

# Hands-on Research at the Natural History Museum - BISC 499 Syllabus - 2013 Fall Semester

## **1. Basic Information**

- Course:* Hands-on Research at the Natural History Museum, BISC 499, 4 credits
- Textbooks:* Michael J. Benton. 2008. The History of Life. Oxford University Press & Peter Dalgaard. 2008. Introductory Statistics with R, 2nd edition. Springer.
- Place and time:* Tuesdays & Thursdays: 1 – 2:50 pm  
Los Angeles County Museum of Natural History (across Exposition Dr.),  
Times Mirror Room
- Faculty:* Dr. Matthew D. Dean  
(matthew.dean@usc.edu, 213-740-5513)  
Assistant Professor, Molecular and Computational Biology
- Dr. Sergey Nuzhdin  
Professor, Molecular and Computational Biology  
(snuzhdin@usc.edu, 213-740-5773)
- Prerequisites:* none
- Class web page:* <https://blackboard.usc.edu> (follow link to BISC 499 web space)

## **2. Classroom policy**

Students must bring laptops to class. Any other electronic communication devices (phones, blackberries, and similar) must be turned off, and no instant messenger/chat type programs are allowed in class.

## **3. Course goals and learning objectives**

The main goal of this course is to immerse students in scientific research, using one of the world's premier repositories of biodiversity, the Los Angeles County Museum of Natural History (LACMNH). The class will take place at the LACMNH, across the street from USC. Your professors are building from ongoing scientific collaborations they have with museum curators and collections managers to enable student science. We will learn through hands-on experience, rather than Powerpoint slides.

Through the course of the semester, students will identify an independent research project that interests them. With guidance from both professors, students will eventually take “full ownership” of their project, moving from hypothesis to data collection and analysis, to scientific inference. Their research projects will utilize museum collections in any manner.

**The ultimate goal of this course is to teach the scientific process while undertaking hands-on research, and to understand the relevance of scientific inquiry in everyday life. The only pre-requisite for this course is scientific curiosity. Students are not expected to know anything about museums, collecting biological data, statistical analyses, etc.**

**Your professors will be very involved in mentoring each student through their specific project.**

#### **4. Weekly themes**

Each week, we will focus on one of the many ways that a museum collection enables scientific discovery – for example, identifying species.

<b>Week</b>	<b>Topic</b>	<b>Professor</b>
1	What is a Natural History Museum?	Nuzhdin
2	Identifying species	Nuzhdin
3	Inferring species relationships	Nuzhdin
4	Mapping species distributions	Nuzhdin
5	Biodiversity	Nuzhdin
6	Population genetics I	Nuzhdin
7	Population genetics II	Nuzhdin
8	Fossils and deep time	Dean
9	Adaptation	Dean
10	Inferring species ecology	Dean
11	Inferring life history	Dean
12	Sexual selection	Dean
13	Genomics I	Dean
14	Genomics II	Dean
15	Student final presentations	Dean/Nuzhdin
16	Student final presentations (flexible scheduling to accommodate finals)	Dean/Nuzhdin

#### **5. Weekly readings**

All biological research (this course is no exception) is rooted in evolutionary biology. Michael J. Benton has written an excellent account of the history of life on earth. Topics from Benton are meant to give students a stronger background in evolutionary thinking. In addition, your research topics will rely heavily on analysis of biological data. Peter Dalgaard has written an excellent introductory text on using R to analyze biological data. Readings from Dalgaard are meant to equip the student with the tools necessary to test hypotheses.

Week	Readings & Discussion
1	Seminars/Discussion with museum researchers
2	Seminars/Discussion with museum researchers
3	Seminars/Discussion with museum researchers
4	Benton, Ch. 1: The origin of life
5	Benton, Ch. 2: The origin of sex
6	Benton, Ch. 3: The origin of skeletons
7	Dalgaard, Ch 1: R basics
8	Midterm: Student presentations on research objectives
9	Dalgaard, Ch. 2: The R environment
10	Dalgaard, Ch. 3: Descriptive statistics and graphics
11	Dalgaard, Ch. 4: Descriptive statistics and graphics
12	Benton, Ch. 5: Forests and flight
13	Benton, Ch. 6: The biggest mass extinction
14	Benton, Ch. 7: The origin of modern ecosystems
15	Benton, Ch. 8: The origin of humans
16	Final: Student presentations on research discoveries

## **6. Professors**

Dr. Matthew D. Dean

Lab webpage: <http://www-bcf.usc.edu/~matthedd/index.html>

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University of Southern California  
Los Angeles, CA 90089

## **7. Assessment**

Grades are based accordingly. The final writeup will be a ~10 page (not including bibliography) paper written in scientific format. Final presentations will be a ~20 minute oral presentation based on the paper. (Note that final presentations during week 16 will be scheduled flexibly to avoid interfering with your finals). Your professors are most interested in the hypothesis (or hypotheses) addressed, the data and analyses used to test that hypothesis, and the rigor of the scientific conclusions drawn.

Assessment	Percent
Weekly participation	10%
Midterm presentation	35%
Final project writeup	30%
Final project presentation	25%

Students who are not able to meet deadlines due to medical or other emergency must notify the instructor immediately.

## **8. Statement for Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html), (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto:ability@usc.edu).

## **9. Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, ([www.usc.edu/scampus](http://www.usc.edu/scampus) or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

## **10. Resources**

*10.1. Web page:* A class website will be setup on Blackboard containing information about the course: syllabus, handouts, grades, miscellaneous information about weekly class activities, and an email directory of all people in the class. Use it as much as you find it useful. The web page can be accessed through the main stem <https://Blackboard.usc.edu>.

*10.2 Office Hours:* Office hours will be held weekly by appointment.