



**Western  
Science**

**Biology 4289A  
Biosystematics and Phylogenetics**

**Fall 2023**

**Course Schedule**

See syllabus on OWL.

**Prerequisites**

Biology 2581b and completion of 1.5 courses from Biology at the 300 level or above.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

**Instructor Information**

**Dr. Vera Tai**

e-mail: [vtai4@uwo.ca](mailto:vtai4@uwo.ca)

office hours: Thursdays 2 - 4 pm, office drop-in  
or e-mail to schedule another time

**Course Description**

Systematics unifies all of biology by providing a framework for understanding the diversity of species and their inter-relatedness. The integration of molecular approaches has propelled systematics to the forefront of biological research and phylogenetic analysis of DNA sequences has eliminated any remaining doubt that earthly species are related by common ancestry. From Woese's proposal that the living world consists of three primary domains, the admission of DNA fingerprints as court evidence, the global Tree of Life Project, to the Barcode of Life Project, the use of molecular biology and bioinformatics has literally transfigured our understanding of evolutionary history. Biology 4289A will introduce the fundamental principles involved

in biosystematics and phylogenetics. Students will learn about the process of systematics in describing, classifying, and identifying the diversity of life, acquire the skills required to analyze DNA sequences in a phylogenetic context, and learn how phylogenetics is applied to understanding not only the evolution of life, but also disease transmission, conservation biology, other other topics. The course consists of formal lectures as well as computer-based assignments and student presentations.

## Course Syllabus

This syllabus may change to accommodate lecture progress or adjust course content over the term.

Dates	Topic(s)
September 7	Introduction. What is biosystematics, what is phylogenetics?
September 11, 12	Evolution and phylogenetic trees, reading trees, trait evolution, geological history.
September 14	<b>Trait evolution lab</b>
September 18, 19	Building trees, parsimony, distance-based tree building
September 21	<b>Tree building lab - neighbor-joining</b>
September 25, 26	Biosystematics, classification, taxonomy
September 28	<b>Identification lab - Thursday Sept 28, location TBA</b>
October 2	Molecular evolution
	<b>Slides DUE for Case Study Presentation #1 on Mon. Oct 2 at 9 pm</b>
October 3 and 5	<b>Case Study Presentation #1</b> , live presentations in class, location TBA
October 9	Thanksgiving Day - <u>No class</u>
October 10 October 12	Molecular data <b>Data collection lab - sequence databases, BLAST</b>
October 16, 17	Nucleotide evolution models, molecular phylogenetics
October 19	<b>Molecular phylogenetics lab - maximum likelihood</b>
October 23, 24	Geneological discordance, molecular clocks
October 26	<b>Geneological discordance lab</b>
Week of October 30	Reading Week, <u>No Classes</u>
November 6, 7	Bayesian inference, review of tree building methods
November 9	<b>Bayesian inference lab</b>
November 13, 14	Ancestral reconstruction, phylogeography
	Guest lecturer - Dr. Art Poon, Dept. of Pathology, Western

Dates	Topic(s)
November 16	<b>Case study help</b>
November 20, 21	Diversification, radiation, conservation, phylogenomics
November 23	<b>Phylogenomics lab</b>
November 27, 28	early evolution, tree networks
November 29	<b>Slides DUE for Case Study Presentation #2, Weds. Nov 29 at 9 pm</b>
Nov 30, Dec 4, 5	<b>Case Study Presentation #2</b> , live presentations in class, location TBA
December 7	Wrap-up, review
December 10-22	December Exam Period, Final Exam scheduled by the registrar

## Course Materials

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All course material will be posted to OWL: <https://owl.uwo.ca/>  
There is no textbook. Readings and other resources will be posted on OWL.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## Technical Requirements

- ✓ Laptop running a Mac OSX or Windows operating system
  - \* **Please notify Dr. Tai immediately if you do not have a laptop and need to use a university workstation for your lab assignments**
- ✓ PowerPoint or other means to create slide presentations

➔ You will also be notified of required software to install for lab sessions. These softwares will be compatible with Mac OSX and Windows operating systems. Attending lab sessions will be essential for dealing with any technical issues.

## Optional texts:

Baum D & Smith S. 2013. *Tree Thinking: an Introduction to Phylogenetic Biology*. Roberts, Greenwood Village, CO. A conceptual overview of the principles of phylogenetics. A highly recommended introduction.

Nei M & Kumar S. 2000. *Molecular Evolution and Phylogenetics*. Oxford University Press. An excellent text for those who wish to explore the biological and mathematical theory and principles of phylogenetic reconstruction.

Page RDM & Holmes EC. 1998. *Molecular Evolution - A Phylogenetic Approach*. Blackwell, Oxford. Probably the most lucid text available on various methods of phylogenetic analysis. Quite up-to-date considering the date of publication.

## Methods of Evaluation

The overall course grade will be calculated as listed below:

Course Component	Weight	Description
Participation	5%	Engagement in classes, labs, presentations, peer evaluation
Lab/tutorial Assignments	30%	Weekly questions, data analysis - 8 assignments total
Case study, presentation #1	10%	Slides DUE Oct 2, 9 pm Live presentations Oct 3 and Oct 5
Case study, presentation #2	20%	Slides and data DUE Nov 29, 9 pm Live presentations Nov 30, Dec 4, and Dec 5
Final Exam	35%	Short and long answer, scheduled by the Registrar

### Participation

Students are expected to be actively engaged in this class, and participate. Participation will be evaluated based on keeping pace with classes, completing lab assignments on time, and peer evaluation of presentations.

### Lab/tutorial Assignments

Lab/tutorials will consist of data collection and analysis, and associated short answer questions based on material covered in lab/tutorial sessions, fundamental concepts explored in the course, or related to a student's case study (see below). Assignments are approximately weekly and are generally completable by the end of the tutorial sessions on Thursdays, but the deadline for submission will be the next day, Friday at 5 pm.

## Case Study

Students will choose a taxon (e.g. Sciuridae - a family of squirrels, or strains of *Vibrio cholera*) that they will use as a case study to explore the various concepts and techniques introduced in the course and in the lab/tutorials. These may include species concepts, evolutionary relationships, evolution of phenotypic/morphological traits, or examples of molecular phylogenetics applied to this taxon. The results of these explorations will be presented to the class in two stages. The first presentation (5-6 minutes) will introduce their taxon, classification, and characteristic traits. The student will also present a classification or evolutionary question concerning their taxon, or a published phylogenetic analysis that includes their taxon. For the second presentation (8-9 minutes), the student will present their own molecular phylogenetic analysis that addresses the classification or evolution of the taxon, or any other evolutionary question. The student will also be required to submit the sequence data that they used in their analysis. This phylogenetic analysis and second case study presentation is a mandatory component of this course, and must be completed to pass the course.

Performance evaluation by the instructor will be based on criteria such as content, effective communication of concepts, quality of figures and slides, response to comments and suggestions, etc.

Students are expected to attend and engage in presentation sessions, and will formally participate through peer evaluation of the presentations. The average peer evaluation score will contribute to bonus points for these presentations.

## Final Exam

The final exam will consist of short- and long-answer questions, and will be scheduled by the registrar. This is a mandatory component of this course.

## Late Course Components

Assignments and presentations must be handed in on the appropriate due date unless a valid excuse is provided through your academic counsellor, and an alternate due date will be arranged with your instructor.

### Information about late assignments:

- Late assignments without academic consideration will be subject to a late penalty of 10% per day.
- Missed presentations without academic consideration will be subject to a late penalty of 20%, and must be rescheduled as soon as possible.

### Required Conditions to Pass the Course

- i) completion of the Case Study phylogenetic analysis and 2nd presentation
- ii) completion of the Final Exam

Students not meeting these conditions will receive a maximum grade of 45.

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

## Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

### **Assessments worth less than 10% of the overall course grade:**

In this course, this pertains to the 8 assignments over the term. Your assignment grade will consist of the best 7 out of 8 assignments - this means you can miss one assignment without penalty and without seeking academic consideration. But please note that the assignments are not equal in weight - the number of marks per assignment vary slightly. If illness or other serious circumstance requires you to miss more than one assignment, you must see your academic counsellor to receive an extension without penalty.

### **Assessments worth 10% or more of the overall course grade:**

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf)

The Student Medical Certificate is available at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

For this class, missed presentations must be re-scheduled as soon as possible. This could mean presenting outside of class time only to the instructor, and being evaluated by the instructor only.

## **Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in a 23-hour period, more than 3 exams in a 47-hour period).

## **Accommodation and Accessibility**

### **Religious Accommodation**

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

### **Accommodation Policies**

Students with disabilities work with Accessible Education which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

## **Academic Policies**

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Electronic devices will not be permitted on tests and exams.

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following web site:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

Review Biology 2290 learning outcomes. You are expected to know what plagiarism is at this stage of your programme.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

**Remote Proctoring, in the event of a health lock-down:**

Tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service.

More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>.

## Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or



in the past), you will find information about support services for survivors, including emergency contacts at:

[https://www.uwo.ca/health/student\\_support/survivor\\_support/get-help.html](https://www.uwo.ca/health/student_support/survivor_support/get-help.html)

To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at:

[http://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.