IBIO*6630: SCIENTIFIC COMMUNICATION I
Course Outline and Schedule

I. General Course and Instructor Information

Course number: IBIO*6630 SCIENTIFIC COMMUNICATION

Semester offered: FALL 2018

Course instructor: Moira Ferguson, Room 1457 Summerlee Science Complex, mmfergus@uoguelph.ca

Office hours: By appointment though my door is often 'open'

First class meeting: Wednesday, September 12th, 10:00-12:50 p.m.
Room 3317 Science Complex

Scheduled classes: Wednesday, 10:00-12:50 a.m., Room 3317 Science Complex

II. Course Rationale

IBIO*6630 is required to be taken by all incoming MSc students (and also is available to all new PhD students) in the Department of Integrative Biology. This course is designed to help prepare new students for successful research at the graduate level.

Many students initially think of the development of a "thesis" as the product of their successful graduate education, rather than a key part of its genesis. A thesis is a conjecture, or a proposition supported by evidence. But how do you get started? What makes one thesis more successful than others? What are the relationships among a thesis, a hypothesis, and a research question? Knowing early on what a student's research questions and/or hypotheses is key to efficient literature searching, organizing background material and writing an effective proposal.

This course will explore the different methods of science, critical thinking, and make use of tools to search literature. Key communication skills also will be developed in this course, and will include a working knowledge of the methods of science such that students can think and converse competently in the language of science. Learning objectives will be met through practice in scientific writing, peer review, oral presentations, and discussions. Class meetings will comprise of facilitated discussions and debates arising from the readings (posted on CourseLink) and group exercises. For each student, the final product of this course is a complete first draft of a Thesis Research Proposal ready for circulation to their Thesis Advisory Committee.

By focusing on the process of scientific research, the learning objectives of this course are to:

1) Develop and refine skills in communication of scientific knowledge (broadly defined to include the ability to be conversant in the methods of science), and competency in oral presentation and technical writing of proposals;
2) Learn to give, receive and value criticism in the form of peer review; and
3) Share in the wide diversity of ongoing research topics across the breadth of biological study represented in IB.

To meet the learning objectives, students successful in this class will:

- attend all class meetings,
- attend departmental seminars, for purposes of gaining a broader understanding of and appreciation for different methods of science and to complete the seminar assignment. Departmental seminars are listed at http://www.uoguelph.ca/ib/seminars.shtml. In the case of conflict with teaching assignments, students may attend any other scientific seminars offered at the university. See the full write-up of the 'Seminar Assignment' for more details,
- read all assigned articles prior to each class meeting (located on CourseLink),
- come prepared to class with a list of points to ensure participation in discussions,
- be respectful of others' opinions and work, and work towards building a rigorous, challenging, but always courteous atmosphere in and out of the classroom.

The learning objectives of the course are closely aligned to the Learning Outcomes of the MSc Program in Integrative Biology. https://www.uoguelph.ca/ib/graduate_learning_outcomes Specifically:

1) Scientific methodology: The student is able to identify and describe the different methods of science.
2) Communication: A student effectively communicates disciplinary knowledge to the scientific community and broader public.
3) Professionalism: An MSc graduate is expected to demonstrate initiative, personal responsibility, respect for others and accountability.
4) Advancement of science: A student seeks to discover new information within a discipline that is distinct from and builds upon past scientific advancement.

III. General Course Topics – *Course topics are subject to change and modification as the course evolves. See section IV below for more detailed information on course topics and assignments.*

Week 1	Course Introduction; Research Ideas and Creativity
Week 2	Methods of Science
Week 3	Methods of Science – A Matter for Debate; **Assignment 1 is due**
Week 4	Follow the Smoke? **Assignment 2 is due** – Oral presentations
Week 5	Proposal Writing; Questions, Hypotheses and Predictions
Week 6	Publishing and Peer Review; Ethics in Biological Research
Week 7	Making Your Pitch: An Effective Introduction; **Assignment 3 is due** – Oral presentations
Week 8	No class: Proposal Writing
Week 9	No class; **Thesis Proposal Draft is due**
Week 10	No class: **Assignment 4 is due** - Peer reviews
Week 11	No class; Revision of Thesis Proposal
Week 12	No class; **Assignment 5 is due** - Revised Thesis Proposal

IV. Detailed Schedule and Reading List – *As indicated above, course topics are subject to change and modification as the course evolves. However, the grade breakdown (see section V) will remain the same. Refer to write-ups on individual assignments for more details.* ***Please read all assigned articles prior to class and come to each class meeting prepared to engage in discussion.***

Pre-course readings

1) Stephen C. Stearns. 1987. Some modest advice for graduate students. Bull. Brit. Ecol. Soc. 18: 82-89 (reprinted in Bull. Ecol. Soc. Amer. 68: 145-150).
2) Raymond B. Huey. 1987. Reply to Stearns: Some acynical advice for graduate students. Bull. Ecol. Soc. Amer. 68: 150-153.
3) Dan Binkley. 1988. Some advice for graduate advisors. Bull. Ecol. Soc. Amer. 69: 10-13.
4) Brian W. Witz, B. W. 1994. Some pragmatic advice to graduate students: A hybridization of Stearns, Huey, and Binkely. Bull. Ecol. Soc. Amer. 74: 176-177.

Note: loaded as one document on CourseLink

Week 1 **Course introduction and overview**
Expectations and success as a graduate student, research ideas and creativity

Readings

1) Gosling, P. and B. Noordam. 2006. Mastering your PhD: Setting goals for success.
2) UBC – Vancouver. 7 keys to success in graduate school
3) Loehle, C. 1990. A guide to increased creativity in research – inspiration or perspiration?

BioScience 40: 123-129.

4) Koshland, D. 2007. Cha cha cha theory of scientific discovery. Science 317: 761-762.

Introduction to Assignment 1: Use the Web of Science and/or other tools, and search for papers using key words related to your thesis topic. Identify key journals, and journal impact factors, and discuss findings with your advisor. See full write-up on this assignment for more details. Submit to CourseLink by the beginning of class during Week 3 (10:00 am).

If you don't have one already, use these articles as the foundation of your own electronic library.

Week 2 **Methods of science**

Readings 1) Platt, J.R. 1964. Strong inference. Science 146:347-353.
2) Quinn, J. and A. Dunham. 1983. On hypothesis testing in ecology and evolution. The American Naturalist 122: 602-617.
3) Betini, G.S. et al. 2017. Why are we not evaluating multiple competing hypotheses in ecology and evolution? R. Soc. Open sci. 4: 160756.

Reminder – Assignment 1 is due at the beginning of Week 3

Introduction of Assignment 2: "Follow the smoke". Identify a key uncertainty in your field of research for your thesis This can and should be done through communication with your advisor. Draft a question and/or hypothesis that is/are directly related to your proposed thesis research. Ideally this will be an early version of what will be presented in your proposal. Prepare a brief oral presentation to be given during class in Week 4. See full write-up of assignment for more details.

Week 3 **Assignment 1 is to be submitted to CourseLink before class (10:00 am)**
Methods of science (continued) – a matter of debate

Readings None this week.

Reminder – Assignment 2 (PPT oral presentation) is to be uploaded to CourseLink by 4:00 pm on October 2nd and presented during class in Week 4

Week 4 **Assignment 2 is due – oral presentations**

Heads-up for next week - bring a copy of the question/hypothesis you presented in Assignment 2

to class next week for a group exercise.

Week 5 **Proposal writing – Questions, hypotheses, predictions**

Readings: 1) Sand-Jensen, K. 2007. How to write consistently boring scientific literature. Oikos. 116: 723-727.
2) Hofmann, A.H. 2018. Chapter 14. Research proposals.
3) IBIO*6630 Proposal Grading Guidelines

Introduction of Assignment 7: "Making your pitch". Develop an outline of the Introduction section for your research proposal. This should include a statement of your question and/or hypotheses and predictions as appropriate. Prepare a brief oral presentation to be given during class in Week 7. See full write-up of assignment for more details.

Week 6 **Publishing and peer review: the good, the bad, the ugly**
Ethics in the Biological Sciences

Readings 1) Clapham, P. 2005. Publish or perish. Bioscience 55:390-391.
2) Anon. 2003. Coping with peer rejection. Nature 425: 645.
3) Rosenzweig, M.L et al. 1988. How to write an influential review. Bulletin of the Ecological Society of America 69: 152-155.
4) International Committee of Medical Journal Editors. Recommendations 2018. Defining the role of authors and contributors.
5) Dance, A. 2012. Who's on first? Nature 489: 591-593.
6) Martinson, B.C., M.S. Anderson and R. de Vries. 2005. Scientists behaving badly. Nature 435:737-738.
7) Macilwain, C. 2012. Scientific misconduct: more cops, more robbers? Cell 149: 1417.

Come to class with all of the questions you might have about what's appropriate and not appropriate in research. Questions might relate to authorship (ask your advisor for their opinion), ownership of data, citing articles in your own writing, etc.

Reminder – Assignment 3 (PPT oral presentation) is to be uploaded to CourseLink by 4:00 pm on October 23rd and presented during class in Week 7.

Week 7 **Assignment 3 is due – oral presentations**

Weeks 8-11 Proposal writing, peer review and editing

By 11:59 pm on November 7th, submit the first draft of your Draft Thesis Research Proposal to both PEAR and CourseLink. This draft will be used for the peer review assignment (Assignment 4), but you should keep working on revising your proposal over the next few weeks.

Assignment 4: By Week 10 (11:59 pm on November 16th), upload completed peer reviews of Draft Thesis Research Proposals to PEAR.

Assignment 5: By the end of Week 12, (11:59 pm on Sunday December 2nd), upload revised Thesis Research Proposals to CourseLink and PEAR. Provide your Thesis Advisor with a copy.

V. Breakdown of Graded Assignments

Assignment	Due Date	Total points
Seminar Reports (2)	Each report is due 1 week post-seminar (complete both before the end of Week 12)	10 (5 points each)
Assignment 1: Literature searching	Week 3	10
Assignment 2: Identifying key uncertainties in research area	Week 4	15
Assignment 3: Making your pitch	Week 7	20
Assignment 4: Peer review of draft thesis proposals	Week 10	20
Assignment 5: Completion of your thesis research proposal	First Draft is due on Week 9; Revised draft is due on Week 12	25
Total		**100 points**