

# FINAL PROJECT

Project checklist:

- Think about a project which interests you, some ideas are given below.
- By Monday 7/8 you should have a project outline which consists of a i) topic, ii) goals, and iii) work plan. This doesn't need to be fancy, just a few sentences and a good idea.
- You can submit a project outline before Monday. You are especially encouraged to do this if your project is more involved (for example, a computer programming project).
- Please consult me (by email, after class, office hours, or any other time) about your proposal.
- Over the final week plan to work roughly an hour each day on your project.
- During Friday's class of the final week give a 5-10 minute presentation on what you have done. Please do not put a lot of effort into preparing the presentation – it is meant to be an opportunity to share what you have learned and hopefully spur some questions and discussion.

A suitable project can be anything which relates to the topics of the class and may contain significant math or no math at all. Here are some examples:

- Solving a challenging problem which requires significant math.
  - Depends on your math and physics background. Please let me know soon to decide on a suitable problem.
- Biography of a major developer of relativity.
  - Albert Einstein
  - Arthur Eddington
  - Hendrik Lorentz
  - Henrietta Swan Leavitt
  - Albert Michelson
  - Stephen Hawking
  - Ed Witten
  - Ernst Mach
  - Mileva Maric
  - Theodor Kaluza
  - Kip Thorne
  - John Wheeler
- Biography of a major developer of “classical” physics.
  - Isaac Newton
  - Johannes Kepler
  - James Clerk Maxwell
  - Galileo Galilei
- Historical development of geometry (Euclidean and/or non-Euclidean)
  - Euclid and/or his book
  - Riemannian geometry
- Philosophy
  - Ideas of space and time. How this has changed throughout history.
  - Time travel (paradoxes)

- Computing the Hubble constant from available online data.
- Interesting topics
  - Black holes
  - Stars (birth, death, black holes, Boson stars, etc)
  - String theory
  - Galactic rotation curves
  - Modified Newtonian dynamics
  - Penrose process and Aliens
  - Tensors (or other useful math concepts)
- Report on current experiments.
  - LIGO, gravitational wave astronomy
  - LISA, gravitational wave astronomy
  - CERN, creating mini blackholes
  - Gravitational lensing
  - Gravity probe B
  - Dark matter or energy
  - faster than light neutrinos
  - GRACE (Gravity Recovery and Climate Experiment)
- If you have some (even if very limited) computer programming experience, computationally solve a difficult physics problem
  - Write code to “solve” the twin paradox
  - Compute the orbits of stars around supermassive blackholes
  - Many many more
- Something not on this list