Physics 121B
The Practice of Science
Spring 2008
1605 CNSI
http://www.physics.ucsb.edu/~phys121B/s2008/

Format of the class:

- Formal meetings Thursday, 4:30 – 6:00 pm
- Consultations on projects with Professor Awschalom, Dr. Goodchild and Erik Lucero, as needed.
- Office Hours: On appointment basis

The weekly meetings are intended to serve as an extended group meeting where each of us can discuss issues relevant to the development of our projects. The meetings should provide a broad forum where critical issues in each of the projects can be discussed, and solutions to problems be proposed. These meetings will also serve as a way of educating the rest of the class in the background, key concepts and progress of the various research projects.

To encourage this exchange each student will be asked to prepare a short presentation for each class – this material will identify individual projects and help to build the final presentation that is expected at the end of the course.

Topics: Week 1: **Overall expectations and Goals**
Expectations for student participation and final presentations

Week 2: **Getting started: Critical Roadblocks**.
Student presentation: Submit slides (.pdf) to class website by Tuesday Midnight
What's the big picture of your research? 1 minute – 1 slide
Create one slide with no graphics – only text that outlines the general motivation.

Class discussion: What are the 1 or 2 largest impediments that you see in making progress on your project? Roadblocks can include the lack of instrumentation, lack of knowledge about the right technique to use, uncertainty about the right person or resource to contact. How are you going to address the roadblocks?

Week 3: **Monitoring Progress: how will you know?**
Student presentation: Submit slides (.pdf) to class website by Tuesday Midnight
What are the specific objectives of your research project? 1 minute – 1 slide
Create 2 slides – 1 should include project title, name, lab mentor and faculty advisor and the funding source for your project
1 should outline your research objectives and approach and may include simple graphics.

Class discussion: The outcomes of many research projects are NOT what their designers originally intended (in many cases, the outcomes are *better*). Projects progress at different tempos, moving slowly and rapidly at different times. Think of reasonable ways for *you* to document and evaluate the progress of

your project over the course of this quarter. What are the benchmarks by which you can determine your success?

Week 4: **Project Background and History: what has gone on before?**

Student presentation: Submit slides (.pdf) to class website by Tuesday Midnight

Experimental methods for your project? 2 minutes – 1slide

Create1 slide to describe the laboratory process, device or instrument that you are using on your project. A schematic or diagram can be useful if clearly labeled and organized. Include one reference that is relevant to your project..

Class discussion: Many of you gave some indication of this in your final presentations from last quarter. We would like to learn more about the 'history' of this project – has anyone tried these kinds of measurements before? If not, why not? If yes, give us an example of another approach to solving your project. Why do you think your approach is better?

Week 5: **A Critical Idea**: can you describe the most important idea or hypothesis that forms the basis for your project? How risky/certain/established is that idea?
Class exercise: solicit idea and prepare a patent disclosure

Week 6: **A Critical Instrument or Measurement:**

*Student presentation***:** *Submit slides (.pdf) to class website by Tuesday Midnight*

Pick out a critical measurement or piece of equipment in your project. 1.5 minutes – 1 slide

Create 1 slide to describe that measurement or instrument (how does it work?).

Class discussion: In most projects, there is at least one critical measurement or piece of instrumentation that is necessary for the research to progress Describe why it is critical, and discuss if there are other ways of carrying out that same measurement to learn what you need to know. Is there instrumentation that you could benefit from that doesn't yet exist?

Week 7: **Data Presentation**: <u>What success have you encountered so far?</u>

<u>*Assignment due*</u>*: Submit slides (.pdf) to class website by* ***Friday Midnight (of week 6)***
Submit 2 slides that outline any data that has been collected from your research. Put careful attention into how you design your data presentation. Everything must be clearly labeled and easy to understand. Your data should stand alone- it should be possible to understand what the data is about without your verbal explanation. Class members will grade each others' reports. Bring two copies to class.

Class discussion: What were the challenges and impediments to collecting this data?
-Was there some critical resource, piece of instrumentation or resource that was *not* available to you that could have 'made all the difference' in the degree of progress you were able to make? What is that resource, and what could you have done if you had access to it?

Week 8: **Critical Applications and the Larger Impact**

Class discussion: If your project were successful, what would the larger impact be?

Week 9: **Final Presentations of Progress on Individual Research Projects (Include two references, one from Week 4)/**

Breakdown of grades:

- **35% Slides and presentations**
  - **10% for the “Data Slides” of week 7**
  - **5% for each of the 5 short presentations**
- **50% Final Presentation**
- **15% class participation, actively engaged in class discussions**