9/5/2023

PHY 245L: Modern Physics Lab

Dr. Daniel Hickox-Young
(hickoxyoung@roanoke.edu)

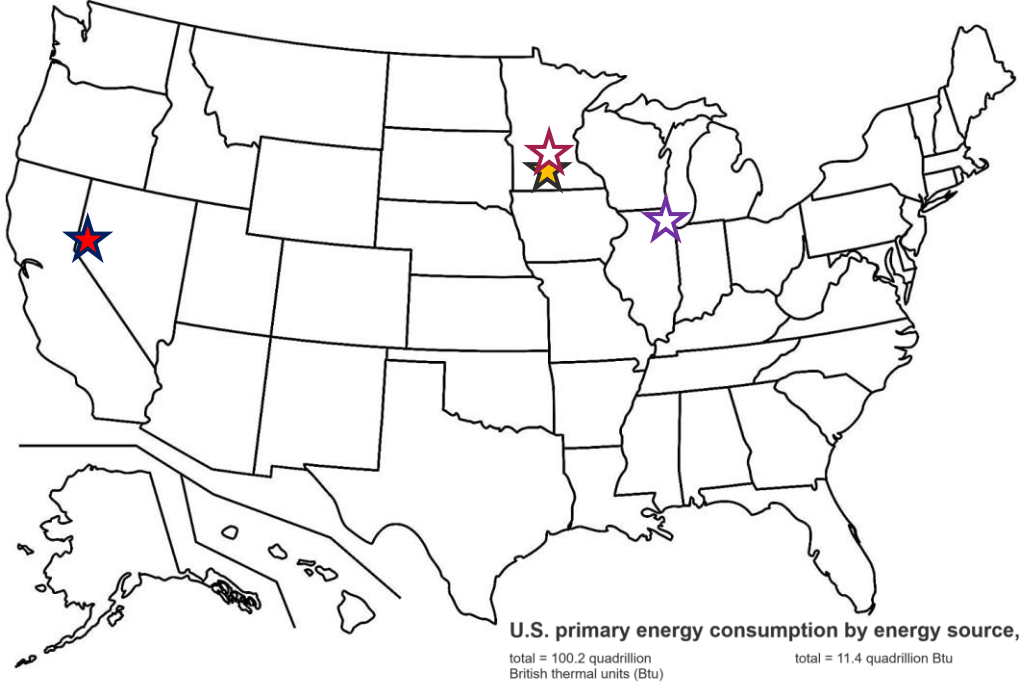
Lecture Topic(s) - Introductions, Syllabus, Practicing Professionalism, The Command Line
Reading for Next Class: Assigned on Moodle
Logistics:
- Reflection 1 due Monday, 9/11 at midnight
- Lab Activity 1 due Friday, 9/8 at 5pm

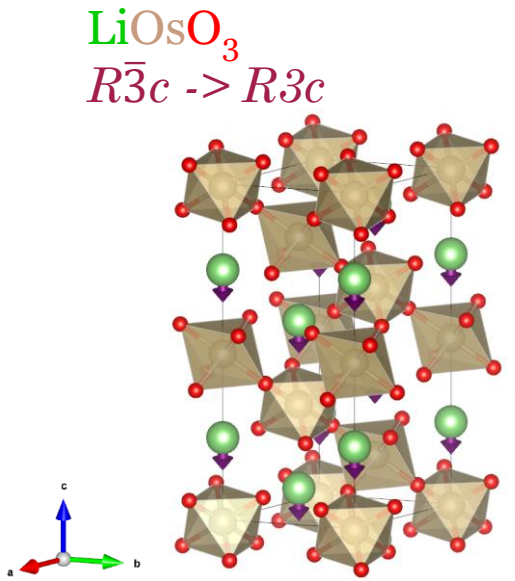
Announcements

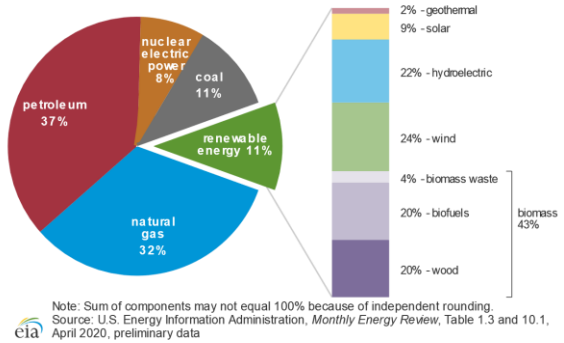
- Ever wanted to fly a rocket?
  - A student team(s) from Augsburg will be building and launching a rocket this semester!
  - Kick-off: Saturday 9/9 at North Branch (transportation can be arranged)
  - Building materials will be provided
  - Weekly remote lessons + weekly building sessions
  - Team(s) will launch their rocket on 10/28
  - Interested? Talk to me after class or send me an email (hickoxyo@augsburg.edu)
  - No engineering/physics background necessary!

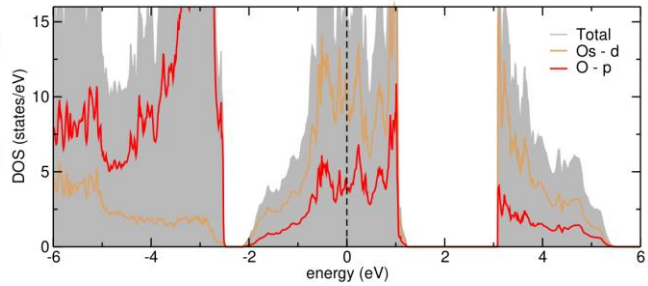
Introductions

- Dr. Daniel Hickox-Young (Dr. H-Y)
  - Pronouns: he/him/his
  - Assistant Professor – Physics
  - Office: Hagfors 135
  - Office Hours: TuW 3-5pm
  - OR schedule with calendly: https://calendly.com/hickoxyoung
  - Also available by appt via zoom: https://augsburg.zoom.us/my/hickoxyo
  - Email: hickoxyo@augsburg.edu
- Background
  - BA in Physics and Mathematics – St. Olaf College (Northfield, MN)
  - PhD in Materials Science and Engineering – Northwestern University (Evanston, IL)
- Research
  - Materials for energy conversion and storage
  - First principles (i.e. quantum mechanics) simulations
  - Conducting and semiconducting polar oxides







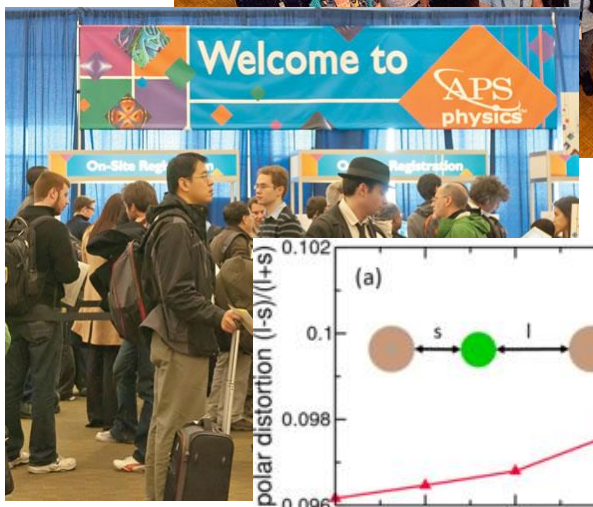


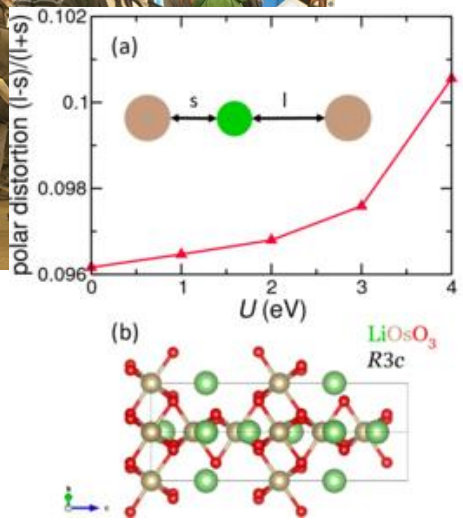
Introductions

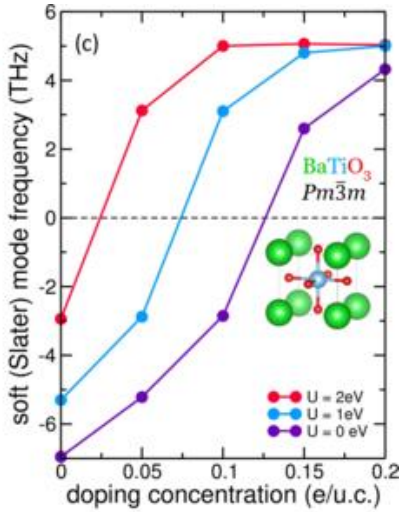
- Please share the following:
  - **Name** (First and Last)
  - What you **prefer to be called**
  - **Pronouns** (if you'd like)
  - **Your favorite science movie (can include sci-fi)**

Practicing Professionalism

- Goal: Provide a hands-on, professional-style experience of "doing physics."
- Why:
  - Develop transferrable skills
  - Prepare you for internships/research opportunities
  - Demystify the practice of science
  - Welcome you into the community of scientists
- How:
  - Authentic research experience (computational physics)
  - Discussions about topics that matter to the modern physics community







What, Specifically?

- See the Syllabus, Available on Moodle

Small Group Activity: Community Agreements

- From the syllabus: “To help create a space in which the diverse backgrounds, perspectives, and approaches will enrich our discussion without causing harm, we will spend some time on our first day of class crafting community agreements to unpack what that means to us.”
- Split into groups (3-4 people) and together develop 2-3 guidelines that you would like to see implemented:
  - Make sure that everyone is on the same page, working together helps everyone involved
  - Invite people to work with you, especially if they appear to be on their own
  - Respect one another: use respectful language
  - Work with each other, not over each other
  - Remember that not everyone knows what you know
  - Critique ideas, not individuals

What do Physicists Care About?

- Initial Thoughts:
  - Nuclear bombs
  - Expanding the boundaries of our knowledge
  - Family
  - Re-learning forgotten math
  - The understanding of how things interact with one another
  - Avoiding eye contact
  - Reproducible experiment
  - The Earth's magnetic field
  - Systems

APS News Activity

1. Receive a number/letter assignment (e.g. 2C)
2. Look through your assigned copy of APS News, making note of the types of articles being written in this newsletter by and for physicists.
3. Group together by number (i.e. all 1's sit together, all 2's, etc.) and come up with a list of topics covered by your issue.
4. Re-group, this time by letter (i.e. all A's, all B's, etc.). Compare topic lists and consider the following:
    1. Is there overlap in your lists? Are there consistent topics?
    2. Which topics appear most frequently?
    3. Any other patterns? (i.e. what's on the front page, what tends to get a longer article, etc.)

What do Physicists Care About?

- Considered Thoughts:
  - Exciting Ideas About The Boundaries of Our Knowledge
  - Connecting Physics to Current Events
  - Public Policy
  - Diversity Equity and Inclusion
  - Application to Daily Life
  - Physics Education
  - Biographies/Obituaries
  - History
  - Awards
  - Units
  - Space
  - China
  - AI

Coding Advice

- Remember, the computer is only as smart as the person pushing the buttons
- Related, the computer only does EXACTLY what you tell it to
- Google is your best friend (websites with names like “stack exchange” are generally reliable, offer good advice)
- When you see “`<words>`”, usually you should replace everything from < to > with your own filename
  - E.g. if you see “`mkdir <YourName>`”, type “`mkdir DanielHickox-Young`”
- Don’t put spaces in filenames!

The Terminal

- For Windows users, you'll need the Windows Subsystem for Linux (https://learn.microsoft.com/en-us/windows/wsl/install)
  - Follow the instructions for install (default settings/distribution will be fine)
  - Set your new Linux password and username
- For Apple users, simply open the terminal

The Command Line: Bash

- What is Bash?
  - “Bash” is the command interpreter, as well as a programming language.
  - Stands for “Bourne again shell”, named for Stephen Bourne, author of an earlier version of the shell
  - Default tool for navigating the command line
- What is a shell?
  - Primary purpose: execute commands
  - Secondary purpose: a programming language capable of executing complex operations

Basic Commands

- Navigating the filesystem
  - `pwd` – prints your working directory, i.e. your current location or filepath
  - `ls` – prints (lists) all the content of your current directory
  - `cd <directory>` – change directory to one named “filename”
  - `cd ..` – Change directory by moving up one level in the file tree
- Creating and editing files
  - `mkdir <directory>` – creates a new directory (i.e. a folder)
  - `mv <filename> <filename2>` – rename a file or directory
  - `mv <filename> <filepath>` – move a file to a new location
  - `rm <filename>` – delete (i.e. remove) a file
  - `rm -r <directory>` – delete a directory and all of its contents
- Quickly access information from a file
  - `head <filename>` – print the first 10 lines of a file
  - `tail <filename>` – print the last 10 liens of a file
  - `grep <string> <filename>` – find the series of characters “string” and print every line containing it

Basic Commands, Editing

- Get comfortable with the basic commands by following this tutorial, moving through sections 3-6:
  - https://ubuntu.com/tutorials/command-line-for-beginners#3-opening-a-terminal
- Then complete the (brief) Lab 01 assignment on Moodle