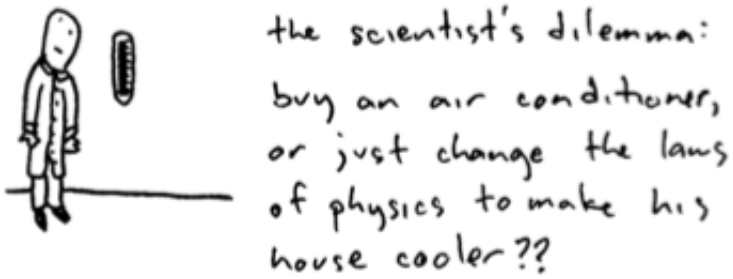

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Seminar on Statistical Physics: Welcome information

Professor: Amy Graves abug1@swarthmore.edu

Office and Lab: 117 / 117a Science Center

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

Website: All course information will be posted on our Moodle site `https://moodle.swarthmore.edu/course/view.php?id=19450&section=3`.

Reading Syllabus: This is located at our Moodle site. Please visit the "Welcome and General Information" page for this, and most of the documents and links listed below.

Meeting Times: These Tuesday times are found in the document "Phys 114 Tuesday Schedule".

Office Hours: I will be using the WASE scheduler. `https://wase.swarthmore.edu/swarthmore/views/pages/login.page.php`. I will have a couple of office hours most days of the week. These will be remote, but if you would like to meet in the real world, just email or text me. You are also welcome to email or text to make appointments outside of my nominal WASE office hours.

Two main texts: Statistical and Thermal Physics: With computer applications by H. Gould and J. Tobochnik (2010) available at `https://www.compadre.org/stp/` 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".

Our commitment to Diversity, Equity and Inclusion (DEI):

The Physics and Astronomy Department has a statement on our Website, highlighting DEI as an incredibly important aspect of being part of a learning community. Physics as a discipline intersects with identity and culture just like any other human endeavor. Moreover, cultural stereotypes about what kinds of people can be "good physics students" or professional physicists place an even greater responsibility on us to stand together for justice, truth and humanity. To embrace and celebrate diversity is vital to our basic mission: educating tudents who will go on to produce and disseminate STEM knowledge.

Stereotypes about what kinds of people can succeed in a seminar like Phys 114 are wholly false and tragically limiting The prevalent stereotype of the physicist as a white male skews our classroom communities. It perpetuates institutional racism, gender bias and homophobia and impedes our scientific progress, particularly since diversity has been

shown to promote innovation in the field (Hofstra et. al., PNAS 2020). Here in Phys 114 and in our entire Dept. of Physics and Astronomy, we are committed to resisting stereotype pressures. Perhaps the most important thing everyone can do to succeed in Phys 114 is to believe that everyone belongs here, because everyone does!

Our workflow: Each week, we have **Reading**, **Meetings**, and **Homework**. Our Meetings will involve **Discussion** and **Problem Doing**. To make our 90 minute synchronous work as impactful as possible, let's try the plan detailed in the document called "Doing seminar problems". Some of your homework exists as **Warmup problems** and **GotIt?!** Moodle quizzes, some as problems to discuss **in Seminar**, and some **to Hand in** the day after seminar. Our Moodle page is going to be (I hope) very helpful by giving you explicit details of what you should be doing, and when things are due.

While we'll use Moodle to help organize our learning, the **Weekly Assignments** you'll download from Moodle will hopefully also serve as standalone guides. I will also try to provide a **Video** to watch asynchronously before seminar, with ideas and sketches of key calculations or derivations. I'll try to guide you to "shortcuts" in the reading, so that in a busy week you can do the minimum and be fully prepared. In addition to required reading, Moodle will list sources for extra help or enrichment. Don't hesitate to consult outside sources, including texts from any of your other courses ... and don't hesitate to use our "Questions and Discussions about Physics" Moodle Forum to tell mention media or written references that you found helpful. I can link these to share with everyone. For example, Schroeder's book, which was used in Phys. 13, will show up in the second half of the semester ... and it also pervades the first half. (But our reading syllabus is complicated enough; I won't overstuff it by pointing out all the places where G&T and B&B resonate with Schroeder :-p.)

When things are usually due and what they are worth:

- Warmup problems: *Sunday at 7 pm ET* **5 points**
- Hand-in problems *Wednesday at 7 pm ET* **20 points**

- GotIt?! Moodle quizzes: *occasional* **5 points ungraded**
  That is, full credit is given for completion.

How to hand stuff in:

Please turn in **Warmups** and **Hand-in problems** as **PDF files** to the Google Assignment widget on each Week's Moodle page. On the "Welcome and General Information" page you'll find a document: "How to Scan Documents to turn in your Homework" which includes doing this with a smartphone.

Because we hope that computation will play a supporting role in our study of Statistical Physics, you are set up to be on a team called "Phys 114" at `http://deepnote.com`. This is a site providing a collaborative way of writing and sharing iPython notebooks. Our Moodle site has a "Preparing to work with codes" document, the second section of which provides a quickstart. While Phys 114 is *not* a course on computational physics, computations and simulations provide enormous insight. There may be times when you want to write a short code. If you have a different way of running Python, it is respectfully requested that you upload your work to deepnote.com, so that all may benefit from what you wrote, and Amy can play with it as needed to fully appreciate it ;-).

Late work? Emergencies?

- Warmups cannot be handed in late, unless you ask me and are granted an extension. Hand-in problems can be up to 2 days late, and will receive a 10% grade deduction. After 2 days, they can't be handed in unless you ask for and are granted an extension.

- I've thought hard and concluded that taking time out for testing is not the best way to use this 12 weeks together. So you see no tests on our syllabus or Moodle site. However ...

- There will be culminating experiences during the Final Exam period in May. One will be a self-scheduled, open book/notes test. You will be able to do "test-corrections" to raise your score.

- The culminating experience is also likely to include a short project (video, document, slideshow) on a topic of your choice. Creative applications of stat mech in a field that interests you are warmly encouraged!

- The culminating experiences will not be high-stakes. The test and project together will contribute **50 points**, equivalent to **two weeks of homework.**

- It goes without saying (but I'll say it anyway) that in this time of remote learning and Covid-19, there may be difficulty remaining engaged with Swarthmore academics. There may be illness that touches you personally, touches a family member, ... We will all stay flexible and will do our best. No student will be penalized for work missed due to the pandemic. The College has an incomplete policy and we will take full advantage of it as needed in this difficult time.

Accommodations for disability:

Our College Director of Student Disability Services is Monica L. Vance. If you believe you need accommodations for a disability or a chronic medical condition, please contact Student Disability Services via email at studentdisabilityservices@swarthmore.edu to arrange an appointment to discuss your needs. As appropriate, the office will issue students with documented disabilities or medical conditions a formal Accommodations Letter. Since accommodations require early planning and are not retroactive, please contact Student Disability Services as soon as possible. For details about the accommodations process, visit the Student Disability Services website. You are also welcome to contact Amy privately to discuss your academic needs. However, all disability-related accommodations must be arranged, in advance, through Student Disability Services.