

## How do they do it? Method and Logic in Biomedical Science

Course No: BIOL 4660, three credits

Spring 2015

The University of Virginia

**Instructor:**

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**Office hours:** by appointment

**Class Hours:** Tuesday and Thursday 12:30-1:45pm

**Location:** Dell 2 100

**Prerequisites:** BIOL 3010

**Course Description:**

How has a bioluminescent jellyfish saved lives? What does a Himalayan pond fish have to do with research into the origins of psychiatric disorders? Innovative methods in biomedical research have played a significant part in the development of revolutionary disease cures, treatments and diagnostics. This course will examine many of these technical approaches and how they have led to such significant discoveries in basic biomedical research. The first 2/3 of the semester will be lecture based, while the final 1/3 will be focused on a combination of discussion, group writing assignments, and presentations. Participation is a large part of the final grade so students are expected to come to class prepared to actively participate.

**Course Objective:**

Upon completion of this course, during oral or written presentations given by biomedical research professionals and scientists, students will be able to:

- identify purpose of the used techniques.
- determine if the experimental design is adequate.
- evaluate if the methodology is sufficient to test the validity of the hypothesis.
- assess whether proper controls and statistical analysis are being used.
- propose additional experiments using modern-techniques to test the hypothesis further.

**Course Requirements:**

All reading and pre-class assignments will be provided in the form of webcasts, review articles and primary literature. These will be available on the course collab page.

**Grading:**

Letter grades (A: >85%; B:>75%; C:>65%; D:>55%; F:<55%) will be calculated from assessments below:

30% Midterm and Final Exam (15% each, both with in-class and take-home portions)

20% In-class participation (see below)

20% Pop-quizzes (based on pre-class assignments) and homework (post-lecture for review)

30% Group presentation and written presentation summary (15% each)

**Class environment and participation:**

There are many people who say “there is no such thing as a stupid question.” This is true. However, there are such things as “embarrassing questions,” because the people who ask them feel embarrassed that they don’t know something they feel they already should. Please feel free to ask any and all “embarrassing questions” here. That is what this class is all about. A substantial part of your grade

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(20%) will be based on your willingness to engage with the discussions. Remember, communication is mandatory for scientific progression and now you are part of it!

### Policies:

- Every student in this course must fully comply with all of the provisions of the UVA honor system.
- Website is at UVA collab (<https://collab.etc.virginia.edu/portal>).
- As participation in class discussions is an essential and graded part of the course, attendance is required.
- No extensions or make-ups will be given for the any of the assignments, exams and quizzes, unless arrangement/permission is given well in advance.
- Please turn OFF all cell phones/electronic devices before entering the class.

Week	Day	Topic
1/13/2015	Tuesday	Intro/Survey/Experimental design and logic
1/15/2015	Thursday	Visualizing structure: Principles of light, fluorescent, electron microscopy
1/20/2015	Tuesday	Visualizing connectivity: Detecting cellular and sub-cellular components
1/22/2015	Thursday	Visualizing function: Static and active reporters of function
1/27/2015	Tuesday	Molecular biology I: History and principles of molecular biology
1/29/2015	Thursday	Molecular biology II: Cloning, purifying and sequencing DNA (RNA)
2/3/2015	Tuesday	Genetic screens: Model organisms, forward, reverse, <i>in silico</i> screens
2/5/2015	Thursday	Manipulating genomes I: Transgenic systems
2/10/2015	Tuesday	Manipulating genomes II: Production of transgenic organisms
2/12/2015	Thursday	Mining x-omic information: Generation and usage
2/17/2015	Tuesday	Cell Culture: <i>in vitro</i> , <i>ex vivo</i> , gene delivery
2/19/2015	Thursday	Electrophysiology: Principles and types
2/24/2015	Tuesday	Animal behavior: Models, design and ethical considerations
2/26/2015	Thursday	Whole brain imaging: EEG, MRI, CT...
3/3/2015	Tuesday	Paper discussion
3/5/2015	Thursday	<b>Mid-term Exam</b>
3/10/2015	Tuesday	Spring Break
3/12/2015	Thursday	Spring Break
3/17/2015	Tuesday	Monitoring cellular activity: Calcium, protein, membrane dynamics
3/19/2015	Thursday	Monitoring cellular signaling/biochemical assays: Studying proteins
3/24/2015	Tuesday	Manipulating cell activity: Chemogenetic and optogenetic methods
3/26/2015	Thursday	Designing science presentations
3/31/2015	Tuesday	Presentations—Find the connection in the brain
4/2/2015	Thursday	Presentations—Find the function of a neuron
4/7/2015	Tuesday	Presentations—Find the gene in a neuron
4/9/2015	Thursday	Presentations—Mine the genome of a brain
4/14/2015	Tuesday	Presentations—Monitor animal behavior
4/16/2015	Thursday	Presentations—Monitor neural activity
4/21/2015	Tuesday	Paper discussion
4/23/2015	Thursday	Wrap-up/Review/Pub-quiz
4/28/2015	Tuesday	<b>Final Exam</b>