Introduction to Phylogenetic Analysis

Monday 21 – Tuesday 22 July, 2014

School of Biological Sciences

Overview
This workshop will provide an introduction to phylogenetic analysis, including practical exercises based on the software MEGA and BEAST. It is suitable for graduate students, postdoctoral researchers, and academics at all levels of experience. Prior knowledge of basic phylogenetics is helpful but not strictly necessary.

The workshop will be run by A/Prof Simon Ho, Sebastian Duchene, and Charles Foster from the Molecular Ecology, Evolution, & Phylogenetics (MEEP) lab in the School of Biological Sciences, University of Sydney. If you have questions about the workshop, please contact Simon (simon.ho@sydney.edu.au). All lectures and practicals will take place in Dry Lab 2 in the Charles Perkins Centre at the University of Sydney. This building is indicated on the map provided at the end of this programme.

Programme
The workshop will comprise a series of lectures and practical exercises. The first day will cover interpreting phylogenetic trees, sequence alignment, evolutionary models, and phylogenetic methods. The second day will focus on Bayesian phylogenetic analysis and will include molecular clocks, estimating timescales, coalescent theory, and demographic reconstruction.

The practical exercises will involve basic analyses of a prepared data sets using desktop PCs. Participants are welcome to bring their own laptops, provided that you have installed the software that will be used in the practical sessions (MEGA, BEAST, Tracer, and FigTree). We will be using free software that can be installed on PC, Mac, and UNIX platforms.
Programme

Monday 21 July: Introduction to phylogenetic analysis

09.30 – 09.45   Welcome
                 Simon Ho
09.45 – 10.30   Lecture 1: Introduction to phylogenetic analysis
                 Simon Ho
10.30 – 11.00   Practical 1a: Sequence alignment in MEGA
                 --- Morning tea ---
11.15 – 11.45   Lecture 2: Evolutionary Models
                 Sebastián Duchêne
11.45 – 12.15   Practical 1b: Model selection in MEGA
                 --- Lunch break ---
                 Simon Ho
14.30 – 16.30   Practical 1c: Phylogenetic analysis in MEGA

Tuesday 22 July: Bayesian phylogenetic analysis

09.30 – 10.15   Lecture 4: Bayesian phylogenetic analysis
                 Simon Ho
10.15 – 11.00   Lecture 5: Rates and timescales
                 Sebastián Duchêne
                 --- Morning tea ---
11.15 – 12.30   Practical 2: Molecular-clock analysis in BEAST
                 --- Lunch break ---
13.30 – 14.30   Lecture 6: Analysing populations
                 Simon Ho
14.30 – 16.30   Practical 3: Inferring population history in BEAST
Useful References

Introductory books
- *The Phylogenetic Handbook*
- *Reading the Story in DNA*
- *Inferring Phylogenies*
- *Molecular Evolution: A Phylogenetic Approach*

Bayesian phylogenetic analysis
- *Bayesian inference of phylogeny: a non-technical primer*
- *Bayesian phylogenetics with BEAUti and the BEAST 1.7*
- *BEAST: Bayesian evolutionary analysis by sampling trees*

Molecular clocks and calibrations
- *Estimating evolutionary timescales using the molecular clock*
- *The changing face of the molecular evolutionary clock*
- *Accounting for calibration uncertainty in phylogenetic estimation of evolutionary divergence times*

Demographic reconstruction
- *Skyline-plot methods for estimating demographic history from nucleotide sequences*
- *Bayesian inference of population size from multiple loci*
- *Bayesian coalescent inference of past population dynamics from molecular sequences*

Gene trees and species trees
- *Gene tree discordance, phylogenetic inference and the multispecies coalescent*
Workshop Location

The workshop will be held in the Dry Lab 2 in the Charles Perkins Centre, University of Sydney. From the main entrance to the building, the lab is behind the reception desk and to the right.

Places to eat

On campus
- Taste Baguette (Charles Perkins Centre)
- Various food outlets (Manning Building)
- Courtyard Café (Holme Building)

Near campus
- Lots of restaurants and cafes along Missenden Rd and King St, Newtown
MOLECULAR ECOLOGY, EVOLUTION, & PHYLOGENETICS LABORATORY

Please contact us for more information about research opportunities
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Simon Ho (simon.ho@sydney.edu.au)


Art by Ainsley Seago