

End of Quarter Project

December 1 (Due December 12)

The project consists on reading up on a specific subject, writing a short, couple of pages long report and preparing a 10 min presentation. The report and the representation should aim at explaining the material to your 215A-classmates, assuming only knowledge of what we have learned this quarter (and all prerequisites for this course).

The presentation will be on the regularly scheduled final exam slot (presentation *cum* final), Thursday, Dec 18, from 11:30 AM to 2:30 PM at MH 5301. Pizza will be provided. You are free to use slides from your laptop or the whiteboard. If you use your laptop you should check that the system works: sneak into the exam room, MH5301, sometime (days) before the final, fire up the projector and connect your laptop. Let me know if you can't get it to work.

The written report should be concise, written in the style of a scientific paper. To this end I provide a [template](#) for your paper in LaTeX, with some minimal instructions in case you have little experience with LaTeX. Here is the [pdf output of the template](#). If you have never used LaTeX you will probably need help and you should make sure you allow time to get assistance from the Instructor or from your classmates or anyone else you know that you know has experience with LaTeX). The limit is 3-pages in length, but I suggest it should be between 2 and 3 pages long. Limiting the length forces you to think how to say things concisely, go to the point. You should convey the main ideas (what is the problem? what is the solution?). There is no need to reproduce every intermediate step. Use equations sparsely, focus on understanding of concepts.

Submit your paper by the deadline above, by email to bgrinstein@ucsd.edu. For the email's Subject: use "215A project." Name your file `LastName_FirstName.pdf`. Do not submit the LaTeX source.

I will compile all submissions into a volume that will be distributed for all to read. Thus your paper will be published in the *Proceedings of the 215A Project, Fall2014*.

The project is to be based on any of the subject proposed below. First come first serve, up to two students per subject. From the moment this is posted you are allowed to send an ordered list of your requested subjects, from most to least desired. I will accommodate you by assigning the most desired subject that has not been claimed by two other students already.

If you have an idea for a project that is not listed you can propose it as a project by emailing me or speaking with me. If approved (if I find it suitable) it will be your subject and will be added to the list so that a second student may also claim it.

For each project I offer some reading material. But you must find at least two other sources and list them in your write-up. Use [SPIRES!](#)

Project Subjects

1. The Unruh Effect. If you don't know any GR or Black Holes, ignore anything said about those. Just focus on QFT for accelerated observers. [Ref1](#) and [Ref2](#)
2. The basis for the discovery of Supersymmetry: The [Coleman-Mandula Theorem](#) and the [classification of supersymmetric algebras by Haag et al.](#) You may want to look for water down/digested versions in textbooks.
3. Soft pion theorems and chiral Lagrangians. This is not just good QFT, it is also a chock-full of particle physics. I like [Coleman lectures](#).
4. T.D.Lee's model is a simple, soluble example, of bound states in QFT. You will see how you can use the LSZ formula to compute scattering of particles that are bound states. [TD Lee's original](#) and a [somewhat simplified treatment](#)
5. Large- N (or $1/N$ expansion). See the first 18 pages in [these lectures by Coleman](#), the consult references therein.
6. The resolution of Klein's paradox. I mentioned [Holstein's](#) in class, but there are also several reviews, *e.g.*, see [here](#) and [here](#)
7. Casimir energy. Here are two of the original papers: [with Polder](#) and [Casimir by himself](#). There are also many reviews, *e.g.*, [this](#) and [that](#). Note that beyond the original work there is much that has been done on effects of surface irregularities, temperature, geometries, etc. Explore some, but not all of these!