# Sydney Phylogenetics Workshop

**Monday 23 – Tuesday 24 July, 2018**


## Overview

This free 2-day workshop will provide an introduction to phylogenetic analysis, including practical exercises based on the software *MEGA* and *BEAST*. It is suitable for graduate students and postdoctoral researchers. Prior knowledge of basic phylogenetics is helpful but not essential.

The workshop will comprise a series of lectures and practical exercises. The first day will cover interpreting phylogenetic trees, molecular data, sequence alignment, evolutionary models, and phylogenetic methods. The second day will provide an introduction to Bayesian phylogenetic analysis and will include models and priors, molecular clocks, and estimating timescales.

## Instructors

The workshop will be run by members of the **Molecular Ecology, Evolution, and Phylogenetics Laboratory** in the School of Life and Environmental Sciences, University of Sydney. The lead organisers are Simon Ho and David Duchêne. The teaching team also includes Nate Lo, Zoe Patterson Ross, Cara Van Der Wal, and Perry Beasley-Hall.

## Venue

The workshop will be held in Learning Studio 3090 on the third floor of the Abercrombie Building at the University of Sydney. This building is a short walk from Redfern Station and is on the corner of Abercombie St and Codrington St.

Tea, coffee, biscuits, and fruit will be available during the workshop. Lunch will not be provided, but the building has a café on the ground floor. The teaching team will be happy to provide suggestions for nearby cafés and restaurants.

## Computing

The practical exercises will involve basic analyses of prepared data sets. You will need to bring your own laptop. Please download and install *MEGA* (version 6 or 7), *BEAST* 2 (version 2.4.8 or above), *Tracer*, and *FigTree* prior to the workshop.

## Registration

The workshop is free to attend, but there will be a limit of 35 participants. To express your interest in attending the workshop, please contact Simon Ho (simon.ho@sydney.edu.au).

# Workshop Programme

## Monday 23 July: Introduction to phylogenetic analysis

| | | |
|---|---|---|
| 09.15 – 09.30 | Arrival and set-up | |
| 09.30 – 09.40 | Welcome | Simon Ho |
| 09.40 – 10.30 | Lecture 1.1: Introduction to molecular phylogenetics | Nate Lo |
| 10.30 – 11.00 | Practical 1a: Sequence alignment in *MEGA* | Nate Lo |
| | *--- Break ---* | |
| 11.15 – 12.00 | Lecture 1.2: Evolutionary models | Simon Ho |
| 12.00 – 12.30 | Lecture 1.3: Phylogenetic data | Zoe Patterson Ross |
| | *--- Lunch break ---* | |
| 13.15 – 14.00 | Lecture 1.4: Phylogenetic methods | Simon Ho |
| 14.00 – 17.00 | Practical 1b: Model selection and phylogenetics in *MEGA* | Cara Van Der Wal |

## Tuesday 24 July: Bayesian phylogenetics and molecular dating

| | | |
|---|---|---|
| 09.15 – 09.30 | Arrival | |
| 09.30 – 10.30 | Lecture 2.1: Bayesian phylogenetic analysis | Simon Ho |
| 10.30 – 11.00 | Lecture 2.2: Models and priors | David Duchêne |
| | *--- Break ---* | |
| 11.15 – 12.30 | Practical 2a: Bayesian analysis using *BEAST* | David Duchêne |
| | *--- Lunch break ---* | |
| 13.15 – 14.00 | Lecture 2.3: Molecular dating | Simon Ho |
| 14.00 – 14.30 | Lecture 2.4: Calibrating the molecular clock | David Duchêne |
| 14.30 – 17.00 | Practical 2b: Molecular dating using *BEAST* | Perry Beasley-Hall |

# Useful Readings

**Reference books**

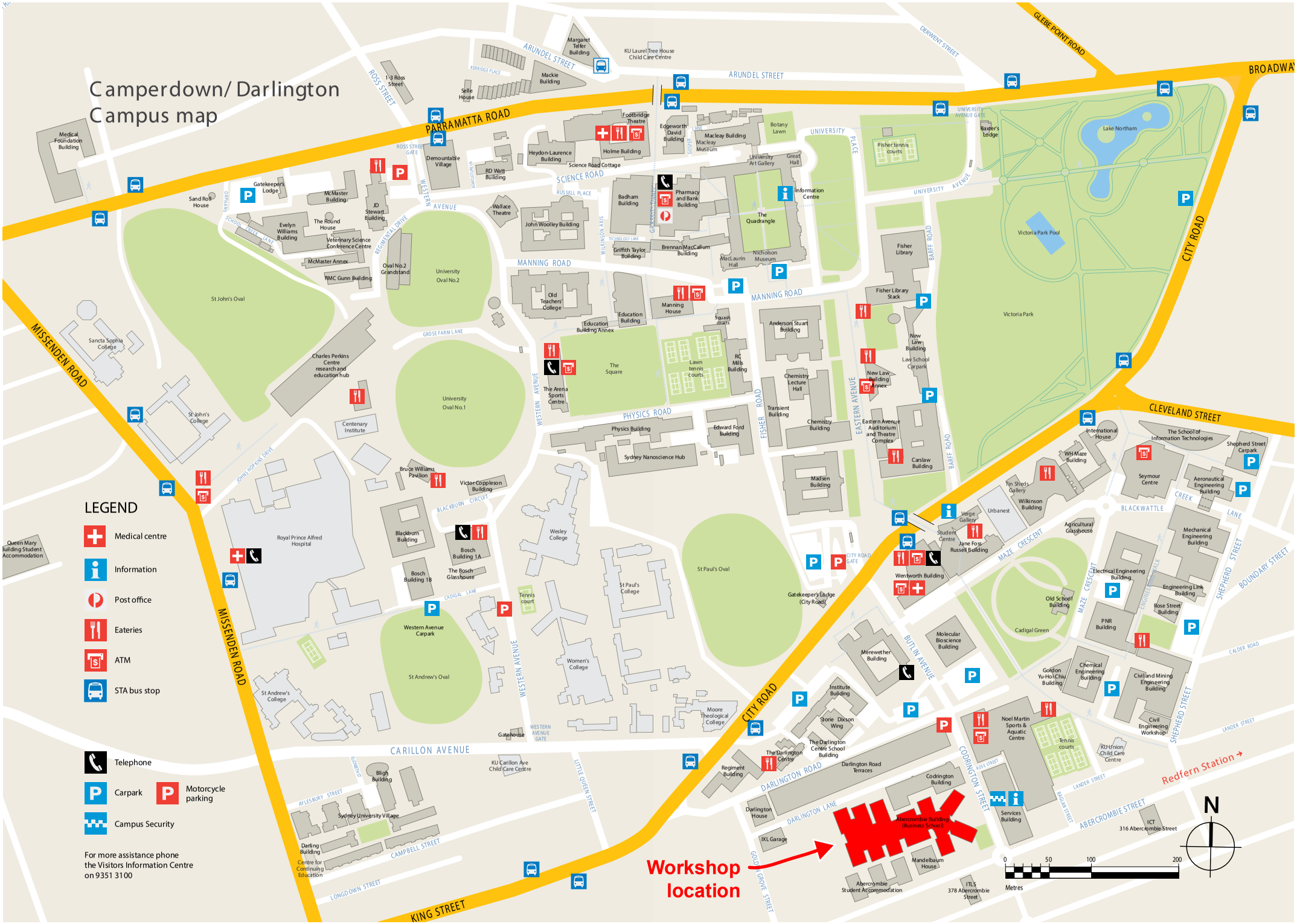
- *An Introduction to Molecular Evolution and Phylogenetics*
  Bromham (2016) Oxford University Press.
- *Molecular Evolution: A Statistical Approach*
  Yang (2014) Oxford University Press.
- *The Phylogenetic Handbook*
  Lemey, Salemi, & Vandamme (2009) Cambridge University Press.
- *Bayesian Phylogenetics: Methods, Algorithms, and Applications*
  Chen, Kuo, & Lewis (2014) Chapman & Hall / CRC.

**Molecular phylogenetics and Bayesian inference**

- *Molecular phylogenetics: principles and practice*
  Yang & Rannala (2012) *Nat Rev Genet* 13: 303–314.
- State-of-the-art methodologies dictate new standards for phylogenetic analysis
  Anisimova et al. (2013) *BMC Evol Biol*, 13: 161.
- *Bayesian phylogenetics with BEAUti and the BEAST 1.7*
  Drummond et al. (2012) *Mol Biol Evol* 29:1969-1973.

**Molecular dating**

- *A practical guide to molecular dating*
  Sauquet (2013) *C R Palevol*, 12: 355–367.
- *Bayesian molecular clock dating of species divergences in the genomics era*
  dos Reis, Donoghue, & Yang (2016) *Nat Rev Genet* 17: 71–80.
- *Estimating evolutionary timescales using the molecular clock*
  Ho & Duchêne (2014) *Mol Ecol* 23: 5947–5965.
- *Bayesian molecular dating: opening up the black box*
  Bromham et al. (2018) *Biol Rev*, 93: 1165–1191.


Camperdown/ Darlington Campus map
LEGEND
Medical centre
Information
Post office
Eateries
ATM
STA bus stop
Telephone
Carpark
Motorcycle parking
Campus Security
For more assistance phone the Visitors Information Centre on 9351 3100
Workshop location
Redfern Station
N
0 50 100 200
Metres
PARRAMATTA ROAD
MISSENDEN ROAD
CITY ROAD
BROADWAY
GLEBE POINT ROAD
ARUNDEL STREET
SCIENCE ROAD
MANNING ROAD
UNIVERSITY AVENUE
CLEVELAND STREET
PHYSICS ROAD
CARILLON AVENUE
KING STREET
DARLINGTON ROAD
ABERCROMBIE STREET
Medical Foundation Building
Sand Roll House
Gatekeepers Lodge
McMaster Building
JD Stewart Building
Evelyn Williams Building
The Round House
Veterinary Science Conference Centre
McMaster Annex
RMC Gunn Building
Oval No.2 Grandstand
University Oval No.2
St John's Oval
Demountable Village
RD Watt Building
Heydon-Laurence Building
Footbridge Theatre
Holme Building
Science Road Cottage
Edgeworth David Building
Macleay Building
Macleay Museum
Botany Lawn
University Art Gallery
Great Hall
Fisher tennis courts
Baxter's Lodge
Lake Northam
Victoria Park Pool
Victoria Park
Information Centre
Wallace Theatre
John Woolley Building
Badham Building
Pharmacy and Bank Building
The Quadrangle
Griffith Taylor Building
Brennan MacCallum Building
MacLaurin Hall
Nicholson Museum
Fisher Library
Fisher Library Stack
Old Teachers' College
Manning House
Education Building
Education Building Annex
Squash courts
Anderson Stuart Building
New Law Building
Law School Carpark
New Law Building Annex
Sancta Sophia College
St John's College
Charles Perkins Centre research and education hub
Centenary Institute
University Oval No.1
The Square
The Arena Sports Centre
Lawn tennis courts
RC Mills Building
Chemistry Lecture Hall
Transient Building
Chemistry Building
Physics Building
Edward Ford Building
Sydney Nanoscience Hub
Madsen Building
Carslaw Building
Eastern Avenue Auditorium and Theatre Complex
Bruce Williams Pavilion
Victor Coppleson Building
Royal Prince Alfred Hospital
Blackburn Building
Bosch Building 1A
Bosch Building 1B
The Bosch Glasshouse
Western Avenue Carpark
Tennis court
Wesley College
St Paul's College
St Paul's Oval
St Andrew's Oval
St Andrew's College
Women's College
Moore Theological College
Gatehouse
Queen Mary Building Student Accommodation
Gatekeepers Lodge (City Road)
Wentworth Building
Student Centre
Jane Foss Russell Building
Verge Gallery
Urbanest
Wilkinson Building
Tin Sheds Gallery
Agricultural Glasshouse
International House
The School of Information Technologies
WH Maze Building
Seymour Centre
Shepherd Street Carpark
Aeronautical Engineering Building
Mechanical Engineering Building
Electrical Engineering Building
Engineering Link Building
Rose Street Building
PNR Building
Old School Building
Cadigal Green
Molecular Bioscience Building
Merewether Building
Chemical Engineering Building
Civil and Mining Engineering Building
Civil Engineering Workshop
Gordon Yu-Hoi Chiu Building
Institute Building
Storie Dixon Wing
The Darlington Centre
The Darlington Centre School Building
Darlington Road Terraces
Regiment Building
Codrington Building
Darlington House
IXL Garage
Noel Martin Sports & Aquatic Centre
Tennis courts
KU Union Child Care Centre
Services Building
Abercrombie Building (Business School)
Mandelbaum House
Abercrombie Student Accommodation
ITLS 378 Abercrombie Street
ICT 316 Abercrombie Street
Bligh Building
Sydney University Village
Darling Building
Centre for Continuing Education
KU Carillon Ave Child Care Centre
KU Laurel Tree House Child Care Centre
Margaret Telfer Building
Mackie Building
Selle House
1-3 Ross Street