**Title:** Thinking about a science Ph.D.? Start planning now before you’re piled high and deep.

**Course #:** Arts & Sciences 1138; Freshman Seminar

**Credit:** 1 semester-hour credit

**Day/Time:** TBD

**Room:** TBD

**Instructor:** Dr. Steven K. Lower ([Lower.9@osu.edu](mailto:Lower.9@osu.edu)**)**

**Office hours:** by appointment

**Impetus**: You are a science major with aspirations to go on to Graduate School for an advanced degree. What does it take to get into a top-notch science graduate program? High grades and GRE scores are obvious merits. But, an undergraduate research project and strong letters of recommendation can make your application really stand out. How do you develop relationships with science professors and begin doing research in a laboratory? Many first and second year science classes can feel overwhelming and impersonal because of their sheer size (100+ students). The goal of this Freshman Seminar is to help you figure out where to begin in your quest to be Dr. Scientist, PhD.

**Instructor**: Professor Steven K. Lower is an interdisciplinary scientist who publishes in the top science journals (e.g., *Science*, *Nature*, *Proc. Natl. Acad. Sci. USA*) and leads scientific grants from the National Science Foundation (NSF), National Institutes of Health (NIH), and Department of Energy (DOE). His honors include a PECASE award from President Obama and he was named a Kavli Fellow by the U.S. National Academy of Sciences. Professor Lower also knows a thing or two about large classes as he routinely teaches classes with >100 students.

**Course Description**:

1. Introduce students to research faculty (i.e. potential research advisors and future letter writers)
2. Expose students to OSU facilities for conducting research
3. Create scientific poster or talk and describe venues for presenting research
4. Participate in peer-review by critiquing science talk, poster, manuscript and grant proposal.

**Texts**: We will primarily use free, online resources from the publishers of *Science*, *Nature*, and the ACS journals. See links below. We may also refer to the humorous book Surviving Your Stupid Stupid Decision To Go to Grad School by Adam Ruben (Broadway Books publishing, 167 pages, 2010; paperback ~$10).

* Science/AAAS <http://www.sciencemag.org/careers/how-series-collections>
* Nature <http://www.nature.com/naturejobs/science/career_toolkit/cvs>
* American Chemical Society <http://acsoncampus.acs.org/resources/video/>

**Course Policies (attendance, participation, written and oral assignments):** You are expected to attend each class, have all the assigned materials done, and participate in class discussions. At the start of each class you should have written down at least three questions on the readings. These questions will form the basis for our discussions. I will evaluate your participation by how actively you provide comments and ask questions. Written and oral assignments are shown in the weekly schedule (see below).

**Grading:** Satisfactory/ Unsatisfactory; An overall score of >85% is necessary for a Satisfactory grade. Class participation (written questions, contribution during class): 50%; Written Assignments (CV, manuscript outline, reviews/critiques, etc.): 30%; Oral presentation (3MT): 20%

**Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For more information, see Code of Student Conduct (<http://studentlife.osu.edu/pdfs/csc_12-31-07.pdf>).

**Students with Disabilities**

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

**WEEKLY SCHEDULE**

**Week 1-2**

**Topic**: Introductions; What makes a great Grad School application? CV, grades, GRE, letters of recommendation, teaching, volunteering/outreach, research project.

**Reading:** (i)Getting into Grad School for the Sciences; Shelley Batts ([link](http://scienceblogs.com/retrospectacle/2007/05/29/repost-guide-to-getting-into-g-1/)), (ii) How not to apply to Grad School; Adam Ruben ([link](http://www.sciencemag.org/careers/2015/04/how-not-apply-grad-school)), (iii) Five factors to consider when choosing your PhD; Maslin & Fowler ([link](http://blogs.nature.com/naturejobs/2016/04/25/five-factors-to-consider-when-choosing-your-phd/))

**Assignment**: (i) Watch “The PhD Movie” (2011; 67 min) directed by V. Gabuchian. “Piled Higher and Deeper” follows the lives of two graduate students (physicist and molecular biologist) as they cope with life in grad school. Filmed on location at Cal Tech.

**Week 3-4**

**Topic**: Funding grad school is different than a B.S. degree. GRA, GTA, Fellowships.

**Readings**: (i) AAAS: How grad students get paid; Jeffrey Mervis ([link](http://www.sciencemag.org/news/2016/04/how-grad-students-get-paid-affects-where-they-work)). (ii) NSF Fellowships; now apply as undergrad ([link](https://www.nsfgrfp.org)). (iii) NIH Fellowships ([link](https://researchtraining.nih.gov/programs/research-education/R36))

**External speaker**: Dr. Lina Patino (NSF Program Director) via WebEx.

**Assignment**: Draft your current CV. Identify holes and create your ideal, future CV.

**Week 5-6**

**Topic**: Creating a scientific hypothesis. Don’t reinvent the wheel. Science databases.

**Readings**: (i) OSU Research Thesis and Honors Research Theses ([link](https://kb.osu.edu/dspace/))

**Assignment**: (i) Use ISI Web of Science ([link](http://library.ohio-state.edu/record=b7158418~S7)) & Google Scholar ([link](https://scholar.google.com)) to find articles on specific topic.

**External Speaker**: (i) Mr. Alex Dibartola, OSU graduate who was coauthor on four peer-reviewed pubs as an undergraduate researcher; and Ms. Ashlee Balcerzak, current OSU undergraduate researcher.

**Week 7-8**

**Topic**: Identifying a topic to investigate. Finding a potential advisor.

**Readings**: Scitable by Nature Education ([link](http://www.nature.com/scitable/study-center))

**Assignment**: Contact 2-3 professors about potential research opportunities.

**External speaker**: Dr. L.S. Wallace from Undergraduate Research Office ([link](http://www.undergraduateresearch.osu.edu)).

**Week 9-10**

**Topic**: Presenting your research (talk, poster). OSU venues Denman ([link](https://denman.osu.edu/home.aspx)), ES3 ([link](https://u.osu.edu/environmentalsciencesymposium/))

**Reading:** Hites, RA (2014) How to give a scientific talk, present a poster, and write a research paper or proposal. *Envir Sci & Tech* **48**: 9960-9964.

**Assignment**: Create a 3-minute talk using Powerpoint (U Queensland 3MT; [link](http://threeminutethesis.org)).

**Week 11-12**

**Topic**: What are science journals? Publishing a paper. Impact factor. Review process.

**Video**: Publishing your research ([link](http://pubs.acs.org/page/publish-research/episode-1.html)) and the review process ([link](http://acsoncampus.acs.org/resources/video/episode-6/)) by ACS

**Assignment**: Begin manuscript submission at ACS ([link](https://acs.manuscriptcentral.com/acs)) and/or review an actual journal manuscript.

**Week 13-14**

**Topic:** SEM, TEM, CLSM, DNA sequencing, NMR, XRD, Mass spec & Proteomics, ICP, etc.

**Field Trip**: Tour a few of the following campus research facilitates

* Center for Electron Microscopy and Analysis (CEMAS) <https://cemas.osu.edu>
* Campus Microscopy and Imaging Facility (CMIF) <http://www.cmif.osu.edu>
* Plant-Microbe Genomics Facility (PMGF) <https://pmgf.osu.edu>
* Campus Chemical Instrument Center (CCIC) <http://www.ccic.ohio-state.edu>
* Trace Element Research Lab (TERL) <http://earthsciences.osu.edu/terl/>