

# BIO4611F – The Physiology of Animal Migration

## Fall 2022

**Lecture: Monday 11:30-13:30, Wednesday 12:30 – 13:30, SSC-3026**

**Instructor:** Dr. Keith A. Hobson, Professor, Biology, [khobson6@uwo.ca](mailto:khobson6@uwo.ca)  
Office Hours: BGS-2070, By appointment.

**Prerequisites:** Either Biology 2601A/B or Physiology 3120, or the former Biology 2672A/B, or permission of the Department; and either completion of at least 1.5 Biology courses from the 3000-level or above, or registration in Year 4 of an Honors Specialization in Animal Behaviour.

*Senate regulation on prerequisites:* “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”.

### Course Description

Migration is an amazing natural phenomenon and an important component of the life history of many species. The goal of this course is to examine the physiological basis of migratory movements in invertebrate and vertebrate animals. Topics covered include (1) the evolution of migratory life histories, (2) biological rhythms and hormonal control of migration, (3) the sensory basis of orientation and navigation, (4) biomechanics and energetics of movement, (5) metabolic fuel storage and utilization, (6) stable isotope, radar, radio-telemetry and other tracking methods, (7) physiological approaches to the study of migration ecology, (8) conservation of migratory species.

### Course Structure and Materials

This course will use a combination of lectures and readings from the primary literature to develop a knowledge base on migration physiology. There is no text book that covers all of the material in the course, but inspiration is taken from *Migration, The Biology of Life on the Move*, First (1996) and Second (2014) editions by Hugh Dingle. Required readings from the primary literature will be posted on the course OWL website. Necessary lecture materials will also be posted on OWL. These are meant to aid in the understanding of the information presented in lecture, **so attendance is mandatory**.

### Primary Literature Reading Assignments – Active Learning

Learning to read, understand and evaluate the scientific literature is a crucial skill for science students. You will be assigned 2 papers approximately each week (~6 papers before the midterm, ~10 papers between the midterm and final = ~16 papers in 8 weeks). We will establish in-class discussion groups (~5 students per group) and you can discuss readings in class every Wednesday for 15 minutes or so. You are encouraged to discuss these readings with fellow students if desired. Each student will write two synopses during the semester and receive marks based on their quality. In addition, an assortment of potential short essay questions examining your understanding of the readings will be posted on-line in advance of exams. A subset of these questions will appear on each exam.

### Writing Assignments

A writing component is included to develop written communication skills. You will first write a one page letter of intent for a research proposal. You will receive written feedback on your letter of intent, and you will discuss details with me prior to the research proposal. Again, you are encouraged to also discuss with other students. You will then write a full research proposal (description to be provided) including a lay summary suitable for public release. These assignments are meant to teach you how to

develop a novel idea into a scientific study and communicate the relevance of your research to the general public.

### **Methods of Evaluation**

Grading will be on a traditional percentage scale. There will be one in class midterm exam and an in class final exam. Exam questions will be drawn from the lectures and assigned readings, and they may include multiple-choice, fill-ins, diagram drawings, short answers, and essays. No electronic devices will be needed during exams. Writing assignments should be submitted electronically on stated due dates. Late assignments will be penalized 10% for each day after the due date including weekends. Assignments not turned in will receive a grade of zero (0).

Writing Assignments: 60%

Synopses (15%): Due on lecture day one week following M/W.

Letter of Intent (15%): Due Friday October 29.

Research Proposal (30%): Due Mon. Nov 29.

Midterm Exam (15%): **TBA**

Final Exam (25%): Time and Date TBA (cumulative).

Upon successful completion of the course, the student will be able to:

- 1) Differentiate between migratory movements and other movements typical of volant organisms.
- 2) Summarize the historical through current primary methods used to track migratory animals.
- 3) Explain the primary abiotic mechanisms influencing animal movements in terrestrial and aquatic environments including the earth's magnetic field, wind and ocean currents, light polarization, the celestial sphere and the earth's rotation and seasonal movement.
- 4) Describe the primary mechanisms used by animals to orient and navigate.
- 5) Describe how migratory ability is influenced by ontogeny.
- 6) Explain the primary physiological mechanisms of biological clocks and circadian rhythms.
- 7) Explain the mechanics and energetics of animal movement through air and water.
- 8) Describe how energy for movement is derived from diet through macromolecular pathways.
- 9) List methods used to quantify animal metabolism related to migratory movements.
- 10) Describe the ecological and physiological consequences of fueling migration from dietary and stored nutrients.
- 11) Describe how the endocrine system controls migration.
- 12) Explain the challenges related to full life cycle conservation of migratory animals.
- 13) Read primary scientific papers in the field of animal migration at sufficient depth to be able to critically assess and synthesize the information.

### Assessment:

- 14) Written examinations evaluate the ability of the student to relate and apply lecture material to the analysis of migratory systems.
- 15) Synopses evaluate the ability of the student to critically analyze primary research articles with respect to their methodology, conclusions, and overall significance.
- 16) Term papers in the form of a Letter of Intent and a Research Grant Proposal will evaluate the ability of the student to propose graduate-level research related to the ecology and/or physiology of animal migration

## Contingency plan for an in-person class pivoting to 100% online learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

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: <http://owl.uwo.ca>.

If students need assistance with the course OWL site, 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.

## Absences, Grade Changes

All assignments and exams are worth more than 10% of the final grade as listed above and so 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).

Late assignments and make-up exams without penalty will be considered only under substantiated circumstances of illness, injury, family emergency, mandatory public service or participation in a university sponsored activity. Please notify me of any planned absences at the beginning of the semester.

**Alteration to the grade basis of the course will not be considered.** If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. Please see: (<https://studentservices.uwo.ca/secure/index.cfm>)

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 23-hour period, more than 3 exams in a 47-hour period).

[optional] If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

Note: missed work can only be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is not sufficient on its own

## 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 are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities 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).

## Support Services

Registrarial Services can be accessed here: <http://www.registrar.uwo.ca>. Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also contact the Student Development Centre (<http://www.sdc.uwo.ca/>) at 661-2111 x 83031 for any specific question regarding accommodation. Other services are available at Student Support Services <http://westernusc.ca/services/>.

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> 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.

## Academic Offences

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/handbook/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf). Work turned in for examinations must be yours alone. You may discuss your research proposal freely with your classmates. However, the assignments must be written by you alone, and you must properly cite all sources used in the preparation of the proposal. **Do not plagiarize. This includes identical or similar assignments written by you for another course. Your proposal must be turned in to turnitin.com for textual similarity checking using a link on the course website. Plagiarized assignments will receive a grade of zero and may result in more serious penalties.**

***Senate statement on plagiarism and plagiarism checking:*** “Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper

referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).”

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>).