Bio66/Bio166: The Molecular Basis of Cancer  
Spring 2018

Instructor: Professor Natasha Grotz  
Tuesday/Thursday 2:25-4:15pm, X-hour Wednesday 4:35-5:25pm  
LSC Room 205  
Email me to set up appointments.

Objectives  
1. To learn how to critically read primary scientific literature  
2. To improve formulating and defending arguments  
3. To practice experimental design  
4. To understand how basic biological processes are misregulated in cancer  
5. To gain an appreciation for how basic research informs/has informed our understanding of cancer

We will use the primary scientific literature as a framework for training critical thinking and data analysis. We will work together to develop skills that can be applied beyond biomedical science to any field where information or data have to be evaluated, analyzed and synthesized.

Organization  
This course will be a mixture of small group problem solving/active class discussion of the primary literature and lectures/presentations. One or two papers will be discussed in depth each class session.

Grading  
15% active participation  
15% problem set  
10% short presentation on type of cancer  
25% paper presentation  
15% News & Views paper  
20% peer review

Participation  
Participation will be based on a student asking thoughtful questions, willingly offering answers to questions in class and generally fueling the classroom dialogue. If do not attend or rarely participate, this can adversely affect your final grade in the course.

Honor Principle  
In all work pertaining to this course, students are expected to obey the Honor Principle (http://dartmouth.smartcatalogiq.com/en/current/orc/Regulations/Undergraduate-Study/Academic-Honor). Unless otherwise stated, assignments are to be performed and written independently and any external sources used in preparing assignments are to be formally cited. Only original research articles, reviews, articles, textbooks, or personal communication with researchers may be cited; website URLs are not appropriate references. In addition to putting a list of references at the end of the assignment, you need to note the author, year within your text
whenever you use a reference.

**Student Accessibility Needs**
Students who may need disability-related academic adjustments should see me privately as early as possible in the term. Students requiring disability-related academic adjustments or services must consult the Student Accessibility Services (SAS) (Carson Hall, Suite 125, student.accessibility.services@dartmouth.edu) and provide me with a copy of the originally signed SAS Services and Consent form and/or a letter on SAS letterhead. If you have questions about whether you qualify to receive academic adjustments or services, please contact the SAS office directly. All discussions will remain confidential.

**Religious Observances**
Some students may wish to take part in religious observances that fall during this academic term. Should you have a religious observance that conflicts with your participation in the course, please come speak with me as early in the term as possible to discuss appropriate accommodations.

**Assignments**

**Problem Set:** You will be given a paper to read and a series of questions to answer independently.

**Paper Presentation:** You and your group will present the background for an assigned paper and lead an in-class discussion of the major findings of a primary research article from the current cancer literature.

**Short Presentation on Type of Cancer:** You and your group will give a short presentation on a specific type of cancer.

**News & Views:** You will independently prepare a “News & Views” review of the primary research article you present.

**Peer Review:** You will independently prepare a written review of an assigned primary research article.

For all written work, each student must independently write his/her assignments in his/her own original words. Any suspiciously similar prose on assignments will be considered in light of the honor code. Late assignments will not be accepted without substantial penalty.

**Details on Presentations**
For the presentations, students will work in small groups of approximately three students.

**Paper Presentation:** Within the presentation, there should be approximately 20 minutes focused on the introduction of the relevant hallmark and specific paper. This portion should go over the relationship of the subject matter to disease, the key discoveries/experiments that led up to the question(s) being asked in the paper(s) as well as providing a quick review of any fundamental molecular biology or any special experimental techniques. You will then lead the class in a discussion of the paper for the remainder of the class (approximately one hour). This will include preparing questions, slides and talking points directly related to the article. Within the discussion, you should address the major questions raised by the paper as well as what type of experiments might answer them. When relevant, a discussion of any therapeutics related to your topic is encouraged as the final portion of the class.
Short Presentation on Type of Cancer: This presentation is expected to be approximately 15 minutes in duration, and its function is to introduce students to various types of cancer. Within the presentation, you and your group should cover the basic details of that type of cancer and include typical treatment options.

Details on the News & Views
Each student will submit one “News & Views” article based on the research article their group presents. A “News & Views” article is written for a broad scientific audience, and it should appeal to all biologists and hopefully other scientists with some interest in biology. These articles are approximately two pages long and contain eight to 12 references to reviews and key papers from the primary literature. Often, they will include an illustrated figure (different from any figure in the paper) that summarizes the central point of the paper. These articles highlight what is remarkable about the work in the broad context of cancer biology and the particular sub-field within cancer biology. Depending on the particular paper being covered, the “News & Views” article could compare this approach (favorably and/or unfavorably) to others that are being currently pursued in the field, describe how a new approach has allowed the researchers to overcome a major barrier in this field and/or describe how this finding will have a direct impact cancer research.

Details on the Peer Review
Practice peer review process (2-page review)
You will pretend as if you have been asked to review an article before publication. As part of your review you will:
1. Put the work into context by describing what it adds to current knowledge in cancer biology
2. Critically evaluate the main experiments.
3. Summarize the major conclusions that can be made based on how you interpret the experiments. This may differ from what the authors conclude.
4. Present an alternative interpretation of at least one experiment and/or the major model presented in the paper.

Reading
Each week, original research papers will be discussed. Papers for the week will be posted by Saturday. It is essential that you read the assigned papers before class begins. Additional background readings that may aid in your analysis of papers will be posted along with papers on Canvas.
<table>
<thead>
<tr>
<th>Class Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>3/27-Tues</td>
<td>Introduction to the Hallmarks of Cancer</td>
</tr>
<tr>
<td>3/29-Thur</td>
<td>Ras-GAP</td>
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<tr>
<td>4/3-Tues</td>
<td>Ras-GAP</td>
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<tr>
<td>4/5-Thurs</td>
<td>Ras Targeting</td>
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<td>4/10-Tues</td>
<td>Ras Dosage</td>
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<td>4/12-Thurs</td>
<td>p53</td>
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<tr>
<td>4/24-Tues</td>
<td>SP (7): Lung, PP (3): Activating Invasion and Metastasis</td>
</tr>
<tr>
<td>4/26-Thurs</td>
<td>SP (8): Breast, PP (4): Evading Apoptosis</td>
</tr>
<tr>
<td>5/1-Tues</td>
<td>SP (9): Colon, PP (5): Evading Growth Suppressors</td>
</tr>
<tr>
<td>5/3-Thurs</td>
<td>SP (1): Prostate, PP (6): Avoiding Immune Destruction</td>
</tr>
<tr>
<td>5/8-Tues</td>
<td>SP (2): Leukemia, PP (7): Tumor Promoting Inflammation</td>
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<tr>
<td>5/10-Thurs</td>
<td>SP (3): Brain, PP (8): Genome Instability</td>
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<td>5/15-Tues</td>
<td>SP (4): Liver, PP (9): Deregulating Cellular Energetics</td>
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<td>5/17-Thurs</td>
<td>Therapeutics</td>
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<td>5/22-Tues</td>
<td>Therapeutics</td>
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<td>5/24-Thurs</td>
<td>Guest lecture: Kristina Godek</td>
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<td>5/29-Tues</td>
<td>Book Discussion: When Breath Becomes Air</td>
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**Assignment Schedule**

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<thead>
<tr>
<th>Date</th>
<th>Assignment Due Dates</th>
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<tr>
<td>4/4-Wed</td>
<td>First Assignment Posted/Groups Posted</td>
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<tr>
<td>4/11-Wed</td>
<td>First Assignment Due</td>
</tr>
<tr>
<td>5/24-Thurs</td>
<td>Final Assignment Posted</td>
</tr>
<tr>
<td>5/29-Tues</td>
<td>Final Assignment Due</td>
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News & Views due dates are listed on the next page; note that all papers will be peer reviewed prior to final submission.
News & Views Due Dates

Group 1
4/19 draft due
4/19-4/20 peer review by Group 5
4/23 final draft due

Group 2
4/21 draft due
4/21-4/22 peer review by Group 6
4/25 final draft due

Group 3
4/26 draft due
4/26-4/27 peer review by Group 7
4/30 final draft due

Group 4
4/28 draft due
4/28-4/29 peer review by Group 8
5/2 final draft due

Group 5
5/3 draft due
5/3-5/4 peer review by Group 9
5/7 final draft due

Group 6
5/5 draft due
5/5-5/6 peer review by Group 1
5/9 final draft due

Group 7
5/10 draft due
5/10-5/11 peer review by Group 2
5/14 final draft due

Group 8
5/12 draft due
5/12-5/13 peer review by Group 3
5/16 final draft due

Group 9
5/17 draft due
5/17-5/18 peer review by Group 4
5/21 final draft due