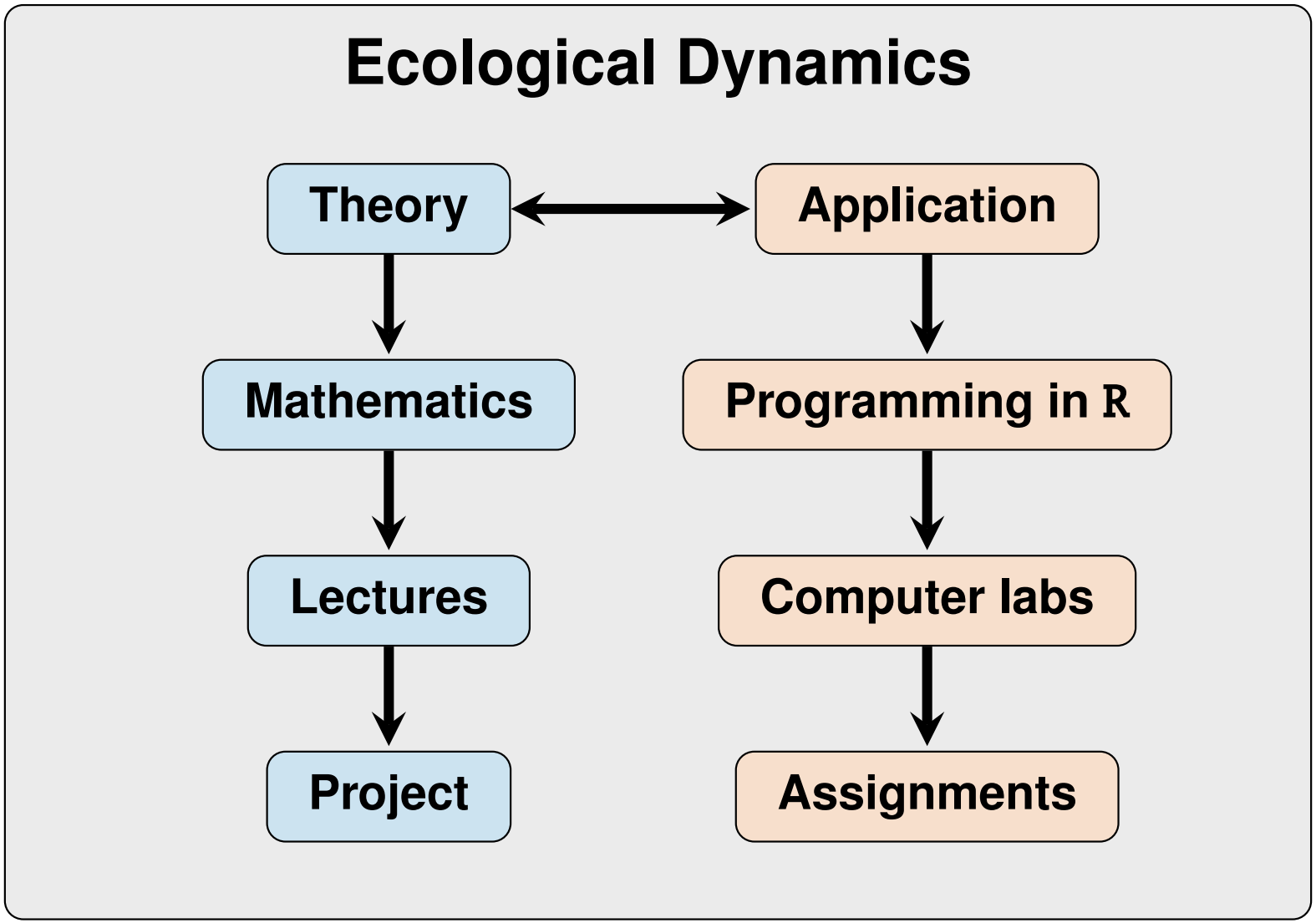


Otto & Day (2007)
Recommended



Bolker (2008)
Suggested

Course organization



Lectures

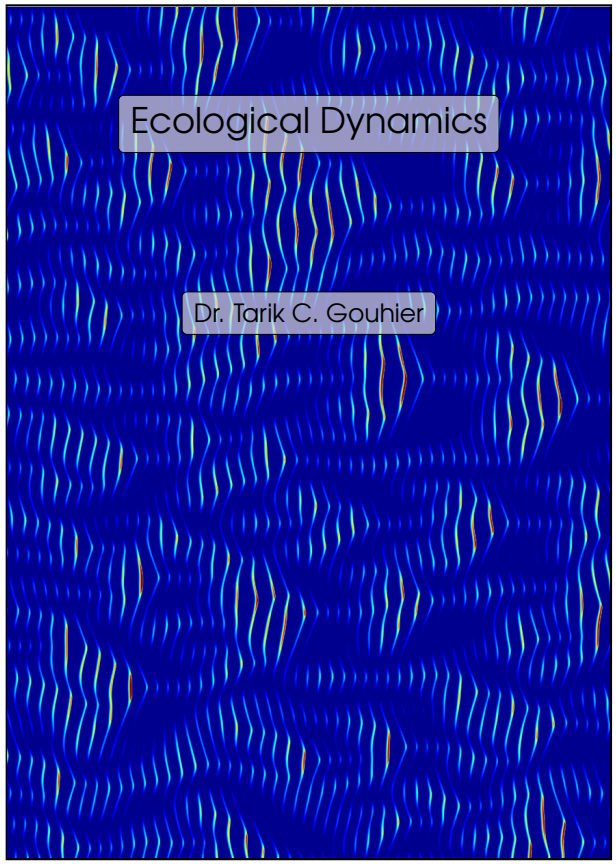
- Two 1.5-hour lectures every week
- Each lecture will have the following structure:
  1. Describe the motivating biological topic
  2. Derive the models and the the analytical tools used to address the topic
  3. Describe potential worthwhile model extensions for student projects

Lecturing style

- I tend to speak quickly, so ask questions if something is unclear
- I will make use of both digital slides and the (black or white)board
- All lectures will be recorded via Tegrity and made available on Blackboard shortly after each class

Labs

- **Sessions**: Monday and Thursday from 2-5 PM in Holmes 070 (GIS lab)
- **Software**: http://www.r-project.org http://www.rstudio.com
- **Course manual**: Available as a PDF on Blackboard
- Course manual contains a thorough introduction to `R` and `Rmarkdown`
- Lab activities will be distributed at the beginning of each week to ensure that labs remain synced with lectures
- Attendance mandatory (-1% per absence)
- **No labs in week 1, but must read chapter 2 of the course manual**



Gouhier (2014)
Required

Installing R

Download R by using the appropriate link:

- **For Macs**: http://cran.rstudio.com/bin/macosx/
- **For Windows**: http://cran.rstudio.com/bin/windows/base/
- **For Linux**: http://cran.rstudio.com/bin/linux/ and select the appropriate distribution

Download RStudio by selecting the appropriate link on the following page: http://www.rstudio.com/products/rstudio/download/

Install both programs and then run RStudio, which will launch R in the background.

Student evaluation

Type of evaluation	Weight
Assignments	20%
Project proposal	20%
Peer-review of project proposal	5%
Project report	40%
Presentation of project	15%

Assignments

- A total of 3 assignments, scheduled every other week (each takes up to 10 hours to complete)
- Assignment questions assess understanding of lecture material and `R`
- Must be completed using the `dynamics-assnTemplate.Rmd` file posted on Blackboard
- This `R markdown` file should include the `R` code used to solve the problems along with your interpretation of the results
- Submit the source `R markdown` file along with the compiled PDF to me via email by the due date
- 5% penalty per (unexcused) day late
- **Note**: To get `R markdown` to work, you will need to download and install a LaTeX distribution on your computer (see instructions in `dynamics-assnTemplate.Rmd`)

Project proposal

- Submit 2-page (single-spaced, 1-inch margins, Arial size 10 font) proposal for project on **Thursday March 19**
- The proposal will have the following structure:
  1. **Introduction & Background**: describe an open question/topic in a biological field and outline its importance
  2. **Questions & Goals**: delineate the questions the project will address along with hypotheses/predictions
  3. **Methodological Approach**: describe how you plan to carry out the research
  4. **Expected Results & Implications**: describe expected results and implications for the broader public

Peer review of project proposal

Students will use form `dynamics-review.doc` to review the proposals of their peers by assessing them on a scale of 1 (Poor) to 5 (Excellent) for each of the following criteria:

- Clarity
- Novelty
- Feasibility
- Potential societal impact

All reviews and proposals will be anonymous.

Project presentation

- Students will prepare and deliver a 15- to 30-minute long presentation of their project during the **the last week** of classes
- Presentations should be prepared in PowerPoint/Keynote/Beamer and articulate the rationale, methodology, results and main conclusions of the project
- Sufficient information should be given to convey the importance of the project to a “generic” scientist (not necessarily a biologist or ecologist)
- Each presentation will be followed by a 5-10 minute question & answer period

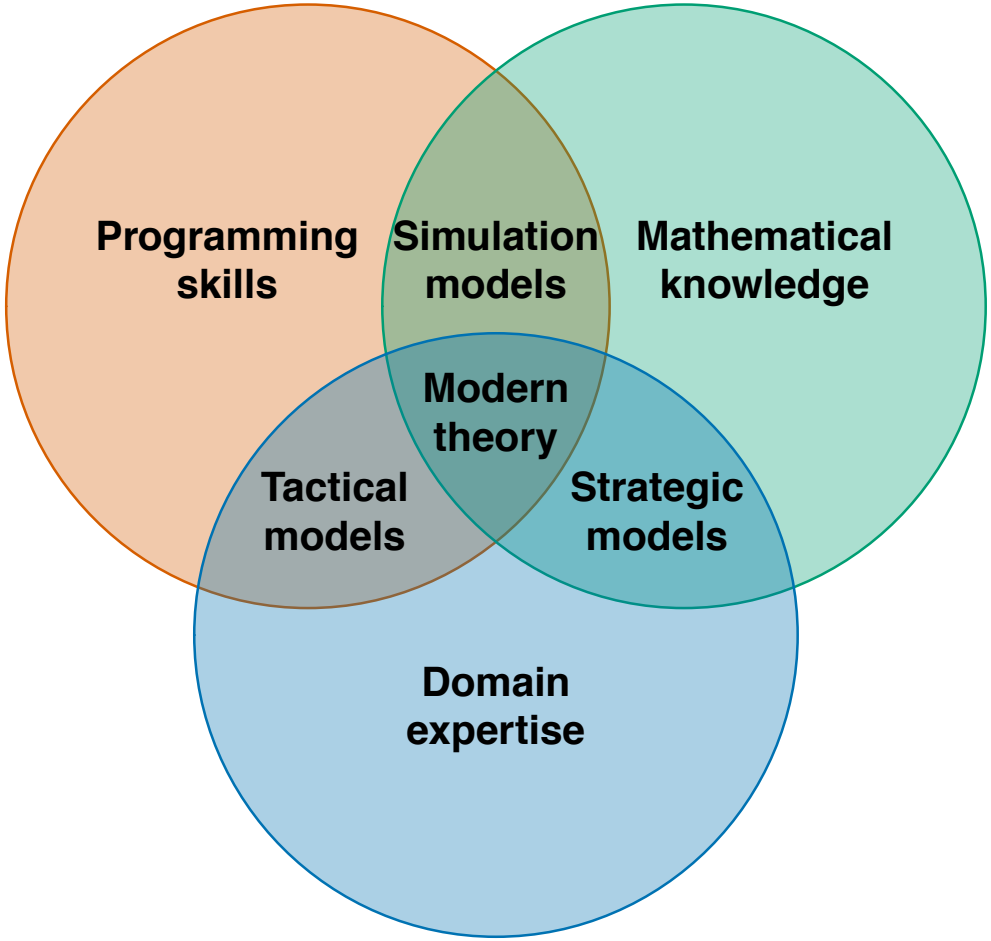
Project report

- Students will submit a scientific manuscript based on their proposal that adheres to the format of a *Letter* for the journal *Ecology Letters* by **Friday May 01**
- The manuscript will present a novel model that tackles the topic described in the proposal. The paper will also include an appendix describing the rationale for the model derivation and analysis, along with the `R` code used to produce the results
- The manuscript should have the following sections: “Abstract”, “Introduction”, “Methods & Materials”, “Results”, “Discussion”, “References”, “Tables”, “Figures” and no more than 5,000 words and 6 tables/figures
- See the author guidelines for greater details about the format of the manuscript
- I suggest using a Citation Manager such as Zotero to organize your references

Course evaluation

- Students are expected to complete the student survey known as TRACE (Teaching Rating and Course Evaluation)
- Accessible via the MyNEU website

Course goals



1. Understand mathematical theory needed to build models
2. Learn practical computational aspects of model-building
3. Develop models to address modern biological problems

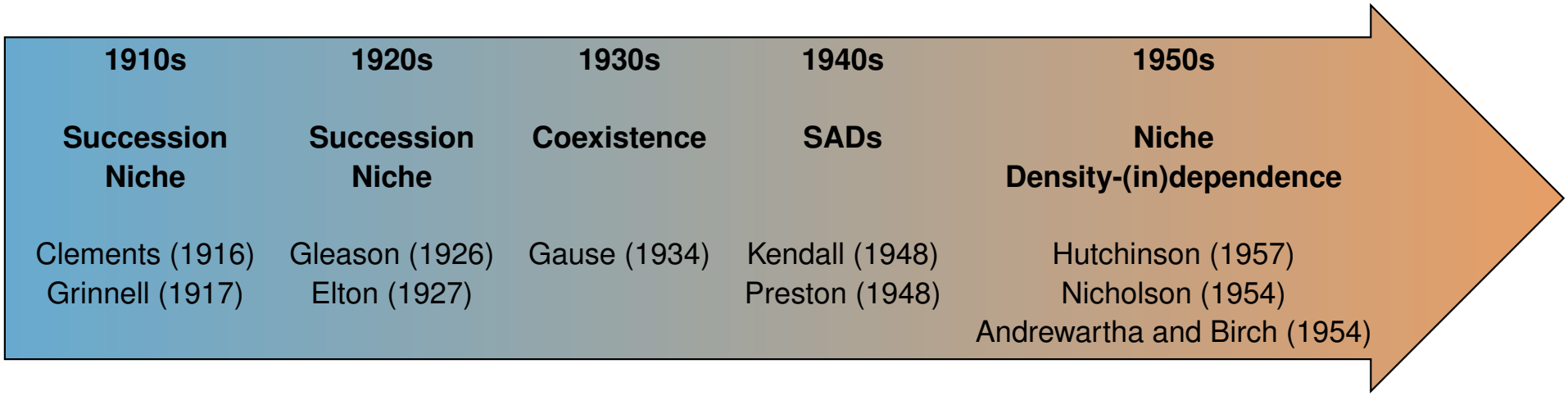
Course syllabus (1/2)

Week	Date	Lecture	Readings
1	Mon Jan. 12 Thu Jan. 15	Introduction Philosophy of modeling	**O**1
2	Mon Jan. 19 Thu Jan. 22	**MLK day: no class** Constructing models	**O**2
3	Mon Jan. 26 Thu Jan. 29	Population growth (1/2) Population growth (2/2)	**G**1, **G**2
4	Mon Feb. 02 Thu Feb. 05	Matrix models Competition (1/2)	**G**3, **O**10
5	Mon Feb. 09 Thu Feb. 12	Competition (2/2) Predation (1/2)	**G**5
6	Mon Feb. 16 Thu Feb. 19	**Presidents' day: no class** Predation (2/2)	**G**6
7	Mon Feb. 23 Thu Feb. 26	Food chains (1/2) Food chains (2/2)	**G**6
8	Mon Mar. 02 Thu Mar. 05	Food webs (1/2) Food webs (2/2)	Selected papers
9	Mon Mar. 09 Thu Mar. 12	**Spring break: no class** **Spring break: no class**	

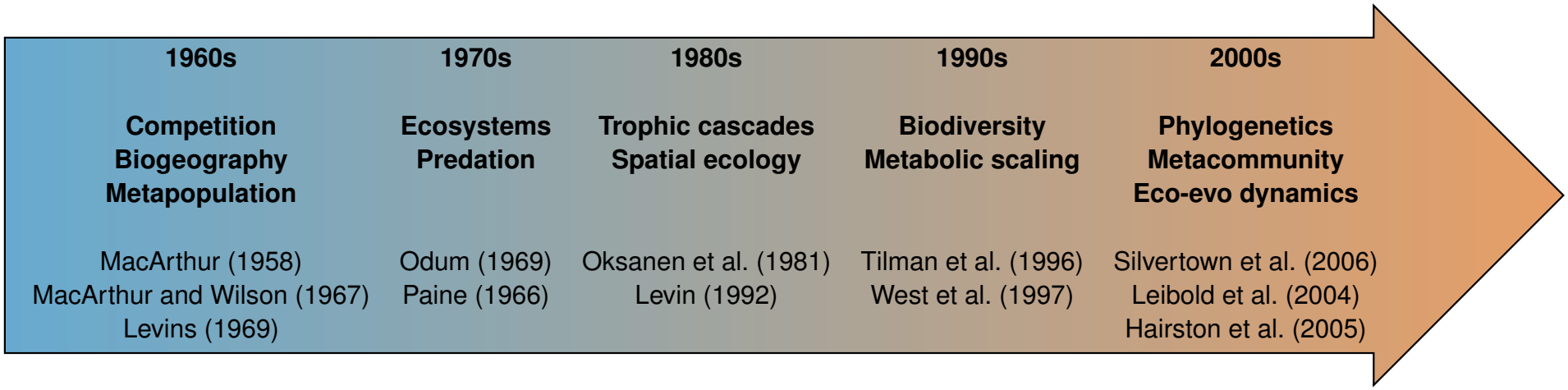
Course syllabus (2/2)

Week	Date	Lecture	Readings
10	Mon Mar. 16 Thu Mar. 19	Epidemiological models (1/2) Epidemiological models (2/2)	**O**3
11	Mon Mar. 23 Thu Mar. 26	Spatial models (1/2) Spatial models (2/2)	**G**4
12	Mon Mar. 30 Thu Apr. 02	Environmental change (1/2) Environmental change (2/2)	Selected papers
13	Mon Apr. 06 Thu Apr. 09	Fitting models to data (1/2) Fitting models to data (2/2)	**B**7
14	Mon Apr. 07 Thu Apr. 10	Project presentations Project presentations	
15	Mon Apr. 13 Thu Apr. 16	Project presentations Project presentations	
16	Mon Apr. 20 Fri May 01	Project presentations **Projects due**	

A brief (and biased) history of ecology (1/2)



A brief (and biased) history of ecology (2/2)



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