Biology 104 - Molecular Biology - Spring 2012

Lecture: TTh 11:10-12:30pm
Instructor: Dr. Jim Doohan
Office Hours: W 11am-2pm, Th 1-3pm
Web site: www.biosbcc.net/doohan/bio104/index

Discussion Sections: T or Th 9:35-10:30am
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Course Description
Lecture topics will focus on four related, but distinct areas: basic concepts of gene expression, manipulation of DNA through recombinant DNA technology, the application of molecular biology to biotechnology, and the use of specific organisms as model systems for research.
The discussion portion of the course is centered on a guest lecture series. I have invited 4 UCSB professors to come to our class and present their research. In preparation for these lectures, we will read and discuss relevant journal articles.

Recommended Textbook: *Molecular Biology of the Cell by Alberts et al. 5th edition*
Reading assignments will be posted on the class website.
Required Book: *The Best American Science Writing 2010*

Lecture exams will be composed of multiple choice, short-answer questions and essay questions.
Article Summaries. You are required to write 2 summaries of 2 journal articles. These articles are recommended by our UCSB guest lecturers. The articles will be posted online. A guideline for writing a summary is included at the end of this syllabus and is posted on the class website.
Discussion Work Sheets. We will be discussing journal articles and other science writings in the discussion section that meets once a week. Prior to class you will submit the work sheet due that day. Work sheets ask specific questions related to that week's reading assignment. Work sheets will be posted online. You must complete them, print and submit them on the appropriate due dates. They will not be accepted late.
Student Presentations. During the last month of the semester, you will be assigned to a team of 4-5 students. The team will be assigned a particular research article. The team will read and master the article, develop a Power point presentation and then explain the article to the class in a 30 minute presentation. Your team will be graded on the quality of the power point presentation and the clarity of its delivery to the class (maximum of 25 points). You will also earn participation points (5 points each day) for attending discussion section during the last 5 weeks of class, as students prepare and present their articles.
Guest Lecture Attendance. You are required to attend the research talks of our guest lecturers.

Grading Determination of grades will be based on points earned in the following categories:

2 Midterm Exams (100 pts each)	200
Final Exam (150 pts)	150
9 Discussion work sheets (5 pts each)	45
5 Discussion participations (5 pts each)	25
1 Student Presentation (25 pts)	25
2 Journal Article Summaries (25 pts each)	50
Attendance of 4 Guest Lectures (5 pts each)	20
Total points possible	515

Grading Scale:	463-515 = A (90-100%)	412-462 = B (80-89%)	335-411 = C (65-79%)	257-334 = D (50-64%)	256 and below = F (<50%)

Molecular Biology-104 Lecture Schedule

Date	Lecture Topic
T 1-24	Proteins
TH 1-26	DNA, Chromosomes and Replication
T 1-31	DNA Repair and Recombination
TH 2-2	Prokaryote - Transcription
T 2-7	Prokaryote - Translation
TH 2-9	Regulation of Gene Expression in Prokaryotes – Lac Operon
T 2-14	Bacterial Genetics - Conjugation
TH 2-16	**Exam #1** (material from 1-24 to 2-9)
T 2-21	Bacterial Genetics – Transduction and Transformation
TH 2-23	**Research Seminar (Thomas Weimbs)**
T 2-28	Eukaryote – Transcription and RNA Processing
TH 3-1	Eukaryote – Translation and Post-translational Modifications
T 3-6	Basic Immunology
TH 3-8	Cloning Genes and Producing Pharmaceuticals
T 3-13	Transgenic Animals and Gene Therapy
TH 3-15	**Research Seminar (Stu Feinstein)**
T 3-20	Stem cells and Animal Cloning
TH 3-22	**Exam #2** (material from 2-14 to 3-13)
3-26 to 3-31	**Spring Break**
T 4-3	Genetic Engineering of Plants
TH 4-5	Apoptosis – Programmed Cell Death
T 4-10	MicroRNAs
TH 4-12	Mitosis and Regulation of the Cell Cycle
T 4-17	**Research Seminar (Tony De Tomaso)**
TH 4-19	Forward (Classical) Genetics - Yeast and the Cell Cycle
T 4-24	Cell Communication - Signal Transduction
TH 4-26	Reverse Genetics – Stat Knockout
T 5-1	Epigenetics
TH 5-3	Molecular Biology of Cancer
T 5-8	Molecular Biology of Cancer
TH 5-10	**Research Seminar (Jamey Marth)**
TH 5-17	**Final Exam 11-1pm** (material from 3-20 to 5-8)

Discussion Section

During the first 11 weeks of class, we will read and discuss science journal articles and other science writings. You are required to read the assigned articles and complete the assigned work sheets. Worksheets will be posted on the class web site as Word documents. You are required to complete the work sheet on a computer and then print it. Worksheets, which are worth 5 points each, are submitted at the end of the discussion class period. You will be allowed to edit your worksheets during class.

During the last 5 weeks of the semester you will be put into a student group (4-5 people). Your group will be assigned a specific scientific article. Your group will have 2-4 weeks to develop a research talk that explains the article. On a specific date (to be announced) your group will be given 30 minutes to explain the article to the class using a combination of Power Point slides and chalkboard drawings. Your presentations will be graded and are worth a maximum of 25 points. You will earn participation points (5 points each day) for attending discussion section during the last 5 weeks of class.

Discussion Section Schedule - Spring 2012

Day	Date	Discussion Topic	Work Sheet
T Th	1-24 & 1-26	Introduction	None
T Th	1-31 & 2-2	BASW – pages 102-123 and 124-146	WS 1
T Th	2-7 & 2-9	BASW – pages 190-217 and 218-231	WS 2
T Th	2-14 & 2-16	Signal transducer and activator of transcription-6 (STAT6) inhibition suppresses renal cyst growth in polycystic kidney disease	WS 3
T Th	2-21 & 2-23	Signal transducer and activator of transcription-6 (STAT6) inhibition suppresses renal cyst growth in polycystic kidney disease	WS 4
T Th	2-28 & 3-1	Amyloid _-Mediated Cell Death of Cultured Hippocampal Neurons Reveals Extensive Tau Fragmentation without Increased Full-length Tau Phosphorylation	WS 5
T Th	3-6 & 3-8	Amyloid _-Mediated Cell Death of Cultured Hippocampal Neurons Reveals Extensive Tau Fragmentation without Increased Full-length Tau Phosphorylation	WS 6
T Th	3-13 & 3-15	Amyloid _-Mediated Cell Death of Cultured Hippocampal Neurons Reveals Extensive Tau Fragmentation without Increased Full-length Tau Phosphorylation	WS 7
T Th	3-20 & 22	Allorecognition in a Basal Chordate Consists of Independent Activating and Inhibitory Pathways	WS 8
M-S	3-26 to 3-31	Spring Break	
T Th	4-3 & 4-5	Allorecognition in a Basal Chordate Consists of Independent Activating and Inhibitory Pathways	WS 9
T Th	4-10 & 4-12	Preparation for Student Presentations	none
T Th	4-17 & 4-19	Preparation for Student Presentations	none
T Th	4-24 & 4-26	Student Presentation Dietary and Genetic Control of Glucose Transporter 2 Glycosylation Promotes Insulin Secretion in Suppressing Diabetes	none
T Th	5-1 & 5-3	Student Presentation Mammalian N-Glycan Branching Protects against Innate Immune Self-Recognition and Inflammation in Autoimmune Disease Pathogenesis	none
T Th	5-8 & 5-10	Student Presentation Pathway to diabetes through attenuation of pancreatic beta cell glycosylation and glucose transport	none

Guest Speaker Series

Date	Speaker	Required Reading	Wrtten Summary
2-23	Dr. Thomas Weimbs Professor MCDB	Signal transducer and activator of transcription-6 (STAT6) inhibition suppresses renal cyst growth in polycystic kidney disease	Summary required Due 2-28
3-15	Dr Stewart Feinstein Professor MCDB	Amyloid _-Mediated Cell Death of Cultured Hippocampal Neurons Reveals Extensive Tau Fragmentation without Increased Full-length Tau Phosphorylation	Summary required Due 3-20
4-10	Dr Anthony De Tomaso Professor MCDB	Allorecognition in a Basal Chordate Consists of Independent Activating and Inhibitory Pathways	No summary required
5-10	Dr. Jamey Marth Professor MCDB	Pathway to diabetes through attenuation of pancreatic beta cell glycosylation and glucose transport	No summary required

How to read and understand a science journal article.

Articles from science journals such as Nature and Science are very challenging to read and understand. They are written by scientists for scientists. They are written above the knowledge level of the typical college undergrad, yet college students are often expected to read and write reports based on such articles. How does one tackle this challenging task? We need to break the article down into its component parts and focus on the most important facts. Typically and article will have 5 parts:

Abstract: This is a summary of the article. It briefly states the goal of the research and the results obtained by the study. Quite often it is so abbreviated and contains so much scientific jargon that it is very difficult to understand. Do not be discouraged if, at first, you don't understand the abstract. You should reread the abstract after you have read the remainder of the paper. It will make more sense then.

Introduction: The introduction describes the current state of knowledge of this particular field of science and provides relevance for the experiments described in the article. Toward the end of the introduction, the author typically states his/her hypothesis, the general approach to testing the hypothesis, and then tells you the essential experimental results.

Results: The results section describes the experiments, in detail, while constantly referring to the figures. The figures are the key to understanding the paper. The figures contain the data on which the author's base their claims. To critically evaluate a research article, we must closely examine the figures. Most of your time and effort should be directed toward understanding the figures. Every figure displays data derived from an experiment. And every experiment begins with a question. If you first identify the question an experiment is attempting to answer, then the experiment will make much more sense. Each experiment involves some type of assay (a procedure that measures something). You are currently ignorant regarding most of the assays used in molecular biology, but we will discuss these assays in discussion section. Once you understand the question being asked and the assay being employed, you should be able to critically evaluate the data in the figures and decide for yourself if the data supports or refutes the author's hypotheses.

Discussion: In the discussion section, the author will restate their results, tie all the experiments together into an integrated whole and then relate their results to other findings in the field. They will attempt to reiterate the importance of their work and suggest future directions.

Methods: The methods section describes the experimental assays in great detail. Typically the reader can ignore this section. However, you may want to read parts of the methods section to further your understanding of a particular experiment.

How to write a summary of a science article

Your summary should have 3 parts; an introduction, a body and a conclusion.

Introduction:

- Give background information about the field of research addressed in this paper.
    - What is the processed being studied? Examples include bacterial pathogenesis, regulation of stem cell development, diabetes research, cancer therapies, etc.
    - What is the experimental organism or type of cells being used? Examples include mice, rats, virus, plants, cultured cells.
    - What is the goal of the research? What fundamental question are they trying to answer? What is their hypothesis?
    - What is the most important outcome of their experiments? What did they find out?

Body:

- The body of your summary will address each and every figure (unless I state otherwise).
- For each figure you should provide the following:
    - State why they are performing the experiment. Every experiment is intended to answer some question.
    - Briefly describe the experiment. You need not describe all aspects of the experiment in detail, rather your should give a general description (rats were infected with 500 cpu of RB50 bacteria …, cells were infected with virus then…, protein was extracted from cells and visualized by Western blot…)
    - State the most important result of the experiment. How does one determine the important result? Often the author will state something like “these results demonstrate that…”, or “these results clearly show that…”. Do not copy down exactly what the author says (that’s plagiarism), rather paraphrase, in your own words, what the author has stated.

Conclusion:

- Restate the goal of the research.
- State the most important results of the experiments.
- State the importance of the research as it relates to our knowledge of biology and to the well being of mankind.

Summary Format and Length

- The length of the summary will vary with the length of the article. Typically 2-5 pages will do the job.
- The summary must be typed, #12 font, double-spaced, 1 inch margins.

Hint: The work sheets you complete in discussion section should prove very useful while writing the summary.

Summary of Exam and Assignment Due Dates

Week 1 (1-24 & 1-26)	no assignments due
Week 2 (1-31 & 2-2)	Discussion Work Sheet 1
Week 3 (2-7 & 2-9)	Discussion Work Sheet 2
Week 4 (2-14 & 2-16)	Discussion Work Sheet 3 Exam #1 (2-16)
Week 5 (2-21 & 2-23)	Discussion Work Sheet 4 Attend Thomas Weimbs Guest Lecture (2-23)
Week 6 (2-28 & 3-1)	Discussion Work Sheet 5 Article Summary #1 (due 2-28)
Week 7 (3-6 & 3-8)	Discussion Work Sheet 6
Week 8 (3-13 & 3-15)	Discussion Work Sheet 7 Attend Stewart Feinstein Guest Lecture (3-15)
Week 9 (3-20 & 22)	Discussion Work Sheet 8 Article Summary #2 (due 3-20) Exam #2 (3-22)
Week 10 (3-26 to 3-31)	Spring Break
Week 11 (4-3 & 4-5)	Discussion Work Sheet 9
Week 12 (4-10 & 4-12)	Preparation for Student Presentations Attend Anthony De Tomaso Guest Lecture
Week 13 (4-17 & 4-19)	Preparation for Student Presentations
Week 14 (4-24 & 4-26)	Student Presentation
Week 15 (5-1 & 5-3)	Student Presentation
Week 16 (5-8 & 5-10)	Student Presentation
Week 17 (5-17)	Final Exam