

## Course Information

<https://bCourse.berkeley.edu/>

### Instructors and staff

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### Overview

Welcome to MCB 133L! This course is designed to offer students a working knowledge of many of the key techniques and strategies used in modern cell biology and physiology research, and to be highly interactive and (we hope) thought-provoking. Through a series of lectures, laboratory exercises, and presentations, students will learn to manipulate nucleic acids, proteins, cells, and organisms, to use microscopes and other important research instruments, to observe and quantify the outcomes of experiments, and to keep a detailed record in a laboratory notebook. In addition, the course provides many opportunities to improve scientific communication skills and to explore primary scientific literature.

### Course meetings

Lectures are presented by the faculty instructors on Mondays from 1-2 p.m. in 103 Moffitt.

Laboratory activities are conducted in 4047 VLSB. Each lab section is facilitated by a GSI. Students attend 2 laboratory sessions per week, either Monday/Wednesday or Tuesday/Thursday. The laboratory sessions meet from 2-5:30 p.m.

Attendance is required at all lectures and lab periods. Absences are only allowed for graduate/medical school or professional interviews, or contagious or debilitating illness (a doctor's note is required). If an absence is anticipated, it is your responsibility to communicate with your GSI **in advance**. It may be possible to attend the other lab session (*e.g.*, to attend on Wednesday instead of Thursday) but makeup lab sessions at other times are not possible. In cases when it is not possible to attend another section, your GSI may allow you to make up an absence by attending a departmental/divisional seminar and writing a short summary. You are still expected to complete your notebook and lab report/presentation based on data collected by your lab partner.

Examples of non-allowable absences: to attend a wedding, reunion, etc.

### **Preparation for class**

Instructions for obtaining the lab manual and other guidelines are available at the course website. You should bring a bound lab notebook to each lab session. Before coming to each lab, you are expected to read the relevant section of the manual and to write a Prelab section for the experiment in your notebook (see the Lab Notebook Guidelines for more details).

### **Student Conduct**

Plagiarism is a violation of the student code of conduct and will not be tolerated. Laboratory science is inherently an individual activity, even when conducted in pairs or teams. As much as possible, all writing in this course should be done individually, even in cases where discussions with your peers or instructors are appropriate and helpful. Direct quotations should be placed in quotation marks and cited appropriately. Data or ideas from others should be indicated as such and attributed to their source. If you are uncertain about whether or how to attribute information, please discuss with your GSI or faculty instructors. Cases of cheating, plagiarism or any other form of misconduct will be referred to the student conduct committee.

### **Grading**

The following components contribute to the overall grade in MCB 133L. A description of each component follows the point distribution.

Lab notebook (three times, 10 points each)	30
Library exercise	5
Journal article presentation (5 pts. meeting with instructor, 15 pts. presentation)	20
Data presentation	20
Lab report I (Protein purification and protein-protein interactions)	30
Lab report II (Somatosensation)	30
Quizzes (three, 25 points each)	75
Departmental seminar	5
Evaluation by GSI	15
Total	230

#### *Lab notebook*

You are expected to bring your notebook to every lab session, to keep detailed notes on your laboratory work, and to enter all data that you collect (for some experiments, you will also need to add data collected by other students in your section, with attribution). Please refer to the notebook guidelines for more details, and talk to the instructors if you have any questions. Your GSI may check your notebook at any time and will assign a numerical score based on completeness, organization, and thoughtfulness near the end of each third of the course.

#### *Library exercise*

This will be based on an introduction to tools for accessing and citing primary scientific literature that will be presented near the beginning of the course. The exercise should be completed individually by

each student.

#### *Journal article presentation*

Each student, working with his/her lab partner, will give an oral presentation (15 minutes + 5 minutes for questions & discussion) based on a primary research article. Students sign up for presentation dates at the beginning of the semester. Faculty instructors will assign a list of papers, which are related to the topics and techniques covered in the laboratory. About 2 weeks prior to the presentation date, students should contact the faculty instructor in charge of that portion of the course (usually by email) to confirm which paper they will present and to schedule a meeting with the instructor to discuss the paper. Students should read the paper thoroughly before the meeting and be prepared to ask any questions that will help them to understand the goals of the work, technical details, results, or interpretations. These meetings usually last for about an hour and offer students a good opportunity to get to know the instructors a bit better, and vice versa. Faculty instructors will assign points for this meeting, based primarily on students' preparedness and their participation in the discussion. Students should use PowerPoint, Keynote, or other presentation tools to prepare graphical aids for their presentations. GSIs will grade the presentations, based on guidelines that they will communicate.

#### *Data presentation*

Each student, working with his/her lab partner, will give an oral presentation based on one of the experiments conducted in the laboratory, as indicated in the course schedule. Students should sign up for presentation dates at the beginning of the semester.

#### *Lab reports*

Each student will write two formal reports on specific laboratory exercises, as indicated in the course schedule. The lab reports should be in the format of a short research article. GSIs will distribute guidelines and will grade these reports.

#### *Quizzes*

Following each of the 3 sections of the course, each faculty instructor will give a quiz covering material presented in the lectures and labs. Quizzes may be given in class (usually 1 hour is allowed to complete the quiz) or take-home, at the instructor's discretion, and are graded by the faculty instructor.

#### *Departmental Seminar*

Each student will complete this exercise individually by attending one MCB departmental or divisional seminar from a list provided by the instructors. You should then write a clear, concise (~half-page) summary that describes the scientific questions, the approach/methods used, and the main conclusions presented by the speaker. The summary must be based on information presented in the seminar, not just paraphrased from the speaker's published work, web site, or other materials, although you are free to consult such sources for clarification or further interest.

#### *Lab practicals*

Each student will complete these exercises individually. Although they will not be scored *per se*, the GSIs may take the practicals into consideration when evaluating students at the end of the semester.

#### *GSI Evaluation*

GSIs have the discretion to assign these points based on attendance, effort, preparedness,

experimental technique, and active participation during class and oral presentations.

## **Course Policies**

### **Safe, Supportive, and Inclusive Environment**

Whenever a faculty member, staff member, post-doc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process. Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling (510) 642-1988.

The classroom, lab, and work place should be safe and inclusive environments for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call (510) 643-7985, email [ask\\_ophd@berkeley.edu](mailto:ask_ophd@berkeley.edu), or go to <http://survivorsupport.berkeley.edu/>.

### **DSP Students**

Please inform your instructor of any accommodations needed during the first week of the course.

### **Cheating**

Cheating including plagiarism will not be tolerated. UC Berkeley's cheating policy (<http://bulletin.berkeley.edu/academic-policies/#studentconductappealstext>) will be followed.

### **Letters of Recommendation**

Any of the three instructors may be approached for a letter of recommendation. We all are quite willing to provide a written evaluation for this purpose. So that we may prepare effective evaluations we ask that you follow the procedure outlined here. Be sure to attend the journal club discussion session with the instructor. In addition, ask your laboratory section GSI to write a brief note about your participation in section to the instructor. Sometime after the end of the course, request an interview with the instructor and bring a copy of your complete transcript, your CV and Personal Statement along with any recommendation forms that need to be filled in.

## Course Schedule

<b>Part I: Molecular Biology and Biochemistry</b>				
<b>Date</b>	<b>Day</b>	<b>Lab</b>	<b>Lecture</b>	<b>Other</b>
Aug 24/25	Wed/ Th	Organization & Safety	Intro 4047 VLSB	Presentations: Biosafety in Lab Intro. to PubMed
Aug 29/30	Mon/ Tu	0-Protein Assay Practical	1	
Aug 31/ Sept 1	Wed/ Th	1.1-Cloning: Polymerase Chain Reaction (PCR) and Restriction Digest		Library Exercise Due
Sept 5/6	Mon/ Tu	<b>Labor Day Holiday</b>		
Sept 7/8	Wed/ Th	1.2-Cloning: Agarose Gel Electrophoresis and Gel Purification		
Sept 12/13	Mon/ Tu	1.3-Cloning: Ligation and Transformation		
Sept 14/15	Wed/ Th	1.4-Cloning: Mini-prep and Restriction Digest		
Sept 19/20	Mon/ Tu	2.1-Protein Purification: Purifying NFAT by Affinity Chromatography	2	Data Club: Lab 1
Sept 21/22	Wed/ Th	2.2-Protein Purification: SDS-PAGE and Coomassie stain		Journal Club 1
Sept 26/27	Mon/ Tu	3.1-Protein-Protein interactions: Affinity Capture of Calcineurin	3	
Sept 28/ 29	Wed/ Th	3.2-Protein-Protein Interactions: SDS PAGE and transfer		Data Club: Lab 2
Oct 3/4	Mon/ Tu	3.3-Protein-Protein Interactions: Western Blot		Journal Club 2
<b>Part II: Cell Biology</b>				
Oct 5/6	Wed/ Th	Microscope Demo and Practice	Microscopy 4047 VLSB	Quiz: Part I
Oct 10/11	Mon/ Tu	4.1-Immunofluorescence of the cytoskeleton: Sample Preparation	4	Journal Club 3
Oct 12/13	Wed/ Th	4.2-Immunofluorescence of the cytoskeleton: Microscopy		Journal Club 4
Oct 17/18	Mon/ Tu	5.1-Chromosome Biology I	5	
Oct 19/20	Wed/ Th	5.2-Chromosome Biology II		Report 1 Due (Lab 3) Data Club: Lab4
Oct 24/25	Mon/ Tu	6.1-Subcellular localization: Hela cell Transfection	6	Data Club: Lab 5 <b>Scope Practical</b>

Oct 26/27	Wed/ Th	6.2-Subcellular localization: Vital Stains		
<b>Part III: Physiology</b>				
Oct 31/ Nov 1	Mon/ Tu	7.1- Ion Channel Basics: Ca <sup>2+</sup> Imaging	7	Data Club: Lab 6
Nov 2/3	Wed/ Th	7.2- Physiological Roles of Ion Channels: Translocation of NFAT-GFP		Quiz: Part II
Nov 7/8	Mon/ Tue	8 - Steroid Induced Exocytosis: Sperm Acrosome Reaction in Real Time	8, 9	Data Club: Lab 7.1-7.2
Nov 9/10	Wed/ Th	9 – <i>In vivo</i> Measurements of the Metal Uptake by Bacteria		
Nov 14/15	Mon/ Tu	10.1- Somatosensation: Human Receptive Fields and Action Potential Stimulation	10	Journal Club 5 Data Club: Lab 8
Nov 16/17	Wed/ Th	10.2- Somatosensation: Mechanosensation Screen in <i>C. elegans</i>		Journal Club 6
Nov 21/22	Mon/ Tu	10.3- Somatosensation: Mechanotransduction and Proprioception in insects	11	Data Club: Lab 10.1
Nov 23/24	Wed/ Th	<b>Thanksgiving Holiday</b>		
Nov 28/29	Mon/ Tu	11- Human and <i>Drosophila</i> Gustation		
Nov 30/ Dec 1	Wed/ Th	Complie & Analyze Group Data, Party		Quiz: Part III
Dec 5-8	M-Th	<b>Reading Period</b>		
Dec 12	Mon			Report 2 due (Lab 10.2)

## Assignment Guidelines

### **Lab Notebooks**

The purpose of a laboratory notebook is to document laboratory experiments and procedures. Items must be written in a way that is understandable and useful to you and to others, whether or not they are familiar with the particular experiments, and whether the notebook is being consulted before, during, or even long after the experiments.

In order to maintain the integrity of the notes, the notebook should be a bound volume with printed page numbers – do not use loose-leaf or spiral notebooks. All writing should be in ink.

The faculty and graduate student instructors will periodically check or initial your notebook to ascertain that it is up-to-date, that you are prepared for current experiments, and that you have properly documented your procedures and observations. Additionally, your notebooks will be collected for evaluation at various times during the course.

Below is an annotated example of the type of information that should be included in your lab notebook.

*I. The following should be written in your notebook before you come to class.*

Date: xx/xx/xx

Experiment number: 0

Title: Determining protein concentrations

Purpose:

The purpose of this lab is to learn how to determine protein concentration and to practice proper pipetting technique.

This should only be one or two concise sentences.

Procedure:

This section should be a summary or flowchart of the important steps in the protocol. It must be completed before class, and you can use it to keep track of each step during your experiment. Procedural calculations should be prepared before class. If there are any pre-lab exercises in your lab manual, include them at the end of this section.

1. Label 24 microfuge tubes: A1, A2, A3, A4, A5, A6, A7, A8, B1, B2, B3, B4, B5, B6, B7, B8, C1, C2, C3, C4, C5, C6, C7, C8.
2. In a separate microfuge tube, prepare 500 $\mu$ l of 2 mg/ml BSA solution by making a 1:10 dilution of a 20 mg/ml stock solution (add \_\_\_  $\mu$ l of stock BSA to \_\_\_  $\mu$ l H<sub>2</sub>O). Mix well.
3. In tubes A1-> A8, prepare 100  $\mu$ l of each of the following concentrations of BSA solutions: 0.0, 0.1, 0.2, 0.4, 0.7, 1.0, 1.5, and 2.0 mg/ml.
4. Repeat steps 2 and 3 twice more to set up a total of 3 independent sets of standard solutions. Make a new stock of 2mg/ml BSA for each set of standards. Use tubes B1-> B8 for the second set, and C1-> C8 for the third set.
5. In a microfuge tube, prepare 50 $\mu$ l of a 1:5 diluted solution of unknown sample Y by adding \_\_\_ $\mu$ l of sample Y to \_\_\_ $\mu$ l of H<sub>2</sub>O. Mix well. Repeat this step for unknown sample Z.
6. Add 80  $\mu$ l of the Bradford dye to each of 36 wells (A1-C12) of a microtiter plate.

7. Add 5  $\mu$ l of each of the solutions in tubes A1-> A8, B1-> B8, C1-> C8 (steps 3-4) to each well containing the Bradford dye. Use a separate pipette tip for each dilution. Mix without generating bubbles.
8. To each of the remaining wells containing the Bradford dye, add 5  $\mu$ l of one of the unknown sample solutions. For each sample, use three wells to set up the assays in triplicate points:
  - Y, U unknown "Y", undiluted
  - Z, U unknown "Z", undiluted
  - Y, D unknown "Y", diluted 1:5
  - Z, D unknown "Z", diluted 1:5
9. Wait for 5 min. Read the color density using the plate reader.
10. Analyze data using the program Delta Soft.

*II. The following should be recorded in class as you do the experiment. Write directly in the notebook as things happen, not some time after you leave.*

**Results and Observations:**

Any deviations you make from the printed protocol in the lab manual should be noted in chronological order. You should record which reagents (plasmids, primers, etc.) you are using, because this information is necessary to interpret your results.

Be sure to include all results: protein concentrations you determine (with calculations), samples loaded in each gel lane, sketches of cells you are observing in the lab, cell counts, etc. It is important that you paste all your raw data into the correct section of the notebook, because you will need it when you go back and write lab reports. Label each figure / table explicitly. Indicate (i) whether it is your own result or a sample result obtained from your GSI, (ii) which experiment it is, and (iii) what each lane / well / picture corresponds to. Data and computer printouts should be firmly and permanently attached with tape.

*III. The following should be completed after the experiment is completed.*

**Discussion:**

You should discuss what the results mean. If there are exercises in the lab manual, incorporate them into your discussion.

**Conclusion:**

I calculated the concentrations of my unknowns to be \_\_\_ mg/ml (unknown Y) and \_\_\_ mg/ml (unknown Z) by Bradford assay using BSA as a standard.

The conclusion section should be very short, no more than a paragraph, and should mention the key results.



## **Data Club Presentation**

You and your lab partner(s) will give a single data presentation together. If necessary you should present data compiled for your entire class. Consult the following grading rubric and the 'oral presentations' guidelines for help as you prepare your presentation. Before your presentation, tear this page out of the manual and give it to your GSI for evaluation.

### **Data Club Evaluation: 20 Points**

Date:

Group:

Presenters:

Time:

#### **Contents**

Introduction (4 pts): \_\_\_\_\_

Methods (2 pts): \_\_\_\_\_

Results (3 pts): \_\_\_\_\_

Discussion (4 pts): \_\_\_\_\_

References (1 pts): \_\_\_\_\_

Questions (2 pts): \_\_\_\_\_

#### **Style**

Use of Visual Aids (2 pts): \_\_\_\_\_

Clarity (2 pts): \_\_\_\_\_

Rubric adapted from Karen Bernd:  
<http://www.bio.davidson.edu/people/kabernd/111/Rubric.htm#oral>

Category	Excellent	Average	Poor
<b>Introduction (4 pts)</b>	The research question or problem is well-defined and connected to the 'big picture' in the field or research area. There is a clear overview of current understanding in the field. (4 pts)	The question or problem is defined, but lacks connection with the 'big picture' or there is little connection to knowledge in the field as a whole. May include factual errors in the background material. (2-3 pts)	Overlying question or problem is not evident. The introduction focuses on details of experiment rather than informing the audience what the field is, why it is interesting and how the experiment at hand fits into investigations that have already been conducted. Factual errors are present. (0-1 pt)
<b>Methods (2 pts)</b>	Summarizes major steps and key variations from standard lab protocol. Provides details that allow audience to understand why experiment was designed as it was. Appropriate controls are explained. Uses appropriate units for substances. (2 pts)	Summarizes some steps and variations from standard protocols. Some details provided to understand variables and experimental design. Contains too many details. Appropriate controls may not be explained. (1 pts)	Restates procedure focusing on details rather than major steps and variations that make the experiment unique. Not enough explanation is provided for the audience to understand experimental design. (0 pts)
<b>Results (3 pts)</b>	The data are analyzed, expressed, and explained in an accurate way. Presentation format uses graphs and tables to convey information clearly. Statistical analysis of data is present. (3 pts)	Most data are analyzed thoroughly and presented accurately, but with minor flaws. There may be no evident use of statistical analysis. (2 pts)	Raw data is presented instead of analyzed results, analysis. Explanation may be inaccurate or incomplete. (0-1 pts)
<b>Figures and Tables/ Visual Aids (2 pts)</b>	The figures and/or tables are appropriately chosen and well-organized; data trends are illuminated. Figure labels are informative and complete. Titles resemble headlines that present the 'message' of the figure. (2 pts)	General trends in the data are readily seen from the figures and tables; in some cases, tables and figures may provide redundant information or data. Figure labels lack clarity and are incomplete. Titles restate axes rather than informing audience. (1 pts)	Data may be represented inaccurately or in an inappropriate format. Raw, unanalyzed data is presented. Figure labels are missing or incorrect. (0 pts)
<b>Discussion and Future Directions (4 pts)</b>	Ties results to background and 'big picture'. Conclusions are supported by the data. Future directions are plausible and include suggestions to improve the experiment if it	Conclusions are supported by the data, but connections with broader goals and topic are not directly made. (2-3 pts)	Conclusions are not supported by the data. Focus on minutiae rather than how the trends fit with current findings/theories in the field. Future directions are not reasonable and do not

	should be repeated. <b>(4 pts)</b>		include improvements to the experiment. <b>(0-1 pts)</b>
<b>Clarity (2 pts)</b>	The presentation is visually appealing, well organized and easy to follow. It draws in the audience and keeps their attention. Fonts are large and colors are easy to see. <b>No</b> distracting backgrounds, slide changes or sounds. <b>(2 pts)</b>	The presentation is visually appealing, but may contain unclear information, use font sizes or colors that are difficult to read. <b>(1 pts)</b>	The slides are text heavy and the presentation is read from the slides. Slide transitions, backgrounds, sounds are distracting. Presenters are difficult to hear or primarily facing the board while speaking. <b>(0 pts)</b>
<b>References (1pt)</b>	Adequate citation and correct format (see 'a note on references' above) so that references look like reference section for an article in the scientific journal 'Cell'. All images that were not created by the authors are properly cited. <b>(1 pts)</b>		Wrong format for citations. (see 'a note on references' above). <b>Lack of references constitutes plagiarism!</b>  <b>(0 pts)</b>
<b>Questions (2 pt)</b>	Responses to the questions exhibit sound knowledge of the study and the underlying science concepts; the presenter exhibits poise, confidence, and enthusiasm. <b>(2 pt)</b>	Responses to the questions show familiarity with the study design and conduct, but may lack clear or accurate connections to basic science concepts. The presenter exhibits enthusiasm, but shows signs of discomfort with some of the questions. <b>(1 pt)</b>	The presenters show difficulty in responding correctly to questions or responses lack insight or scientific creativity. The presenter is only familiar with the section that s/he presented. <b>(0 pts)</b>

## Journal Club Presentation

Journal club articles will be presented by groups of two students. Each pair should sign up for a paper on the schedule, read this paper, meet with a professor to discuss the paper and give a 15 minute presentation on the paper in class. The meeting with a professor is designed to coach you on the content of your presentation and make sure you fully understand the article, not to go over the paper for the first time. By the time you meet with the professor, you should have read the paper and should be familiar with the experimental procedures, data and interpretations. This may include researching previous papers to find out details and methods. You will be given a demonstration designed to familiarize you with PubMed, and will be expected to use this resource. Also, feel free to take advantage of any other resources you may have to help you understand the information. The main goal of the presentation is to explain the important message of the paper to the audience. In the presentation the following points should be covered:

1. A short summary of background information on the topic.
2. The major question the paper is addressing.
3. A summary of the major experiments, relevant techniques and results.
4. A short summary of the major conclusions drawn.

The presentation should be clear to an audience who has not read the paper. Every detail does not need to be explained, but all major points should be covered. Overheads or powerpoint slides should be used to assist in the presentation. Refer to “Oral Presentations” for more suggestions. Tear out this page and give it to your GSI for your evaluation.

## Journal Club Evaluation: 20 Points

Date:

Group:

Presenters:

Time:

Preliminary Meeting with Professor (5 pts): \_\_\_\_\_

### Contents

Background and Methods (5 pts): \_\_\_\_\_

Results and Conclusions (5 pts): \_\_\_\_\_

### Style

Clarity and Use of Visual Aids, Questions (5 pts): \_\_\_\_\_

## Oral Presentations

You will be giving two oral presentations during 133L: a journal article presentation and a lab data presentation. Regardless of your future career path, giving talks is likely to be an important part of your professional life. Even interviews for medical and graduate school are made easier by being comfortable with presenting information in a concise and clear fashion. So, here's your chance to practice to a friendly audience!

### **Basic Ideas to Keep in Mind:**

#### **Oral Communication is different from written communication**

Your audience has only one chance to hear your talk and can't "re-read" when they get confused. Therefore, you must be clear! There are two well-known ways to communicate points effectively. The first is to K.I.S.S. (keep it simple stupid). Focus on getting one to three key points across. Second, repeat key insights: tell them what you're going to tell them (Forecast), tell them, and tell them what you told them (Summary).

#### **Think about your audience**

As Nobel prizewinner Max Delbrück always said: Assume that your audience possesses infinite ignorance and infinite intelligence. Don't assume the audience will be familiar with basic concepts that form the foundation of your talk. Outline these concepts briefly but clearly early in the talk to avoid confusion.

#### **Start early!**

This is especially important because you will be working in groups. Allow enough time to really understand the material, practice the presentation using your visuals, and fix any problems you find.

#### **Practice, practice, practice!**

It is hard distilling a journal article or an experiment down to 15 to 20 minutes. Practice to yourself first, and make sure to time yourself. Nobody appreciates a talk that goes over the time limit. Most importantly, practice in public- to the rest of the group, your roommate, whoever will listen and tell you honestly that you mumble, face away from your audience, your slide font is too small, whatever. Even non-science majors can help you with your presentation, since most problems are those of style, not content. And remember rule 2: even non-science majors should get something out of your talk even if they don't even know the central dogma!

#### **Length**

Presentations should be at least 12 minutes in length but not more than 15 minutes. You will be evaluated on your ability to stick to this time limit. This means that you should practice the presentation in advance to get your timing down. We recommend that you practice with the other members of your lab group as an audience. Feedback from others is important and will help you give an excellent presentation.

#### **Your Visuals:**

You may choose to give your oral presentations as either overheads or Powerpoint presentations. If you choose Powerpoint and cannot bring your own laptop to plug into the projector, please let us know beforehand and check whether your presentation will work on our computers.

### **Important Design Concepts**

#### **Make it BIG.**

This applies to fonts, pictures, everything (Fonts should be no smaller than 14 pt and preferably 18-24pt). If the audience can't read your slides, all those pictures and words won't do much good. Remember that everything should be legible to the person sitting in the back row!

### **Keep it Simple**

Don't write entire paragraphs on your slides! For your overheads, the more illustrations you include the more effective they will be. Don't type out complete sentences and read off them (boooooorrrrring). Your audience is interested in what you have to say! It is often more effective to make use of bulleted lists which will keep you focused on the main points on which you can then elaborate. Also, especially in the era of powerpoint, it is tempting to use a plethora of special effects. While these are entertaining, the content is the important part. Keep your audience focused on the basic points of the talk. Also, remember that the more complicated powerpoint files are, the more likely they are to be incompatible between Mac and PC.

### **Make it Clear**

This goes along with keeping your slides simple, with large fonts and pictures. Your slides should act as cues, both for your audience (important points only on slides) and for you (to make sure you remember the important points)

### **Be Consistent**

Again, this is especially important since you will be working in groups. If you prepare your slides separately, make sure that they form a consistent presentation.

### **A Basic Talk Outline**

Most good speakers average one to two minutes per slide (not counting title and outline slides), and thus use about a 8 to 12 slides for a 15 minute presentation. You do not have to follow this guideline specifically, but you do need to present the general ideas listed in this guide.

#### **Title/author/affiliation (1 slide)**

For your lab data presentation, this slide should list the experiment title and members of your group. For the journal presentation, it should provide the title of the paper, the journal reference, and the list of authors.

#### **Forecast/Outline (1 slide)**

Give a BRIEF description of the problem and main result. For your lab presentation, this should be the "purpose" of the experiment and a one-line description of the conclusions. For the journal presentation, this is a VERY SHORT version of the abstract in your own words. If you like, you may include a brief outline of the rest of your talk on this slide. This is the "tell them what you're going to tell them" slide.

#### **Background (1-3 slides)**

Here is where any concepts needed to understand your talk should be covered. This may include but is not limited to what you are studying, defining technical terms, explaining the rationale behind why you performed the experiment, and describing what is already known about the specific topic you are investigating. For instance, if you were studying a particular transcription factor, you would want to explain what is already known about how it works and what genes it regulates. Also, use this section to talk about what was known up to the point of the paper (covered in the introduction of the paper).

#### **Methods (1-2 slides)**

The methods section should give the audience information about the experimental system you employed as well as the basis of how your assay works. You may explain special techniques, as well as describing the experimental conditions under which your assays were performed. Be sure to define any abbreviations used (such as SDS-PAGE) and to describe the system used (tissue culture, yeast, etc.)

#### **Results (2-5 slides)**

Present key results and key insights. This is main body of the talk. The structure of the results will vary according to the paper or lab. When presenting charts or graphs, be certain to include a title for each chart as well as labels on the axes. When presenting data in picture format be sure all photographs are clearly labeled so your audience does not focus on trying to decipher what

they are looking at. In presenting your data explain what the charts, etc. mean and describe what the audience is looking at. Point out specific features and make the appropriate comparisons among different parts of your data set. By the end of this section, the audience should have all the information about what you did and how your results turned out. If your particular group had a problem during the lab and you ended up with bad data, then you may use data from another group. Explain this in your presentation and cite the other group when you show their data. It is not that important to explain in great detail what went wrong unless it would be beneficial for the class to know about it. An important point: even though you are presenting someone else's work in your journal article presentation, you should present it in your own words. Don't just read figure legends out loud! Also, when presenting figures of the paper, you need to go through the experiment. Don't just put a figure up –point to things you're talking about and be clear about why a result leads to an interpretation.

### **Discussion and conclusions (1-2 slides)**

During this portion of the talk you should discuss your results. Talk about whether the results matched your expectations at the beginning of the experiment. Discuss what the results could mean physiologically as well as their significance. Make it clear to the audience why it is important for them to know. Discuss and technical problems which could have affected the results. This is the time to really think about what your experiments mean in an overall context and talk about it. After your discussion, provide a summary of conclusions of what you have learned from your study. This should be a list in which you give key points and key conclusions.

### **Summary (1 slide)**

Use this slide to “tell them what you told them.” Make sure to include a statement about the main finding of the work and its significance.

### **Future Directions (1 slide)**

This is often the most interesting part of the talk. In this section you may discuss future questions to be addressed that lead naturally from your current work. These may include other interesting questions you may like to ask using your experimental system or the techniques you employed in this study. You should use your creativity.

### **Questions**

Your audience now has the opportunity to ask you questions about anything in your talk including background, methods, results and discussion. Be prepared to answer questions, as your audience will certainly ask. If you do not know the answer to a question, say so but try to answer it to the best of your ability. It's okay to speculate and make educated guesses and to use phrases like "I think" or "maybe." It's much better to do this than to make stuff up -- you never know when your audience can see right through you.

### **A Few Final Comments:**

- It's okay to show enthusiasm when you think something is cool
- If you can think of an interesting way to start your presentation then go for it. This can be an ice breaker and make both the presentation and the audience more comfortable. Plus it will grab the audience's attention from the start.
- Speak slowly
- It's nice to give a brief pause in between slides. This is especially important when giving a PowerPoint presentation because it is easy just to barrel through the talk. This gives the audience a little time to digest what you have just told them.

### **References**

Material for this guide has been adapted from material compiled by Mark D. Hill, Computer Sciences Department, University of Wisconsin-Madison and Jeff Radel, Kansas University Medical Center, and former TAs Sadie Wignall, Renee Deehan, and Defne Yarar.

## Lab Reports

### Format (2)

Lab reports should be modeled after peer-reviewed published literature. It should be clear and communicate all necessary information yet remain concise. Look up good published papers for inspiration. Use 'Times New Roman' font, size 12. Double-space the body of the text (excluding title and abstract) and limit the report to 8 pages (excluding figures), 1-inch margins.

### Title and Abstract (3) (maximum 250 words)

The title, centered at the top of the first page, must be descriptive yet concise. Follow the title with an author line (listed alphabetically), affiliation line, and a section number and date line. The abstract should contain the purpose of the experiment, a very brief description of methods, major results and conclusions.

### Introduction (5) (1-2 pages)

Discuss the relevant background information required to understand the purpose of the report. Include references (at least 3; in Journal of Cell Biology format) where necessary. Link the known biology to the purpose of the experiments. End by clearly stating the hypothesis, as well as the approach you employed to test this hypothesis.

### Materials and methods (4) (~1 page)

Written in paragraph format in past tense, not a list or flowchart. If necessary, use subheadings. The purpose of this section is to provide only ESSENTIAL information (e.g. temperature, time, volume, concentration, etc), so that others can repeat your experiments. Do not go into detail explaining the theory behind your methods.

### Results (7) (~3 pages)

Use text, tables, and figures to illustrate what you have found in the experiment. Important data points, figures, or bands should be clearly marked. Describe any abnormal or unexpected results. The text should simply report in detail what was observed. Limit the interpretation of the data.

### Discussion (7) (~1-2 pages)

In past tense, briefly summarize and interpret the results and data, respectively. Include any implications and conclusions that you have made. Also include interpretation for any unexpected results or abnormal phenomena that you observed. Discuss possibilities for why you obtained the data you did and explain how it is relevant to your hypothesis and to the known biology you discuss in your introduction. If methodological problems were present, discuss them and speculate on why things did not work correctly. Comment on the extent to which the data is still interpretable. Describe how experiments could be expanded on in the future.

### References (2)

References should consist mostly of primary journal articles, not textbooks or Internet resources (e.g. Wikipedia). Format as for publication in *JCB* and cite all references in the text.

### Useful Links

Useful guide: <http://abacus.bates.edu/~ganderso/biology/resources/writing//HTWtoc.html>  
*JCB* formatting: <http://jcb.rupress.org/misc/ifora.shtml>

**Total is worth 30 points**



## Library Exercise

### Purpose

This exercise will familiarize you with the process of obtaining and citing information from the scientific literature. These skills will be useful in your preparations for data presentations, journal club presentations, and lab reports.

### Assignment

1. Choose a speaker who will be presenting a seminar in the Cell and Developmental Biology division seminar series anytime this term. A list of speakers is available on the MCB department website: <http://mcb.berkeley.edu> > “News and Events” > “Seminar Schedule” . From the “Seminar series” dropdown menu, select “Division of Cell and Developmental Biology” or “Department of Molecular & Cell Biology”.
2. Using PubMed, obtain a list of all of the papers that this scientist has authored from 2010 through the present. Based on this information, write a short paragraph (a few sentences) summarizing this person’s research interests.
3. Using bibliographic management software (Endnote or Refworks), create a database that contains the references you have located. Make a bibliography of this person’s publications from 2010 through the present and include it beneath the paragraph you’ve written. The bibliography should be formatted in the style used by *The Journal of Cell Biology*.

## Laboratory Safety

The following information concerning general health and safety practices for VLSB laboratories has been provided to you in compliance with the Injury and Illness Prevention Program. All students are required to read this information and be present for any safety training provided, to be allowed to attend laboratories.

### SUPPLIES AND EQUIPMENT

1. Maps of VLSB are posted at the front of the lab detailing locations of fire extinguishers and fire alarms, the building evacuation plan, and the location of the Emergency Assembly Area. Emergency information is also posted in each lab by the door.
2. Basic first aid supplies, safety glasses, and disposable gloves are available in the labs.
3. Eye wash stations are located in each lab.
4. An eye wash fountain and safety shower is located in the hallway.

### PERSONAL SAFETY

1. Smoking is not permitted in **any** indoor areas on campus.
2. Wash hands before leaving the lab and before eating.
3. **No** food or drink is allowed in the lab.
4. Contact lenses can cause eye damage in the event of chemical or material contamination of the eyes and should not be worn in the laboratory without eye protection.
5. Tie back medium length and long hair when working near flames or entangling equipment.
6. Maintain unobstructed access to all exits, fire extinguishers, and electrical panels.

### INJURIES/ILLNESS

1. Report all injuries and illnesses to the staff in room 4015 or 4017.
2. For life-threatening emergencies, CALL 911 (from any campus phone) for medical aid and for transportation to the hospital.
3. For less serious cases, first-aid supplies can be found in the first-aid kit on the wall in each lab room.

### HAZARDOUS AND TOXIC SPILLS

1. Students will be informed about any hazardous or toxic materials used in lab including instruction in correct handling procedures and disposal. If a spill should occur notify your GSI and the staff immediately.
2. Assistance and advice on spills is available by calling Environmental Health & Safety (EH&S) at 2-3073.
3. If a spill presents an extreme hazard: evacuate immediately, pull the fire alarm, call 911 and give the exact location and nature of the spill.

### WASTE DISPOSAL

1. Dispose of sharp items (i.e. razor blades, scalpel blades, etc.) into the red sharps disposal containers found in each room.
2. Broken glass should be cleaned up immediately and disposed of in **BROKEN GLASS** containers available in each room. Brushes and dustpans are available.

3. Infectious agents, animal wastes, and hazardous chemicals must be collected by the staff and disposed of in a proper manner (not in the trashcans or down the sink).
4. Nothing should be poured down the sink drains unless you have been instructed to by the staff or your GSI.

### **MAJOR EMERGENCY PROCEDURES**

In the event of a major emergency affecting the entire building, campus, or community follow the instructions given by your GSI, the staff, or emergency assistance personnel. Information will be provided as soon as it becomes available. Your cooperation is necessary to insure the safety of everyone involved.

### **EVACUATION PROCEDURES**

1. Upon the instruction of your GSI or the staff **exit the building via the closest stairway** in a calm and orderly fashion; **do not use the elevator**. Take time to familiarize yourself with evacuation routes in advance.
2. **Assist the injured and handicapped when possible.**
3. Do not move the seriously injured unless there is danger of further injury. Ask disabled persons in wheelchairs how best to assist them. If there are deaf or hearing impaired persons nearby, be sure they know there is an emergency.
4. **Once outside the building, go directly to the meeting area designated for your room.** Keep at least 100 feet away from the buildings to avoid danger from falling glass, etc. Make sure your GSI knows that you have reached the assembly area. **Be sure you know where your meeting area is in advance.**
5. **Do not re-enter the rooms until police or fire personnel have determined that it is safe.**
6. Remain at the assembly area to receive instructions to return, to proceed home, or to proceed to Emergency Relief Areas

### **FIRES**

1. When the fire alarm sounds, turn off any electrical equipment you are operating and evacuate the room immediately following the procedure outlined above. Close all doors to help prevent fires from spreading and exit.
2. IN THE EVENT OF A FIRE IN YOUR LAB:
  - A. **Insure the safety of you and the other students.**
  - B. **REPORT THE FIRE:** (Send a student to inform the staff)  
Pull the nearest fire alarm, and call 911 to give location and extent of the fire. Stay on the phone to give the dispatcher other information if directed. Fire alarms are on each stairwell landing at every floor, next to all elevators and in hallways. There are telephones in the prep rooms connected to the two lab classrooms (4021 and 4083). Fire alarms and fire extinguishers are located near all exit signs.
  - C. **If you are trained to operate a fire extinguisher, attempt to put out the fire when feasible.**

When fighting a fire, always position yourself between the exit and the fire. **If the fire cannot be contained, GET OUT quickly!**

3. **Know where the closest fire extinguisher is located.** Extinguishers are mounted on the wall in all rooms in the building and in the exterior corridors. They are type ABC, which can be used for ordinary combustibles, flammable liquids and electrical equipment.
4. Aim the extinguisher at the **base** of the fire; squeeze the lever and sweep. Be careful to keep yourself between the fire and the door. **Do not allow the fire to block your exit from the room.**
5. **Do not risk personal injury** in attempting to put a fire out. If it cannot be contained, exit the building to the designated emergency assembly area (EAA) for your unit.
6. If you are able to put out a fire successfully, wait outside the north center entrance at the site to make a report to the Fire Department or UCPD.

**EARTHQUAKES:**

1. **Seek shelter** under a desk, table, counter, or doorframe away from windows, **DUCK, COVER AND HOLD.**
2. **Do not attempt to leave** the room while the tremor is occurring.
3. **When tremor stops, leave room immediately** following the evacuation procedure outlined above. In case of possible gas leaks from other buildings **do not** light matches or candles.
4. **Do not use telephones** except to report extreme emergencies.

**EMERGENCY PHONE NUMBERS**

**FIRE - POLICE - AMBULANCE:**

From pay phones no coin necessary	911
From all campus phones	911
From personal cell phone	2-3333
UC POLICE (24-hr. service)	2-6760

**UNIVERSITY HEALTH SERVICE**

Urgent Care Clinic (8 AM - 8PM)/ 24hour advice line	2-3188
<b>THE NIGHT ESCORT SERVICE</b>	<b>2-WALK (2-9255)</b>
Evening hours: 6 PM- 2 AM PST	
7:30 PM-2 AM PDT	

<b>OFFICE OF EMERGENCY PREPAREDNESS</b>	<b>2-9036</b>
<b>ENVIRONMENTAL HEALTH &amp; SAFETY</b>	
Hazardous spills, general information	2-3073