

**Faculty of Science Course Syllabus
Department of Biology
BIOL 3102
Microbial Eukaryotes: Biodiversity and Evolution
Fall 2019**

Instructor(s):	Alastair Simpson alastair.simpson@dal.ca	LSC 5088
Lectures:	Mondays: 9:35-11:25	PSYCH P4258
	Wednesdays, Fridays: 11:35-12:25 unless superseded by a lab	LSC C208
Laboratories:	5 labs; certain Fridays (see timetable): 10:35-12:25 or 11:35-1:25	LSC 7012
Tutorials:	None	

Course Description

Microbial eukaryotes are of tremendous ecological, evolutionary and medical/veterinary importance. This course provides a comprehensive understanding of the biodiversity and evolution of both algal and protozoan eukaryotes, and examines important aspects of their organismal biology, including cell and genome organization, life histories, trophic strategies, locomotion and symbiosis.

Course Prerequisites

BIOL 2020.03 (or BIOA 2001.03) and BIOL 2004.03 (or MICI 2100.03)

Course Objectives/Learning Outcomes

- Describe the basic biology of the most important major groups of microbial eukaryotes.
- Describe the nature and role of the cytoskeleton in microbial eukaryotes (esp. flagellar apparatus, including replication)
- Explain the composition and synthesis of several important types of mineralised scales and tests of microbial eukaryotes
- Explain, and contrast the cellular basis and relevant hydrodynamic considerations for major forms of i) swimming, ii) gliding and iii) amoeboid locomotion by microbial eukaryotes.
- Describe and contrast major feeding modes for phagotrophic microbial eukaryotes.
- Understand the functions of major structures/life history stages often represented specifically in microbial eukaryotes (e.g. extrusomes, cysts)
- Describe the functions of major types of mitochondrion-related organelles in anaerobic eukaryotes.
- Contrast primary, secondary and tertiary plastid endosymbiosis, including the evolutionary pattern of occurrence, and protein targeting.
- Describe the basic evolutionary tree, and early evolutionary history, of eukaryotes; further, show understanding of major unresolved questions in eukaryote evolution.
- Develop a strong proficiency with compound light microscopy, including phase contrast optics.

Course Materials

The material for the course is that which is covered in the lectures and labs. There is no single textbook or course pack for this course. The following resources will be made available instead:

- 1) The lecture slides will be made available online **after** each lecture, **in edited form** (i.e. you will need to take notes during lectures themselves).
- 2) There will be supplementary notes for most (but not all) of the lectures, especially in Parts 1 and 2 (see **course content**, below). These will be made available online in .pdf format before the relevant part or subsection of the course.
- 3) There will be a small number of short readings (e.g. review papers) that you will be expected to read during the course. These will be provided in class or online prior to the relevant lecture.
- 4) Handout/worksheets will be provided for each **lab** (see above).
- 5) The “Handbook of the Protists” edited by Archibald, Simpson and Slamovits (2017) is available from the Dalhousie Libraries as an e-book. It is an *optional* resource, especially for Part 1 of the course.
- 6) The book “Protistology” by Hausmann, Hulsman and Radek (3rd Edition, 2003) is a useful resource for selected parts of the course (when advised). There will be a copy of this book available on short-term loan in ‘closed reserve’ at the Killam library.

The online material will be housed on Dalhousie’s Learning Management System (Brightspace).

Course Assessment

Component	Weight (% of final grade)	Date
Tests/quizzes		
Test 1	18%	2 October, 2019; 11:35-12:25
Test 2	28%	18 November, 2019; 9:35-11:25
Test 3	15%	3 December, 2019; 9:35-10:35
Quizzes (best 7 of 10)	14% total	Most Mondays + 1 Wed. (see Calendar)
Assignments		
Laboratory reports (5)	25% total	Following each Lab (see Calendar)

Other course requirements

There are no other course requirements in addition to the assessment components above

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

Course Policies

Late Assignments: The due dates for lab assignments will normally be the Friday following lab, unless otherwise posted on the lab worksheet. Late assignments will be penalised 0.5 marks (typically out of 5) for every part or whole week late, *and* any commitments made by the instructor to return the marked assignment by a certain date (e.g. prior to a test) will not apply.

Missed Test (Tests 1 and 2): For Tests 1 and 2, the policy for rescheduling a missed exam, or not, will be as follows:

A student requesting an alternative time shall be granted that request only in exceptional circumstances. Such circumstances include illness (with medical certificate, or student declaration of absence - SDA) or other mitigating circumstances outside the control of the student. Varsity sport is a legitimate circumstance, providing reasonable prior warning (a week or more) is given to the instructor. Elective arrangements, such as travel plans, are not considered acceptable grounds for granting an alternative examination time.

Missed Test (Test 3): For Test 3, there will be a rescheduled exam for anyone who does not take Test 3 at the scheduled time. SDAs or similar documentation will **not** be required. The time and date will be announced closer to the end of semester.

Missed Quizzes: 'Quizzes' cannot be taken after the original date due to absence. Please note, however, that only 7 of your quiz marks will count to your final grade, so up to 3 quizzes can be missed without reducing your maximum possible mark for the course.

Cancelled classes: If a lecture is cancelled due to weather etc. it will normally be given in the next available lecture slot. The remaining lecture schedule will be adjusted as needed.

In the unlikely event that a lab has to be cancelled, we will similarly attempt to shift the lab schedule (including adding an extra Friday to the lab schedule), which likely will involve also changing the lecture schedule. If it is impossible to reschedule a lab, the other lab assignments will be evenly reweighted such that the total lab mark remains as 25% of the total course mark.

Policy on Collaboration: This policy is relevant for the completion of the lab reports. Some of the actual laboratory work is inherently collaborative (examples; students working in small groups to prepare material; the entire class making similar measurements, then sharing them to generate larger datasets). However, unless explicitly stated otherwise in the worksheet, all components of all lab reports are to be done individually, and will be marked as the individual work of the student submitting the report.

Course Content

1) Lectures:

The lectures will be held at 9:35 am in PSYCH P4258 (Mondays) or 11:25 am LSC Room C208 (Wednesdays and Fridays). Monday lectures are scheduled for the **full two hours** (9:35am-11:25am), albeit with an intermission.

The lecture component of the course is divided into three Parts, described below (see **Calendar** on the next page for a full listing of planned lecture titles).

Part 1 (Lectures 1-10): **Introduction to microbial eukaryote biodiversity** - An overview/revision of the diversity of microbial eukaryotes, emphasizing the particular biology of some important and relatively well-studied groups.

Part 2 (Lectures 11-23): **Microbial eukaryotes as organisms** - The organization of the cytoskeleton, and examination of cell biological features particular to microbial eukaryotes (mineral scales, cysts, extrusomes, etc); Locomotion and nutrition (especially feeding); some aspects of the biology of microbial eukaryote parasites.

Part 3 (Lectures 24-28): **Topics in microbial eukaryote evolution** - e.g. How we infer deep eukaryote evolution; Endosymbiosis, and the evolution and cell biology of the endosymbiotic organelles (plastids, mitochondria etc), emphasizing special kinds of these organelles found in various microbial eukaryotes; Current controversies in understanding the diversity and evolution of microbial eukaryotes, including the nature of its fossil record, and the extant diversity of protists.

Note that there are lectures on only **some** Fridays because there is often a Lab scheduled instead (see below).

Each of the three Tests (see **Assessment**, above) follows immediately after one of these Parts. It will examine you on that particular Part. Material from Part 1 is 'assumed knowledge' for Parts 2 and 3, but will **not** be directly tested in Tests 2 and 3.

2) Labs:

There are five short labs scheduled. These will be held on various Fridays through the semester, in place of a lecture (see **Calendar** on the next page). Labs will take place in **Room 7012** of the Life Sciences Centre (Cell Biology Labs). There are two overlapping sessions: 1) 10:23am-12:25pm; 2) 11:35am-1:25pm. You can choose either start time.

The lab work sheets will be made available at each lab (see below) and will normally be due to be handed in on the Friday of the following week (there is usually some take-home work involved).

You are expected to bring your lab coat to labs. Transport it inside a plastic bag. If BIOL3102 is the **only** class where you need a lab coat, you can store it with the instructor for the duration of the semester (it must be labelled with your name, and have empty pockets).

Calendar

	Date	Day	Time	Location	Activity	Quiz
Sept	4	Wed	11:35-12:25	LSC C208	Lecture 1: Orientation, Introduction	
	6	Fri	11:35-12:25	LSC C208	Lecture 2: Archaeplastida	
	9	Mon	9:35-11:25	PSYCH P4258	Lecture 3: 'Minor'algae, Stramenopiles1	***
	11	Wed	11:35-12:25	LSC C208	Lecture 4: Stramenopiles 2	
	13	Fri	10:35+/11:35+	LSC 7012	LAB 1	
	16	Mon	9:35-11:25	PSYCH P4258	Lecture 5: Alveolates 1	***
	18	Wed	11:35-12:25	LSC C208	Lecture 6: Alveolates 2	
	20	Fri	11:35-12:25	LSC C208	Lecture 7: Rhizaria	
	23	Mon	9:35-11:25	PSYCH P4258	Lecture 8: Amoebozoa, Opisthokonts	***
	25	Wed	11:35-12:25	LSC C208	Lecture 9: Excavates 1	
	27	Fri	10:35+/11:35+	LSC 7012	LAB 2	
	30	Mon	9:35-11:25	PSYCH P4258	Lecture 10: Excavates 2; Other Groups	***
Oct	2	Wed	11:35-12:25	LSC C208	TEST 1	
	4	Fri	11:35-12:25	LSC C208	Lecture 11: Form 1	
	7	Mon	9:35-11:25	PSYCH P4258	Lecture 12: Form 2	
	9	Wed	11:35-12:25	LSC C208	Lecture 13: Form 3	
	11	Fri	10:35+/11:35+	LSC 7012	LAB 3	
	14	Mon	<i>Dal closed</i>	<i>n/a</i>	<i>None - Thanksgiving</i>	
	16	Wed	11:35-12:25	LSC C208	Lecture 14: Motility 1	***
	18	Fri	9:35-11:25	PSYCH P4258	Lecture 15: Motility 2	
	21	Mon	9:35-11:25	PSYCH P4258	Lecture 16: Motility 3	***
	23	Wed	11:35-12:25	LSC C208	Lecture 17: Cysts	
	25	Fri	11:35-12:25	LSC C208	Lecture 18: Topic TBA	
	28	Mon	9:35-11:25	PSYCH P4258	Lecture 19: Topics in parasitism (G)	***
	30	Wed	11:35-12:25	LSC C208	Lecture 20: Extrusomes	
Nov	1	Fri	10:35+/11:35+	LSC 7012	LAB 4	
	4	Mon	9:35-11:25	PSYCH P4258	Lecture 21: Feeding/Nutrition 1	***
	6	Wed	11:35-12:25	LSC C208	Lecture 22: Feeding/Nutrition 2	
	8	Fri	11:35-12:25	LSC C208	Lecture 23: Topic TBA	
	11..15	M-F	<i>Study break</i>	<i>n/a</i>	<i>None</i>	
	18	Mon	9:35-11:25	PSYCH P4258	TEST 2	
	20	Wed	11:35-12:25	LSC C208	Lecture 24: Intro to protist evolution	
	22	Fri	11:35-12:25	LSC C208	Lecture 25: Mitochondria & anaerobes	
	25	Mon	9:35-11:25	PSYCH P4258	Lecture 26: Plastids 1	***
	27	Wed	11:35-12:25	LSC C208	Lecture 27: Plastids 2	
	29	Fri	10:35+/11:35+	LSC 7012	LAB 5	
Dec	2	Mon	9:35-11:25	PSYCH P4258	Lecture 28: Protist origins +fossils	***
	3	Tues	9:35-10:35	PSYCH P4258	TEST 3	

**Faculty of Science Course Syllabus (Section B)
Department of Biology
BIOL 3102
Microbial Eukaryotes: Biodiversity and Evolution
Fall 2019**

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support**Advising**

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>