

## Syllabus

OEB275r – Spring 2021

Scott V. Edwards, Sang Il Kim, OEB/MCZ

### Phylogeography and phylogenetics in the era of genomics

Instructor: Scott V. Edwards, MCZ Laboratories room 306; 617-384-8082;  
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Weekly meeting time: Wednesdays 12-2:45 pm EST.

Zoom link:

<https://harvard.zoom.us/j/99459096480?pwd=STRoaksxK0NOVXVjdlFwOFZlZXRkUT09>

Course overview:

**Three major themes:** 1) fundamentals of population genetics and phylogenetics; 2) using gene trees and coalescent to estimate species trees (phylogenies) 3) new models for studying genetic diversity within species and population structure

**Course structure:** The course will begin with introductory lectures and demonstrations so that everyone is on the same page. We will also introduce basic models of phylogenetics using the multi-species coalescent model. In mid-course, pairs of students will present a topic through one or two original research papers. The course will end with several guest lectures on specific topics, including studying adaptive evolution and estimating gene flow. A short (8 double-spaced pages) “Opinion piece” on a course theme will be due at the end of the course, during reading period.

#### **Week 1 (Jan. 27) – Course introduction**

Course themes, from genetic diversity to phylogenetics.

#### **Week 2 (Feb. 3) – Scott Edwards (lecture/discussion)**

Neutral theory of molecular evolution: implications for population genetics and phylogenetics

#### **Week 3 (Feb. 10) – Scott Edwards (lecture/discussion)**

Molecular markers; genetic diversity; phylogeography and gene flow

#### **Week 4 (Feb. 17) – Scott (lecture/discussion)**

Population genomics; linkage disequilibrium and detecting natural selection

**Week 5** (Feb. 24) – **Scott** (lecture/discussion) 1<sup>st</sup> hour: Listen to Scott's plenary talk to the Pacific Seabird Group 2021 virtual meeting

**Week 6** (Mar. 3) – **Tim Sackton, FAS Informatics** (lecture/discussion)

Comparative population genomics and the measurement of genetic diversity

**Week 7** (Mar. 10) – **Prof. Heng Li, Dana Farber Cancer Center**

Assembling Eukaryotic Pangenomes

**Week 8** (Mar. 17) – **Scott** (lecture/discussion) & **Student paper presentation**

Reading/discussion on phylogenetics and the multispecies coalescent model

**Week 9** (Mar. 24) – **John Wakeley & Mia Miyagi** (lecture/software demo)

Coalescent theory and statistical tests of hybridization

**Week 10** (Mar 31) – **Harvard Wellness day #4**

**Week 11** (April 7) – **Student paper presentation & discussion**

**Week 12** (April 14) – **Student paper presentation & discussion**

**Week 13** (April 21) – Dr. Robert Maier, Reich Lab, Human Evolutionary Biology

ADMIXTOOLS 2 and f-statistics in historical demography

**Week 13** (April 28) – Wrap up – how have we navigated the phylogeography-phylogenetics continuum?