

**Summer 2012**  
**UnSt 421 section 513**  
**Research experience for science majors**

<b>Instructor:</b> Erik Bodegom, Department of Physics	<b>Grading:</b>
Phone: 503-725-4230	Class Participation: 30%
Email: Bodegom@pdx.edu	Research activities: 30%
Office: room 150 SRTC (aka SB2)	Classroom Presentations: 10%
Office hrs: Tuesday 1130-1230 and by appointment	Powerpoints: 10%
Class time: MW 18:00-20:00	Final report: 20%

**Learning Objectives**

Students enrolled in this course will develop an understanding and appreciation for scientific, societal, economic, political, and ethical dimensions of physics. This will be accomplished through the initial weekly readings and subsequent discussions of overarching publications on the subject of the role of science.

- Scientific dimension: we will address the science needed to address the community partner's need, ways of acquiring the missing knowledge, ways of presenting the final product that is in line with standard scientific practice (*critical thinking, social and ethical responsibility, communication, quantitative skills*)
- Societal implications: too often science is done without any regard to its societal implications (see how scientist are trying to address this in the case of nanotechnology or how it failed in the case of genetically modified foods) (*appreciation for diversity, social and ethical responsibility, quantitative skills*)
- Economic dimension: we will address the issue of patentability, copyrights, and trade secrets by means of the assigned readings (see: "Survival skills" and "Patents") (*critical thinking, appreciation for diversity, quantitative skills*)
- Political dimension: see the readings from the newsletters from the "Forum on Physics and Society" (*social and ethical responsibility, appreciation for diversity, critical thinking*)
- Ethical dimension: the issue of fraud as exemplified by Woo Suk Hwang (stem cell research) or Victor Ninov (claimed to have produced two new elements and falsified data) and the ethics of scientists (*social and ethical responsibility, appreciation for diversity, critical thinking*)
- Aesthetical dimension: the issue of presentation of scientific results and how this impacts funding and recognition; and the tension often felt between aesthetics and science (*appreciation for diversity, critical thinking, communication*)

Note that UnSt goals associated with the above overarching course goals are listed in parentheses.

**Literature and reading List**

Research:

Philip R. Bevington and D.Keith Robinson: Data Reduction and Error Analysis for the Physical Sciences, McGraw-Hill Education, 2002

David C. Baird, Experimentation: An Introduction to Measurement Theory and Experiment Design, Prentice Hall, 1995

Scientific careers:

Federico Rosei and Tudor Johnston, Survival Skills for Scientists, Imperial College Press 2006

Alternative careers in science: leaving the ivory tower, edited by Cynthia Robbins-Roth, Academic Press 1998

Economic aspects (property rights, labor relations):

Craig Hovey, The Patent Process, Wiley, 2001

<http://www.sigmapisigma.org/governance/ethics/tenure.pdf>

<http://www.thesolutionsjournal.com/node/1053>

Societal dimension (nanotechnology, climate, energy efficiency):

<http://www.springerlink.com/content/k5rr658746t71781/fulltext.pdf>

<http://www.springerlink.com/content/cq2m1512226x4145/>

<http://www.springerlink.com/content/c460x2626452k006/>

[http://dels.nas.edu/dels/rpt\\_briefs/climate\\_change\\_2008\\_final.pdf](http://dels.nas.edu/dels/rpt_briefs/climate_change_2008_final.pdf)

<http://www.aps.org/energyefficiencyreport/summary/energyexecsum.pdf>

Political aspects (three topics: climate, nuclear weapons, evolution):

<http://www.thesolutionsjournal.com/node/1053>

<http://www.aps.org/units/fps/newsletters/200807/hafemeister.cfm>

<http://www.aps.org/units/fps/newsletters/200807/monckton.cfm>

<http://www.aps.org/units/fps/newsletters/200810/weart.cfm>

<http://www.aps.org/units/fps/newsletters/200804/oelrich.cfm>

<http://www.aps.org/units/fps/newsletters/2008/january/article-hafemeister.html>

<http://www.aps.org/units/fps/newsletters/2008/january/article-hobin.html>

Fraud and ethics:

<http://www.time.com/time/magazine/article/0,9171,1137709,00.html>

[http://en.wikipedia.org/wiki/Hwang\\_Woo-Suk](http://en.wikipedia.org/wiki/Hwang_Woo-Suk)

<http://www.physics.emich.edu/mthomsen/kaar.htm>

Aesthetics:

[http://www.mukto-mona.com/new\\_site/mukto-mona/Articles/aparthib/science\\_aesthetics.htm](http://www.mukto-mona.com/new_site/mukto-mona/Articles/aparthib/science_aesthetics.htm)

[https://openaccess.leidenuniv.nl/bitstream/1887/10225/1/9\\_57\\_005.pdf](https://openaccess.leidenuniv.nl/bitstream/1887/10225/1/9_57_005.pdf)

### **On collaboration, writing, presenting, and publishing:**

Bourne, P. and L. Chalupa, "Ten simple rules for getting grants." *PloS Comput Biology* **2(2)** e12 (2006)

Vicens, Q. and P. Bourne. "Ten simple rules for a successful collaboration." *PloS Comput Biology* **3(3)**, e44 (2007)

Bourne, P., "Ten Simple Rules for Making Good Oral Presentations." *PLoS Comput Biol* **3(4)** e77 (2007)

[http://www.how-to-write-a-resume.org/cover\\_letter\\_tips.htm](http://www.how-to-write-a-resume.org/cover_letter_tips.htm)

[http://www.how-to-write-a-resume.org/resume\\_writing\\_tips.htm](http://www.how-to-write-a-resume.org/resume_writing_tips.htm)

### **Assignments:**

All word documents should be double spaced, 10-point font, 1" margins.

No spelling errors or typos, grammatically correct, i.e. you better proofread.

Each group of four writes a 10-page report on one of the discussion items for this course and presents this in class (20 mins).

Write a CV – submit online June 30.

Final report should be in the form of a (physics or related science) journal article, unless I have agreed to a different format. For guidance, see:

<http://www.unc.edu/~haipeng/teaching/sci.pdf>

[www.paeaonline.org/ht/a/GetDocumentAction/i/107528](http://www.paeaonline.org/ht/a/GetDocumentAction/i/107528)

<http://www.ploscollections.org/article/info%3Adoi%2F10.1371%2Fjournal.pcbi.0010057>

### **List of past research projects :**

Snowman, Biosensors, Programming, Atmospheric research, Photography, Solar cells, Bones. If you have an idea or are working on something, let me see if that project is acceptable (there is an extremely high chance that it is).

### **Schedule (tentative we will have to adapt to the inevitable problems with summer schedules – vacations!)**

June 25: initial meeting and June 27: resume/CV, form groups

*June 30: submit resume/CV online*

July 2: discussion of resumes, finalize groups and July 4: holiday

Week of July 9: rules for presentations and project updates

*July 13: submit draft of group paper online*

Week of July 16: feedback on draft group papers

Week of July 23: group presentations

*July 29: submit group presentations and papers online*

Week of July 30: schedule individual research presentations

Week of August 6: individual presentations, final class meeting to be continued

Week of August 13: individual presentations, final class meeting to be continued

*August: 17: Final group papers, final individual presentations, final individual papers*