HW 0: Read a paper and write a description of it

DUE DATE AND TIME: **Fri 31 Jan 2020 3pm**

(i) Use Google and find the most interesting, surprising and exciting paper you can about statistical mechanics. Like the ones I mentioned in class, and others that I did not have time to mention. For example, the connection between black holes and Planck's radiation formula, known as Hawking radiation ... Modern papers are preferred. Look in arxiv, PRL, Nature Physics, Phys Rev E, European Journal of Physics, PNAS, ... TIME LIMIT: 20 minutes or less

(ii) Read the paper. TIME LIMIT: 10 minutes.

Yes, 10 minutes. [Actually, originally I wrote 5 minutes, but I know some of you do not have English as first language, and most papers are in English]. The way you read a paper is NOT to read it like a book or textbook. From beginning to end, pencil in hand, working through the equations. If you do that, you will be brainwashed by the paper and you will waste your time. I want you to read the paper by filling in the headings of the review given below in (iii). That is to say, you actively explore the paper as if it were a new city that you were visiting. When you visit a new place, you don't visit every tourist attraction starting at A and ending at Z. You go and look for (e.g.) the best noodle shop, the best science fiction bookshop, the best Goth bar, etc... So treat a new paper as something that you interrogate to find answers to your questions. This exercise will teach you how to read a scientific paper in a few minutes, and if you practice it every week for the rest of your graduate career, you will very quickly improve and get very knowledgeable.

(iii) Write a ONE PAGE REVIEW of the paper. TIME LIMIT: 30 minutes.

Your review can be in bullet points (preferred) or like an essay but has to be no more than 1 page. The headings in the review are:

* BIBLIOGRAPHICAL CITATION OF THE PAPER (e.g.) in MLA format:
Einstein, Albert. "On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat." *Annalen der physik* 17 (1905): 549-560

You can get this from Google Scholar. Also the link to the paper's PDF.

* MAIN CLAIM
What is the main claim of the paper FROM READING ONLY the title and abstract? Do not read any further in the paper!!! Seriously.

* WHY INTERESTING
What interested you about the title and abstract?

* MAIN IDEA
Still no more reading other than title and abstract. What do you think the idea of the paper is, and how will the authors calculate or measure or simulate or otherwise do their work?

* GUESS ABOUT RESULT
What do you think the result should be? You can't replicate the work, so just make a cartoon picture in

your mind or a piece of paper and guess.

* MY GUESS vs. ACTUAL PAPER
Go to the Introduction, Discussion or Conclusion. Was the result what you expected? If not, go back and quickly try and find the place where what the authors did was different from what you expected. It might be the first line of the paper, or it might be somewhere else. Most likely at this stage of your education you will not be able to guess the result, but later you will be able to, if you practice doing this exercise every week of your graduate school life and beyond.

* REGIME OF VALIDITY
Did they make some approximation in their work? Is it justified or does it impose a limitation on the validity of their result? An example is the perturbation theory of Boltzmann that we talked about in class. That was only valid for very dilute gases, so the derivation of the Navier-Stokes equations was not in full generality.

* WHAT WOULD I DO NEXT?
How could this work be extended in an interesting way? How would you apply it? How would you correct it if you thought it was wrong? How would you improve it? What did I really learn?

(iv) **Submit your HW to me and the grader (copied here) by the due date**. **It is crucial that you follow these instructions precisely, most importantly the Subject field of the email.**

I get about 200 emails a day sometimes, and I am currently super busy with a big proposal and other stuff. So I filter emails associated with this course based on the course number 504. If you omit that, I will not see your email and you will have wasted your time.

Make your review in no less than 11 point font and convert it to PDF.
Title your one page review <YOUR NAME-HW0>.pdf
Make the subject field of your email be:

504 SM: HW0 from <YOUR NAME>

So it would look like this:

To: nigel@illinois.edu
From: netid@illinois.edu
Subject: 504 SM: HW0 from <Your name goes here>

Body of email: Attached is my 1 page review.

It will not be graded quantitatively, but I will give you feedback. The graders may also give you feedback. I encourage you to share your review with your class mates or friends and give each other feedback. As you will understand, the goal is not "a grade" but to learn how to read papers quickly and systematically record your knowledge. I encourage you to do this exercise once a week, and possibly do this with the feedback of your advisor to learn this skill systematically.

I am interested to know your feedback on this exercise or what can be done to improve it.

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molecular-kinetic theory of heat
A Einstein - pdfs.semanticscholar.org
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Cite

MLA Einstein, Albert. "On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat." *Annalen der physik* 17 (1905): 549-560.

APA Einstein, A. (1905). On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat. *Annalen der physik*, *17*, 549-560.

Chicago Einstein, Albert. "On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat." *Annalen der physik* 17 (1905): 549-560.

Harvard Einstein, A., 1905. On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat. *Annalen der physik*, *17*, pp.549-560.

Vancouver Einstein A. On the motion of small particles suspended in liquids at rest required by the molecular-kinetic theory of heat. Annalen der physik. 1905 May;17:549-60.

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