Molecular Ecology

Bio493Z/793R
Fall 2006

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Plan for Today

- Overview of class: nuts and bolts
- Introductions
- Conceptual overview of class
- Test
Course Structure

- Lectures on Monday and Friday
- Usually literature discussions on Wednesday
- 3 lab periods on Wednesdays
  - Mostly on days when something is due.
  - Labs held in Biology Department Computer Lab, LSB 3306
Text

◆ Lowe, Harris, and Ashton at bookstore and Book Exchange

◆ Also on reserve in library:

◆ Required reading on course website or reserve
Course Website

- [http://www.as.wvu.edu/~sdifazio/molecemol.htm](http://www.as.wvu.edu/~sdifazio/molecemol.htm)
  - Accessible through my departmental page
- Lecture slides (but probably not until the morning of the lecture)
- Updated reading list and links to papers
- Informative links and other exciting material!
Accessing Course Reserves

MountainLynx Catalog of the WVU Libraries

Database Name: WVU Libraries

Basic Search

Instructor: DAGISHAN, J.

Course: College, Corey

Section: DAGISHAN, J.

DALESSANDRI, DR.

DALEY, STEWART

50 records

Course Reserve

Select the

DONOVAN, GRAEME

DONOVAN, GRAEME

DUSSICH, CHARLES

DuGeorge, Frank

Dorf, Thomas, Lisa

Dow, Stephen

Denley, Meteoro M.

Search

E-ZSearch

E-ZBorrow

ILLiad

Patron

Request

Reset

Home
Course Requirements

- Two exams: midterm and final, 100 points each
- Term paper: 100 points
- Class participation: 100 points
Exams

- Mid-term and final, both take-home, due one week after distribution

- Essay questions that require thinking and synthesis!

- Strict word limits: probably 500 words total, plus some calculations.

- Honor system: please work alone and come to me with questions or for clarifications
Term Paper

◆ **Grads**

- 10 page grant proposal for a topic in molecular ecology
- Introduction, background, rationale, approach, expected results, timeline, and budget.
- Can be related to dissertation topic.

◆ **Undergrads**

- 5 page paper on a topic of your choice related to molecular ecology

◆ **Proposal, outline, and draft all due before final paper. Ten points each.**

◆ **Final presentation of proposal (grads only), 20 points.**
Class Participation

* Based primarily on literature discussion sessions

* Each student will lead discussion of one paper (25%)
  - 5 minute overview of background, approach and main findings

* All students will be expected to answer questions related to the paper (75%)
  - Randomly select students to answer questions related to the paper. At least 5 questions per paper related to background, methods, or conclusions.

* Extra Credit: lead an extra discussion session! 20 available, only 15 students
Introductions
Molecular Ecology

◆ Application of DNA-based methods in ecology
◆ Using genetic composition of populations to explore ecological characteristics and interactions
◆ Exploration of the interface between molecular biology and ecology
Ecotones

- Transition or interface between adjacent communities or biomes
- Typically very high in diversity and complexity
- Also very stressful environments!
Molecular Ecology is an Ecotone of Two Disciplines

- Power of molecular biology and genomics approaches can yield unprecedented insights into structure and functioning of ecosystems
- Ecological approaches provide a means for dealing with complexity, variability, and nonlinearity
- Life can be stressful in this field. Complexity x Complexity = A hopeless mess!
- Judicious choice of species and questions
Choice of Questions

- Specificity
- Testability
- Are molecular methods really the best choice?
Choice of Study Species

- Well-characterized life history
- Ease of collection
- Short lifespan
- Adequate genetic variation
- Ease of propagation/maintenance
- Ecologically important
Areas of Impact for Molecular Ecology

◆ Inference of population history
  - Historical bottlenecks
  - Migration rates and routes following deglaciation

◆ Studies of current population processes
  - Characterization of unknown communities
  - Patterns and distances of migration
  - Identifying population of origin

◆ Prediction of future population trajectories
  - Patterns of adaptive variation and likely responses to perturbations
Course Objectives

◆ Provide an overview of molecular tools that can be useful for ecological investigations, from a theoretical and practical standpoint

◆ Introduce analytical approaches for studying molecular variation in complex systems

◆ Explore future directions and novel applications of molecular methods in ecology
Overview of Syllabus

- Historical perspective
- General review of genome structure and composition, DNA basics, and key population genetics concepts
- Molecular methods
- Analysis of selectively neutral variation
- Analysis of adaptive variation
- Toward ecosystem genomics
- Student presentations