INSTRUCTORS

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LECTURE

T & Th, 8:10 - 9:10 AM

Attendance in class is mandatory. Because part of your grade in the course will be based on participation and because it is essential for you to be engaged with what is going on in this course, your success depends on being in class. Absences will only be excused for documented personal emergencies or health-related problems. If you miss a class, it is your responsibility to contact us and make yourself aware of any information or assignments that you missed. Any missed group work must be made up on an individual basis and will be graded on an individual basis.

COURSE OBJECTIVES

1. During BIO 601, each student will:
   a) Initiate discussions with potential faculty research advisors in order to develop a research project;
   b) Identify questions, using appropriate literature and resources, that are of potential importance to our understanding of the natural world, and are within an area of interest of Westminster faculty;
   c) Select a faculty advisor and work in collaboration with them to develop a proposal for a project (to be carried out in BIO 602): formulate a good specific question, select appropriate experimental methodology and identify a suitable model system with which to study your question;
   d) Complete a pilot project to assess the feasibility of your research;
   e) Present your ideas to other students and learn how to incorporate constructive criticism and suggestions into the experimental design and final proposal;
   f) Write a comprehensive research proposal in the style of a NIH grant application, as outlined in the provided guidelines

2. Evaluate and assess current concepts, theories and ideas in the field of biology through active review of primary literature and active engagement in current scientific methodologies

3. Continue to develop the qualitative and quantitative reasoning skills required for scientific inquiry and data analysis;

4. Enhance your information literacy, including facility in locating, reading, and interpreting scientific articles;

5. Strengthen your written and oral communication skills and problem-solving skills

COURSE CONTENT

Participation: You will be expected to participate in all class discussions by asking questions or offering insights and suggestions to your peers. Attendance alone is not enough to gain participation points. Unexcused absence from class will negatively impact your participation grade.

Identification of a research advisor: Following a faculty fair, you must talk to several faculty members whose research interests you, and identify 3 whom you would like to work with on your project. You will be asked to submit a short application to each of
those people with an explanation of why you want to work with them. The faculty will select students to work with them based on your applications. All effort will be made to match you to your choices, keeping in mind that students will be divided evenly among the faculty.

**Annotated bibliography:** You will be expected to obtain and read at least 15, relevant primary articles and at least 4 relevant secondary articles from suitable sources; this is necessary for you to adequately identify a good question and discuss the background to your proposed project. You are strongly encouraged to ask your research advisor for an article or two to start you off and get you on the right track. You will be expected to submit a summary of the information you have gained from each article, highlighting relevance to your project in an annotated bibliography. Details will be given in class.

**Question summary:** You will refine your questions and ideas through reading and discussion with your research advisor and identify a specific question that you wish to investigate through your fall research project. Your final question should be novel, and should have potential importance to our understanding of the natural world. You must write summary of the question and a statement describing how the question is relevant to biology, approved and signed by your research advisor.

**Journal club presentation:** You will be expected to present the data from the primary research paper that is most relevant to your proposal ideas to the rest of the class in a clear, informative, and critical style, focusing on 1 or 2 key figures. You will develop your own guidelines for your presentation during a primary paper reading workshop.

**Journal club review:** Students who are not presenting a paper on a given day will review a presentation by another student. Worksheets will be due the class period following the presentation that is reviewed.

**Proposal first draft:** Having identified your question, you will write a first draft of your research proposal using the NIH research grant application guidelines. These will be provided in a separate document. This draft will be written and submitted in parts. Specific Aims and Significance will be due first; Approach (Methods), Concluding Remarks, Citations, and Abstract will be due at a later date. Incomplete versions will not be accepted. A 5% reduction in possible points will be applied for each day the selected portions are late. Any portion of the proposal that is more than 1 week late will receive a grade of zero (0).

**Proposal presentation 1:** You will make a short presentation of your specific aims and significance. Guidelines will be given in class.

**Pilot study:** You will perform one or two pilot experiments in order to determine whether your chosen methodology is manageable, reliable and reproducible. Grant-awarding bodies will usually not fund a research proposal without some preliminary data that shows the chosen methods are reasonable and appropriate. You will include results of your pilot study in the final proposal.

**Proposal presentation 2:** You will make a formal presentation of your research proposal to your peers and instructors, which you will have modified from presentation 1, based on feedback and your pilot study. You should include a description of and data from your pilot study.

**Final proposal:** Feedback from your initial version along with results of the pilot study should be used to write the final draft of your proposal. A 5% reduction in possible points will be applied for each day the proposal is late. Any proposal that is more than a week late will receive a grade of zero (0).

**URAC:** You will be expected to attend the Westminster Undergraduate Research and Arts Celebration (URAC) on April 18th and write a 2-page summary of a presentation. The presenters must have done their research in Biology, Molecular Biology, Neuroscience, Chemistry, Biochemistry, Physics or Environmental Science.

**Final - Capstone Qualifying Exam:** Assessment of your proposal presentation will be used to customize final exams that test comprehension and recall of important concepts specific to your project. The qualifying exam will consist of 2-4 questions that are specific to your project, followed by a more general short essay question that every student will be required to answer.
GRADING

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<tr>
<th>Assignment</th>
<th>Points</th>
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<tr>
<td>Participation</td>
<td>60</td>
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<tr>
<td>Annotated Bibliography</td>
<td>100</td>
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<tr>
<td>Journal club presentation</td>
<td>50</td>
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<tr>
<td>Journal club presentation review</td>
<td>20</td>
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<td>Question summary</td>
<td>25</td>
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<td>Proposal draft 1 (Submitted in two parts)</td>
<td>200</td>
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<td>Peer editing / in-class writing assignments</td>
<td>70</td>
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<td>Proposal presentation 1</td>
<td>25</td>
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<td>Proposal presentation 2</td>
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<td>Final proposal (advisor assigns 100 points)</td>
<td>250</td>
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<td>Research URAC summaries (1 @ 25 points)</td>
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<tr>
<td>Capstone Qualifying Exam</td>
<td>100</td>
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<td><strong>Total</strong></td>
<td><strong>1000</strong></td>
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Above 93%: A  
90% - 92.9%: A-  
87% - 89.9%: B+  
83% - 86.9%: B  
80% - 82.9%: B-  
77% - 79.9%: C+  
73% - 76.9%: C  
70% - 72.9%: C-  
67% - 69.9%: D+  
63% - 66.9%: D  
60% - 62.9%: D-  
below 60%: F

Academic integrity: The issue of academic integrity is taken very seriously at Westminster. Students are expected to abide by the College Policy on Academic Integrity. The policy can be found in the college catalog, available online at: [http://www.westminster.edu/acad/undergraduate_catalog.cfm](http://www.westminster.edu/acad/undergraduate_catalog.cfm)

Academic integrity is particularly important when dealing with scientific writing. We encourage students to work together, and discuss their assignments. But written assignments must be the original work of each student. Quotes, data or ideas taken from another source must cite that source fully and correctly. Work that is not the students' own (i.e., copied from an external source, a classmate, or class material) is considered to be plagiarized, and will receive a score of zero for the assignment. Note: plagiarism includes extensive, unnecessary quoting from another source, even if it is cited. More than one incident of plagiarism will result in a grade of "F" for the course. If in doubt, ask.

In the case of your research project, if your question, ideas, experiments or data are not your own and have been previously published by someone else, or if you fabricate, falsify or modify your data, you will earn an "F" for the course. These violations of integrity amount to scientific fraud; persons attempting to publish fraudulent work are liable to prosecution.