-toothpastefordinner.com

Seminar on Statistical Physics: Welcome information

Professor: Amy Graves abug1@swarthmore.edu

Office and Lab: 117 / 117a Science Center

Phone: 328-8257(office); 610 888 3227 (cell)

Website: Course information will appear on a Moodle site that will up and running by the start of Week 1 of the semester.

Meeting Times: Wed afternoon (possibly an A earlier and B later section ...) in SC 113 or Thurs 1:30 - 3:30 PM in SC 117 (my lab/office).

Office Hours: See my office hours document ... Monday morning, Tuesday afternoon and Friday morning are the set times.

Text: Statistical and Thermal Physics by H. Gould and J. Tobochnik (2010) and Concepts in Thermal Physics (2nd edition) by Blundell and Blundell (2014).

Welcome to our seminar! Statistical physics is an amazing tool for large systems, whether the entities consist of inert matter, living organisms, or even abstract beings like consumers in an idealized economy. In physics, we analyze sand grains, molecules, atoms, electrons, quantized excitations in solids, ... via statistical mechanics. We rely on other branches of physics (or biology, chemistry, economics ...) for the basic rules of how a few entities behave when they interact with each other. We rely on the mathematics of probability theory to predict the most likely "macroscopic" behaviors, the

ones we observe when either we cannot see individual behaviors, or just choose to not care about them. Sometimes we care about some static, "equilibrium" state that establishes itself eventually. (Statistical physics also attaches importance to the size of fluctuations around the equilibrium state.) Other times, we want to describe a controlled transport of some property (mass, energy, momentum, money, ...) from one part of the system to another. Whether the objects of interest are classical or quantum, massive or massless, dilute or dense ... statistical mechanics describes the system and predicts emergent properties - for example, the direction in which time flows! These properties only emerge when small objects are gathered in very-big-numbers ... the so-called "thermodynamic limit"

Seminar Assignments: Each week, we have **Reading**, **Presentations**, and **Problems**. In addition to required reading, I'll give sources for extra help or enrichment. Statistical physics builds on ideas from all other branches of physics. Books will appear on the seminar reserve shelf of Cornell Library and electronic resources will be linked to our Moodle page. Don't hesitate to consult outside sources, including texts from any of your other courses. For example, Schroeder's book, which was used in Phys. 13, might be very useful to you.

When things are due:

1. Warmup problems: *Monday at 5 pm ... for Seminar 1 this is Mon. Jan. 22*
2. Problems due for credit after seminar: *24 hours after your seminar ends*

How to hand stuff in:

1. For "Warmup problems" please upload to Moodle.
2. For "Problems due for credit after seminar," please do the old-school thing of putting *paper copies* in the grey box outside my door. For marking work and creating solution sets for you all, I always end up just printing them out. Technology that lets me do Moodle → Tablet computer to mark your work → Moodle ... still in the future :- /

Honesty, respect, making seminar a happy time to which you look forward ... is what we all hope to achieve. There are many facets of this. One is respectful speech and and listening. Treat others with the kindness and respect with which you want to be treated, multiplied by a factor of 2. Yield to others if you find yourself speaking a lot. Jump in when you find that you have a question or a comment. If you are wondering about something, I guarantee that at least one other person is wondering the same thing ... and you will give those people a chance to learn, and give those who think they know the answer a chance to practice their pedagogical skills. There are no such thing as dumb questions, except the ones that are left unasked!

We will work together on almost everything in seminar: doing problems in and out of the seminar room, preparing presentations, studying for tests, ... We particularly want the "problem introducer" and the "problem solver" to communicate before and during seminar, making it a team effort. There are just a few instances (writeup of a "for credit" problem after seminar, midterm test, final test) when your work should represent your own original ideas, and be written in your own voice. Plagiarism, the use of another person's words or ideas without giving clear credit, is prohibited in these instances.

For information about how to cite sources properly in work that you hand in, as well as more details about the College's plagiarism policy, please see the Swarthmore College Student Handbook. If you find yourself in a time crunch, it may seem like a good idea to copy from solutions (which are likely to be found somewhere online), but *don't*. Doing this is counterproductive to your learning and against the College's rules. If you find yourself overwhelmed with a lot of work, come to speak with the prof about some flexibility in when things are due, and to brainstorm time-management issues. I'm always glad to commiserate, and work with you on this!

In order to minimize distractions for yourself and others, you are not allowed to use a phone, laptop, tablet, or other electronic device for taking notes or looking things up in seminar ... unless we are specifically doing a calculation or running a simulation. If you do require one for a disability accommodation, that's different - and can be arranged through the Office of Student Disability Services.

Diversity: is it important?

There are many ways to approach the question of how personal identity affects the strength of a physics learning community. Students, professors, funding agencies, even Supreme Court justices have wrestled with this issue. For example, in the 2016 Fisher vs. UT Austin case, Chief Justice Roberts asked: "What unique perspective does a minority student bring to a physics class?" Around 2500 physicists responded by signing a letter to the court, explaining how diverse people are important to physics. The president of the American Physical Society, the National Society of Black Physicists, and others have written to support this view. Much research in physics has been done on issues of diversity by sex, gender, race ... with more to come. Here, we would simply suggest the questions below, adapted from A.R. Daane, S.R. Decker and V. Sawtell, in their 2017 article in *The Physics Teacher*. How would you answer them?

- What is physics?
- Do you think physics is subjective or objective, and why?
- Do you think diversity by race, gender, ... is important? Why or why not?

Accommodations statement:

If you believe that you need accommodations for a disability, please contact the Office of Student Disability Services (Parrish 113) or email that office arrange an appointment to discuss your needs. As appropriate, students with documented disabilities a formal Accommodations Letter. Since accommodations require early planning and are not retroactive, please contact them as soon as possible. For details visit the Student Disability Service Website. You are also welcome to contact me privately to discuss your academic needs. However, all disability-related accommodations must be arranged through the Office of Student Disability Services.