

PHYSICS 2170: *FOUNDATIONS OF MODERN PHYSICS*



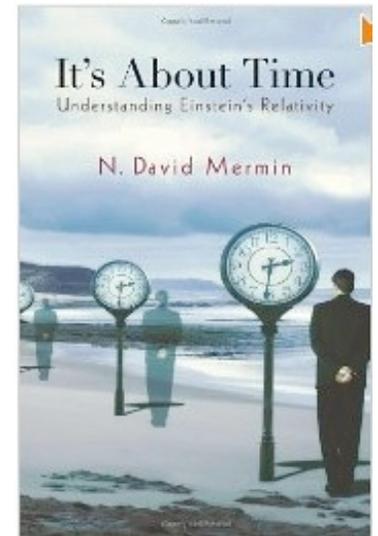
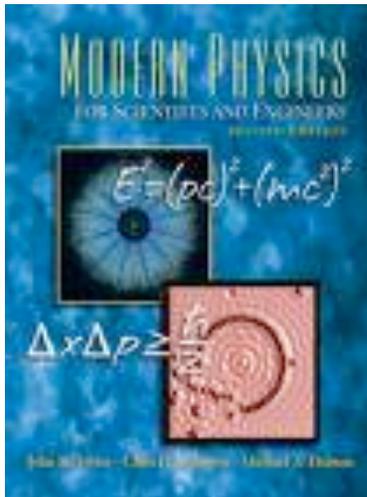
- Instructor: Professor Leo Radzihovsky
- Office: Duane Physics F623 (Gamow Tower)
- Phone: 303-492-5436
- Email: radzihov@colorado.edu (*best way to reach me*)
- Office Hours: Monday, Friday 2 – 3 pm (*or by appointment*)

<http://www.colorado.edu/physics/phys2170/>

“Last Time”

recall “Lecture 0”:

- Phys 1110 (Newton’s mechanics) and Phys 1120 (E&M)
- do you have your Taylor Zafiratos Dubson (TZD) text?
...also “It’s About Time”



- do you have the right clicker and know how to use it?
 - must be registered on CUconnect (once)
 - must be set to frequency CB (once)



Today

- course logistics
- pedagogical comments
- course overview
- introduction to relativity

Announcements

- homework 1 is posted on the class website
 - due Wed, Jan 19 in class
 - solutions will be posted on the website or CULearn
- reading for this week is:
 - Ch 1 in TZD
 - course syllabus details
- remember to bring your clicker to every class
 - register it (once)
 - set it to frequency CB (once)

Administrative details

All course information can be found on the class website, that must be checked regularly (daily)

<http://www.colorado.edu/physics/phys2170>

Class rules

- no use of laptops, cell phones, no texting, no newspapers
- you are responsible for all the material assigned in the book even if it is not covered in class
- Lots of physics discussion (with nearby “study group” of students) during clicker questions is required before voting
it facilitates your learning and gives me valuable feedback on your understanding

Collective work vs. independent work

What is authorized:

- working with others to make sense of questions
- collectively sorting out the answer (explaining reasoning)
- writing up your own solution in your own words

The CU
Honor Code

“On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work.”

What is NOT authorized:

- telling students answers
- representing someone else's work as your own

Pedagogical comments

Physics is difficult, but succeeding in this class is not; follow these suggestion and you will do well:

- Learning only comes as a result of your effort
- Stay on top of it; that's easier than playing catch-up
- Attend class regularly, participate, ask questions
- Read text and review notes before class; it will save you time
- Do homework early (not last minute)
- Working in study groups is OK, but be "careful"
(make sure you can do it on your own)
- Think hard about concepts and solve many problems
...no pain, no gain
- Come see me right away if you are having difficulties

More on clickers



- To set frequency, hold down on/off button until power light starts flashing. Then enter CB and vote; light should flash green and power light should be solid blue
- Can only set frequency after the first question on the class has started
- If you turn off your clicker, repeat above procedure
- You can vote as often as you like during the allowed time, with only last vote counted
- Only use your own clicker
- Answering for someone else using their clicker is a violation of the CU honor

set frequency to CB

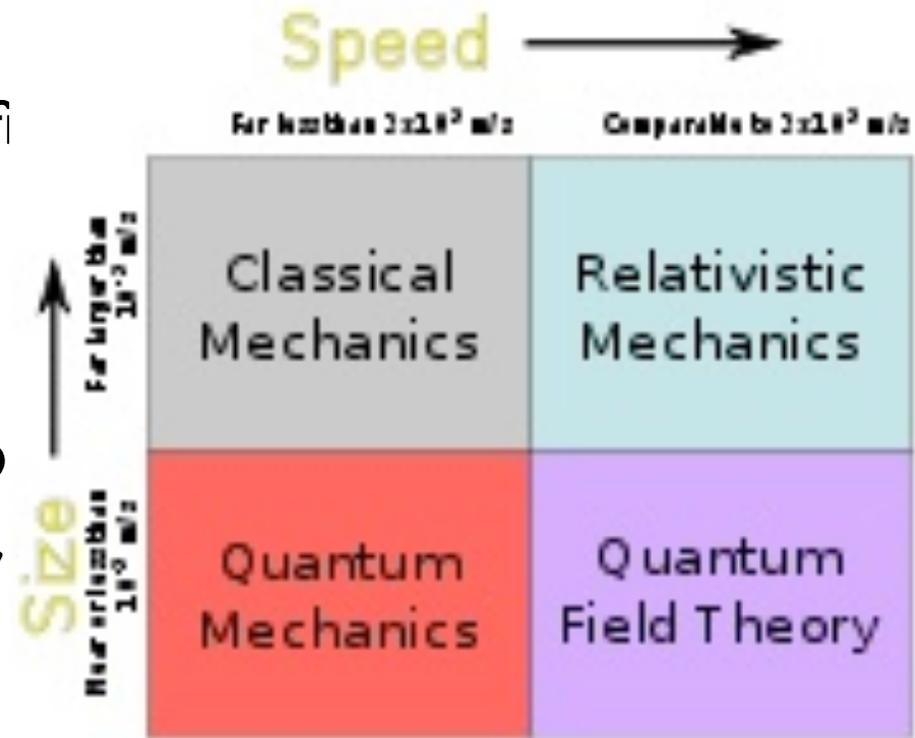
- a. It is required for Physics majors
- b. Much of the modern technology depends on covered material
- c. To impress your friends with a casual "You mean you don't know how time dilation and energy quantization is important for the Global Positioning Satellite (GPS) system?"
- d. To better appreciate nerdy comments in the Big Bang Theory and Star Trek TV series
- e. This is just really cool stuff!

What's your reason for taking this course?

Course overview

Modern Physics: (relativistic quantum fi

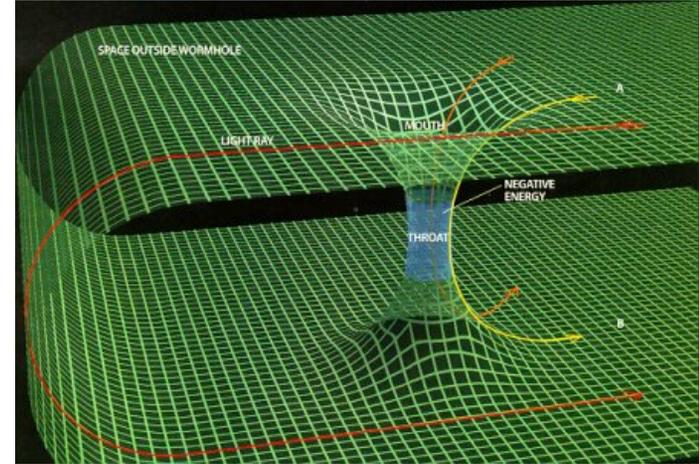
- established during 1900–1920
- exotic and counter-intuitive
- now common place in all modern GPS, electronics (cell phones, iPo throughout science, e.g., physics,



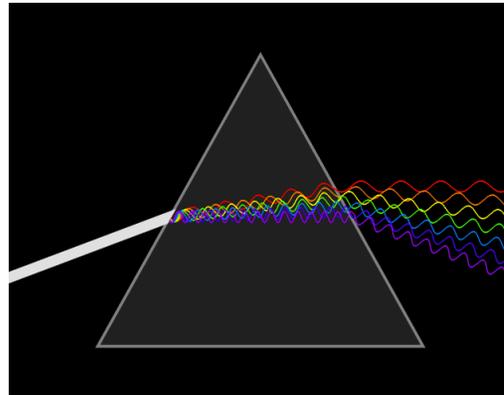
- **(special) theory of relativity** (mostly Einstein, 1905)
 - how does the world look when you are moving...fast?
- **quantum mechanics** (Bohr, Heiseberg, Einstein, Schrodinger, ...)
 - what are the laws of nature for very small things, like electron, proton, photon,...a tiny electrical circuits in you i-Pod?

Big picture

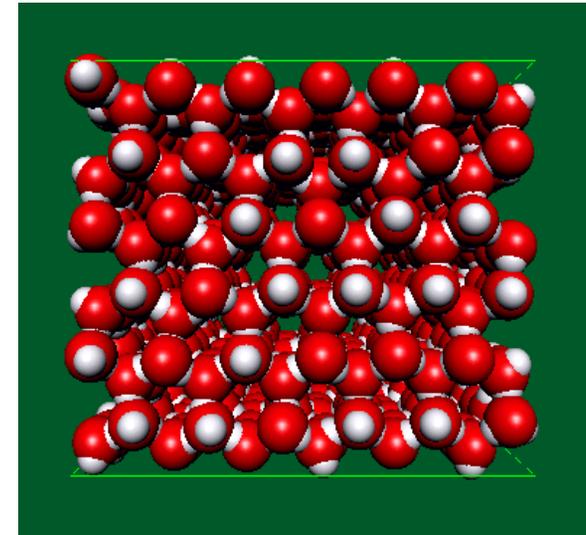
Basic properties of space-time



Basic properties of light



Basic properties of matter: atoms to solids



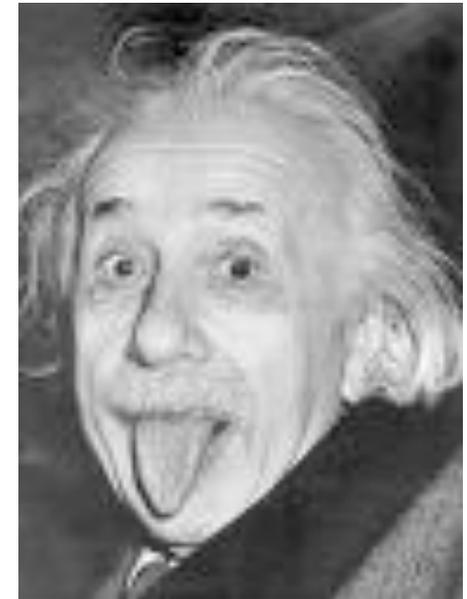
How light and matter interact

(Special) Theory of Relativity

(mostly Einstein, 1905)



Albert Einstein



How does the world look when you are moving...fast,
...real fast ?



Outline of Relativity part of the course

- Relativity before Einstein (Galileo, Newton,...)
- Simultaneity
- Time slowing and length contraction
- Lorentz transformation
- Momentum, energy, and relativistic mechanics

We will *not* have time to cover:

- effects on electricity and magnetism (light)
- gravity (General Relativity)