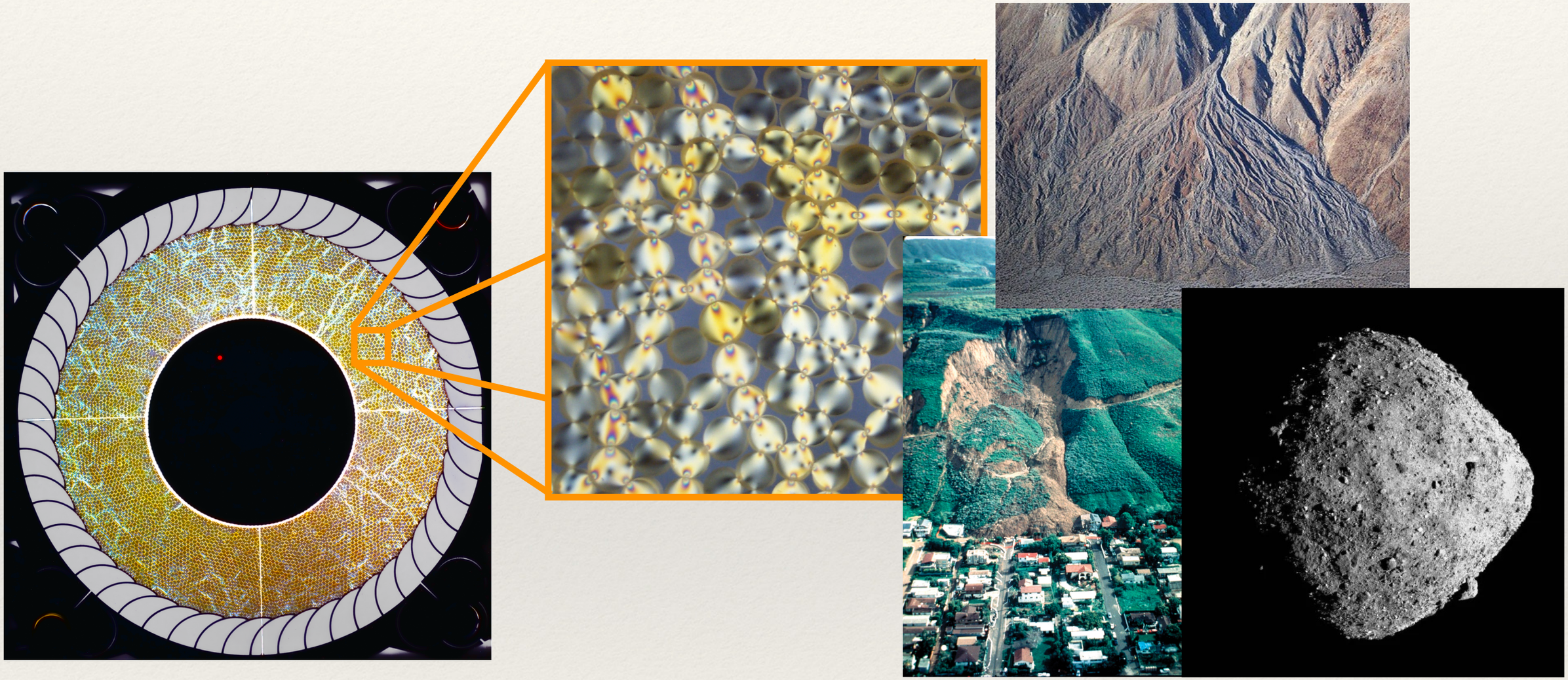
Welcome to Physics 308:

Prof. Ted Brzinski

Who am I?

I do mechanics + statistical/nonlinear physics! How do simple constituents produce complicated and surprising phenomena?

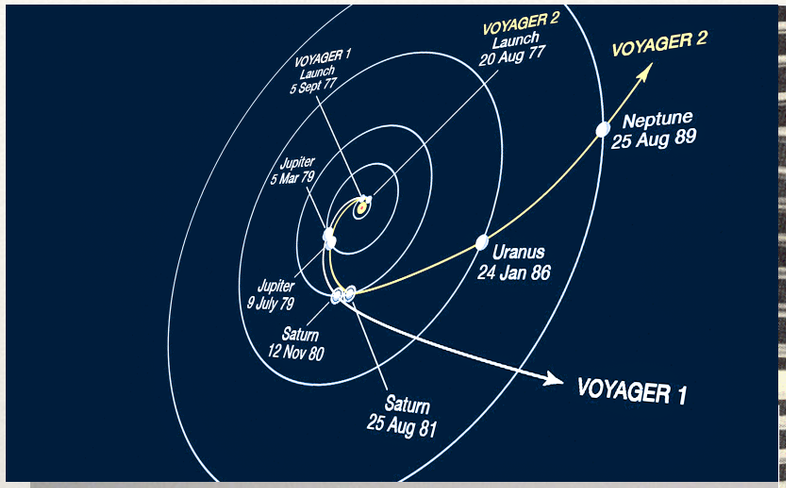


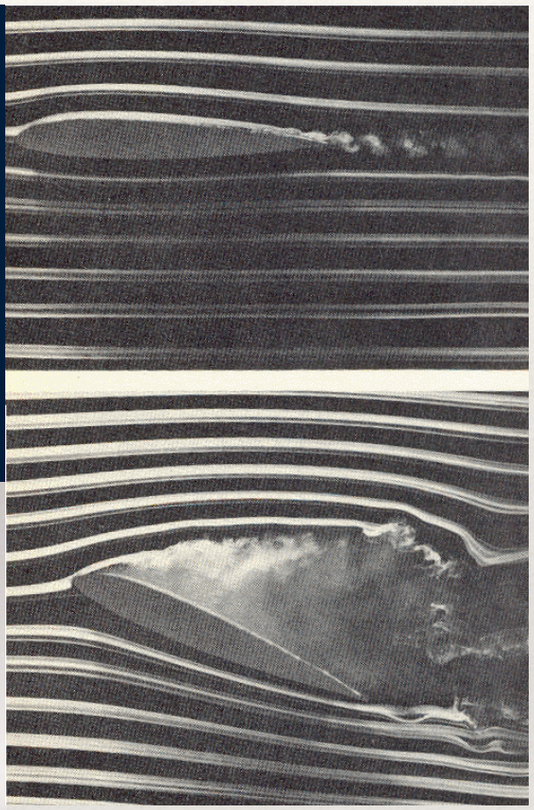
Things I do other than physics:

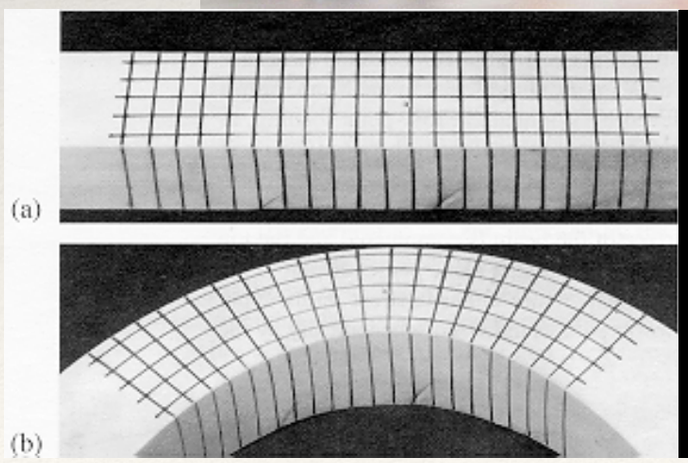
playing with my kids and dog and cats, biking, hiking, cooking, coffee'ing, board games, books

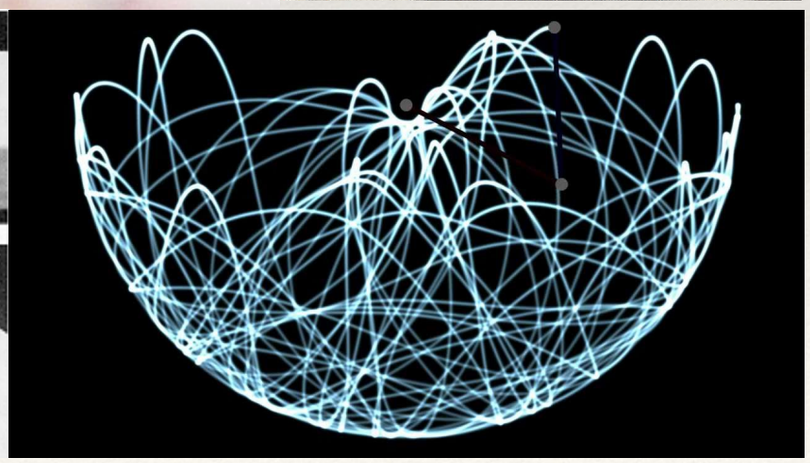
What is this class about?

- Mechanics of systems in the classical limit:
  - No quantum
  - No relativity
  - No thermal motion
- Particles, solid body, continuum
- New analytic frameworks!
  - Newtonian formulation
  - Lagrangian formulation
  - Hamiltonian formulation

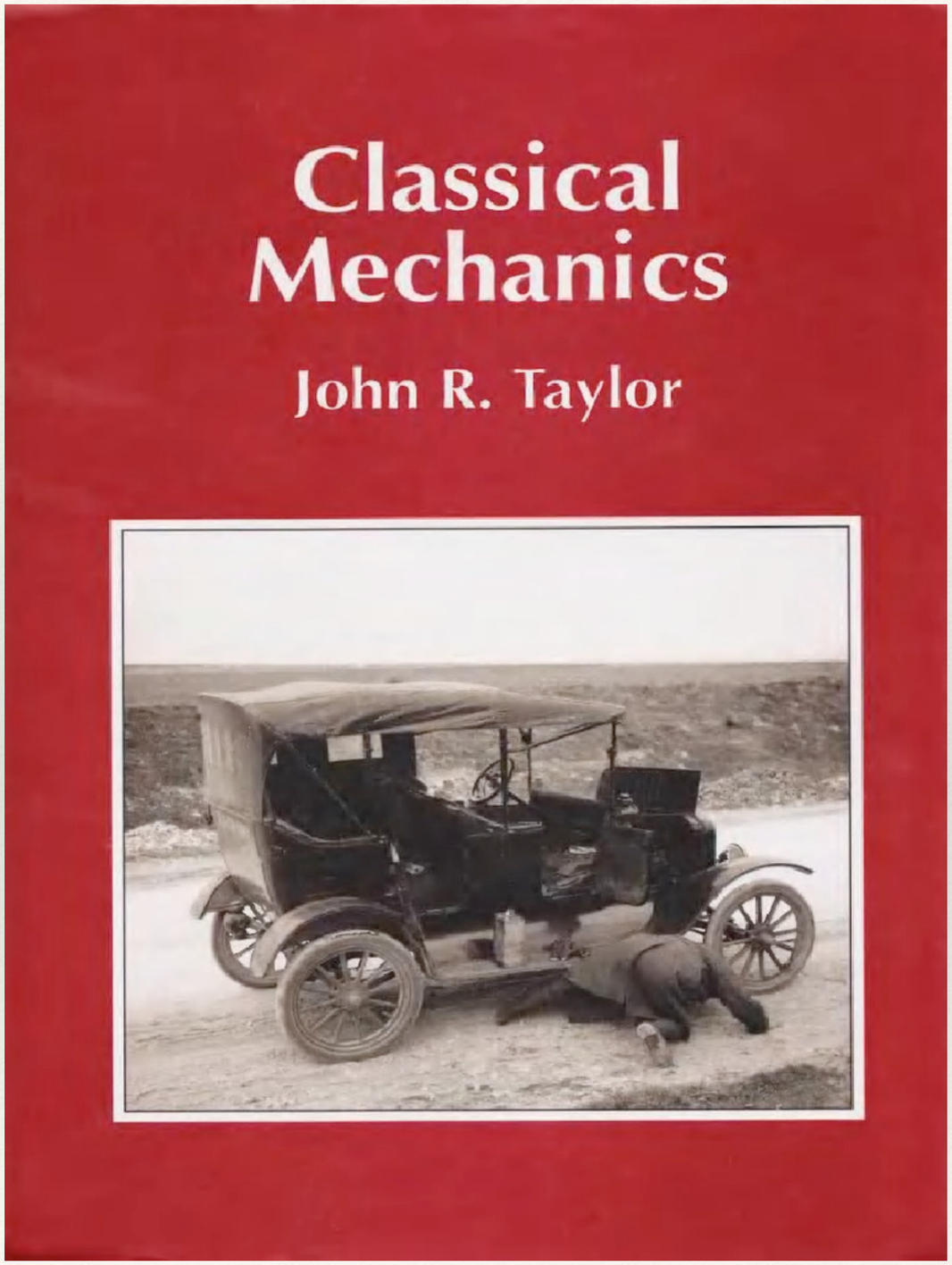


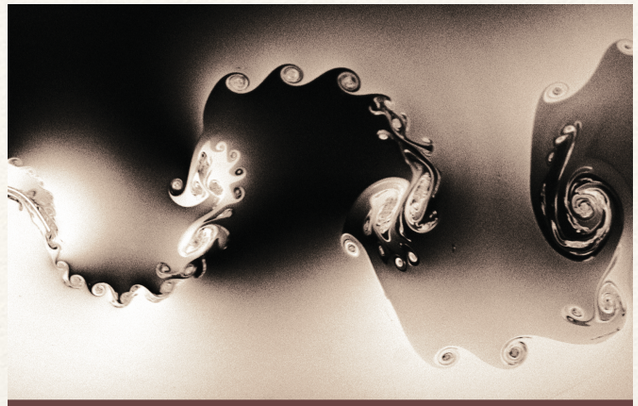






Texts and other resources





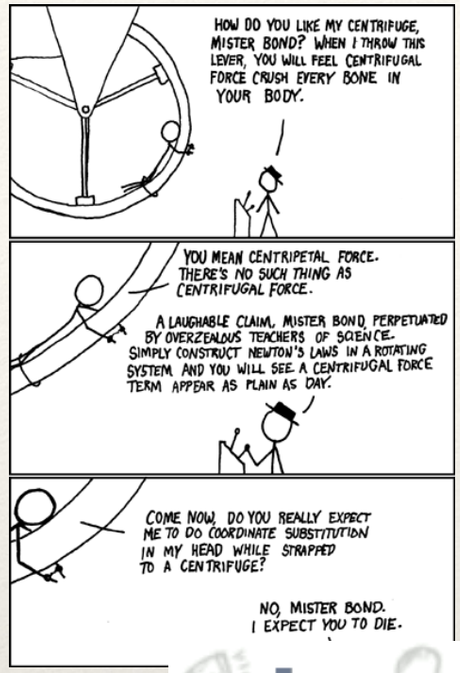
Physics of
Continuous Matter

Second Edition

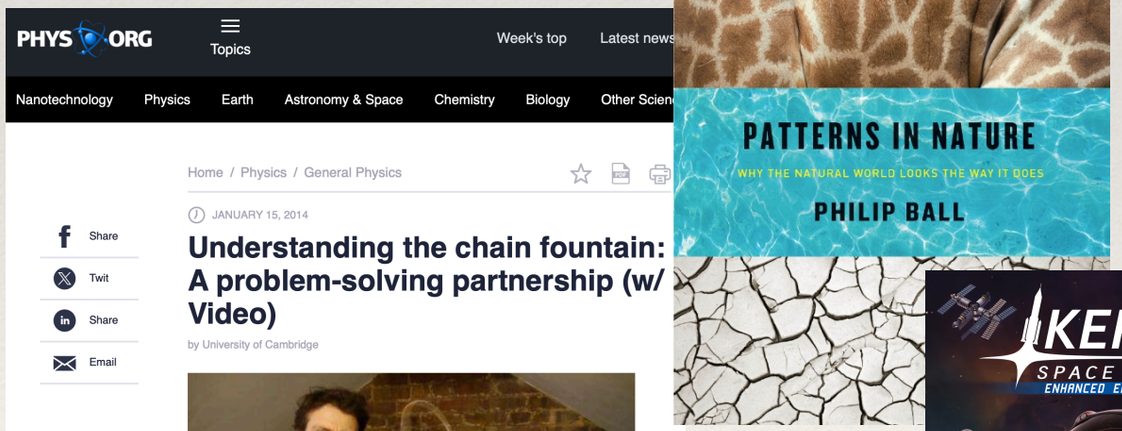
Exotic and Everyday Phenomena in the Macroscopic World

B Lautrup

CRC Press
Taylor & Francis Group
A TAYLOR & FRANCIS BOOK



xkcd



Class format

- Classes:
  - Introductory comments: approximately 10:00 - 10:15
  - Group work: approximately 10:15 - 11:15 (with breaks to share between groups)
  - Summarize and share: approximately 11:15-11:25

Class format

- Deadlines for each topic/week:
  - Notes on independent study (**Tuesday before class** — less than 30 minutes, or [better] write as you read!)
  - First draft solutions (**Friday, 11 PM** — varies by week)
    - Peer feedback (**2nd Monday, 11 PM** ~30 minutes)
    - Final solutions (**2nd Wed., 11 PM** — varies by week)
    - Quiz (**2nd Friday 11 PM** — 15 minutes)
- Every 2 weeks - 3ish "exam" problems (plus an opportunity to revisit earlier exam topics)

Motivation for class format:

- There is not enough time for all the details in class, and most effective learning happens in “office hours”.
- It is cognitively important to see things multiple times in multiple ways (research-proven!)
- Class as a way of reinforcing, testing, and contextualizing your independent learning through communal work
- Scientific work is collaborative work, and is communication work!

Collaboration!

- In-class groups — self selected, groups of 4
  - Work together on problems
  - Share insights from independent learning
    - Collaborate on communication with the class
- Peer evaluation — assigned by Friday.
  - Source of low-stakes feedback from peers
- Recommended — accountability partners/study groups

1st vs final drafts?

https://squishlab.github.io/PhysH308/writeup/

Your grade!

- I trust that you're here because of a good faith interest in the class content!
- Numerical grades
  - Are stressful
  - Are arbitrary
  - Don't give you actionable feedback

Numerical grades suck – now what?

- Every assignment, quiz, exam, etc. is either satisfactory or "not yet".
  - HW graders will use this modified EMRF rubric.
- Some work (HW, exams) offer multiple opportunities to submit satisfactory work.
- Haverford, med schools, grad schools, future employers all still expect you to have grades. We need a mapping…

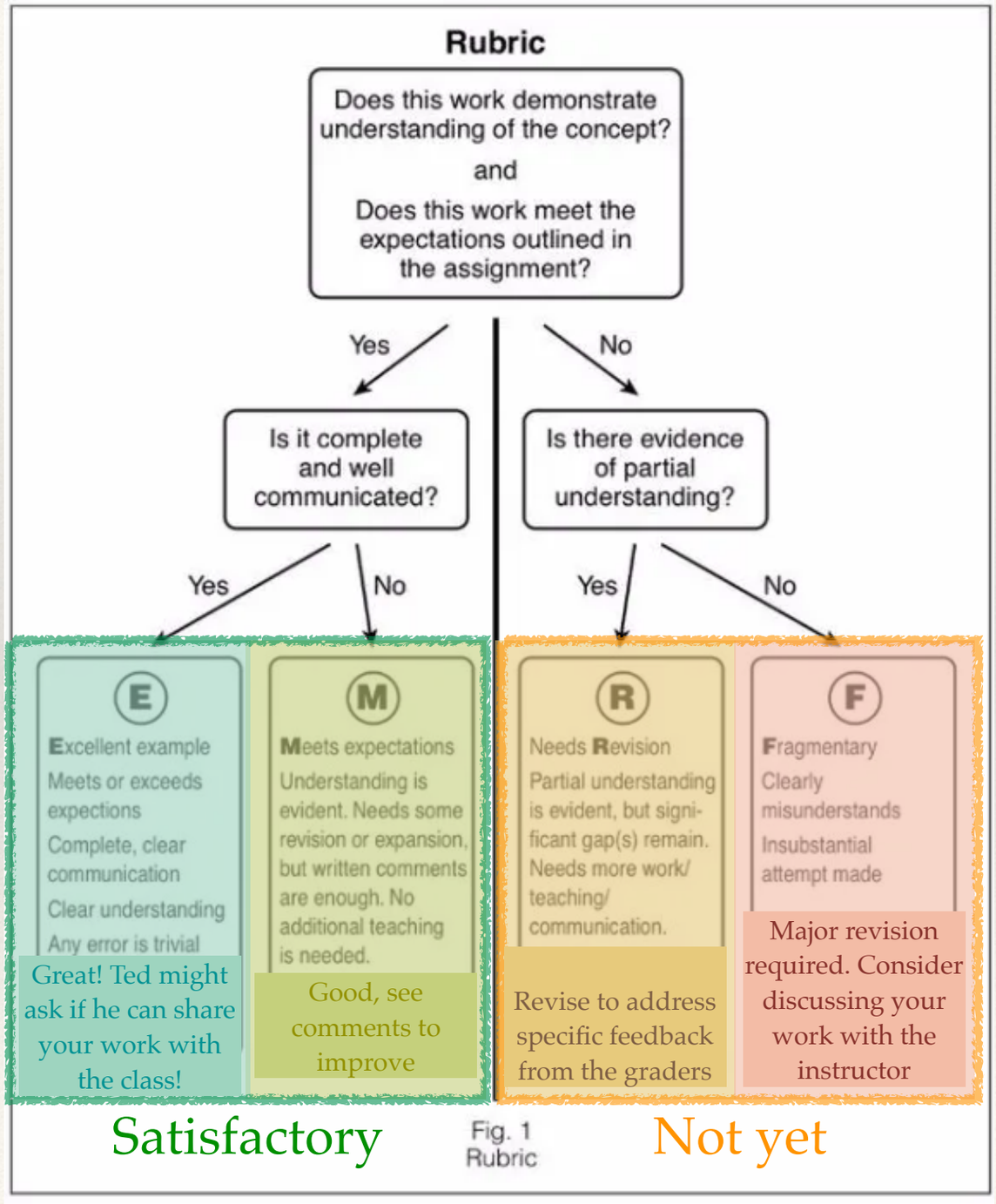


Fig. 1 Rubric

Numerical grades suck – now what?

Mapping to your final grade:

Grade	Criteria
4.0	Earn a Successful score on all homework assignments AND Earn a Successful score on all but 1 learning standards AND Complete all peer assessments and quizzes
3.3	Earn a Successful score on all but 1 homework assignment AND Earn a Successful score on at least 80% of learning standards AND Complete all peer assessments and 70% of quizzes
2.7	Earn a Successful score on at least 50% of the homework assignments AND Earn a Successful score on at least 70% of learning standards AND Complete all peer assessments and 50% of quizzes
2.0	Earn a Successful score on at least 50% of the homework assignments AND Earn a Successful score on at least 50% of learning standards AND Complete all peer assessments.

If you complete all of the criteria for a grade, and 2 of the criteria for the next grade category, you will automatically move up to an intermediate score (e.g., 3.3 becomes a 3.7). If you complete only one of the criteria from the next category, you may move up to an intermediate score at the discretion of the instructor - generally based on partial completion of the other 2 criteria (e.g., successfully complete a 3.3., successfully complete all homeworks, AND succeed at all but 2 learning standards, AND complete all but 1 of the quizzes).

How to get help in this class [everyone will need it!]

- Office of Academic Resources — help with study skills/effective reading/time management, tutors available!
- Ask questions (of me and your peers!) in class!
- Come to office hours — I am here to help! TBD, or by appointment.
- Try #phys308 in the dept. slack to get help from peers, TAs (TBD), or (occasionally) me.

How to succeed in Ted's classes (based on prior end-of-semester feedback)

- Go to the office hours prepared with questions, initial work.
- Use office hours preemptively and regularly.
- Work with peers.
- Do the readings, and attempt at least a hand-wavey strategy for related problems *as you read*.

Your feedback

- Anonymous surveys: few weeks in, 7 weeks in, right before finals period

- Talk to Ted by appointment, in office hours, etc.

I take your feedback seriously!

This whole class is an experiment with a relatively new way of teaching and learning this material. If the learning outcomes for any of you are worse than they would be in a regular lecture, we need to tweak things!

For the gritty details ....

- Moodle has a (very) little. All coursework submission will happen here!
- Class syllabus/website is the main place for info!
  https://squishlab.github.io/PhysH308/
  (linked on moodle)

This week

- Reading notes due Thursday instead of Monday!
- Thursday we'll have a mathstravaganza! Before class, work out one of the indicated problems independently. Each group will share their solutions and then choose one to present.
- Theme for the week: Review of Newtonian Mechanics

Newton's Laws

- 1 -

- 2 -

- 3 -

Newton's Laws

- 1 - Objects keep moving (or not) unless you push 'em.

- 2 - Objects change how they're moving proportionally to how hard and how long you push them:

$$F = ma \Rightarrow dv = \frac{F}{m}dt$$

- 3 - When you push a thing, it pushes you back!

One problem not from the book

2.4. **Keeping a book up** ∗

A book of mass M is positioned against a vertical wall. The coefficient of friction between the book and the wall is μ. You wish to keep the book from falling by pushing on it with a force F applied at an angle θ with respect to the horizontal ($-\pi/2 < \theta < \pi/2$), as shown in Fig. 2.10.

(a) For a given θ, what is the minimum F required?
(b) For what θ is this minimum F the smallest? What is the corresponding minimum F?
(c) What is the limiting value of θ, below which there does not exist an F that keeps the book up?

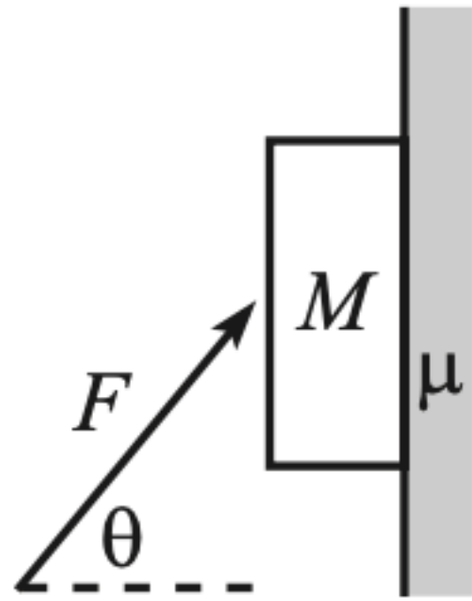


Fig. 2.10

2.23. **Keeping a book up** ∗∗

The task of Problem 2.4 is to find the minimum force required to keep a book up. What is the maximum allowable force, as a function of θ and μ? Is there a special angle that arises? Given μ, make a rough plot of the allowed values of F for $-\pi/2 < \theta < \pi/2$.

From David Morin's Introduction to Classical Mechanics
These slides will be posted later today.