MICHIGAN STATE UNIVERSITY

The future that liberals want

Welcome to PHY 321: Classical Mechanics

Friendship ended with NEWTON

$$\frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\partial L}{\partial \dot{q}_j}\right) = \frac{\partial L}{\partial q_j}$$

Now Lagrange is my best friend

F=ma

Prof. Danny Caballero (he/they; course instructor)
Scarlett Rebolledo Caceres (she/her; GTA)
*Elisha Alemao (she/her; ULA)*

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About Me
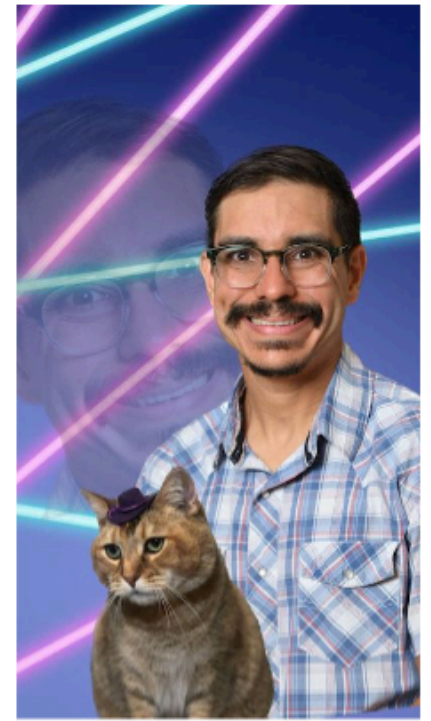
- Lappan Phillips Professor of Physics and Computational Science

- Co-direct two research labs (in Physics & Computational Science Education)

- PhD in Physics from Georgia Tech in 2011
  Postdoc CU-Boulder 2011-2013

- Former high school physics teacher
  (Atlanta Public Schools)

- Labor Organizer for Union of Tenure System Faculty

- Taught at MSU for 12 years.

MICHIGAN STATE UNIVERSITY
UTSF UNION OF TENURE SYSTEM FACULTY

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How to Contact Me

- Open "office" Hours
  - https://cal.com/dannycaballero/phy321
  - Zoom (in person if requested)
- Office hours (Physics Help Room; Strosacker Ctr)
  - MW 4-5; F 3-4; or by appointment!
- Response Hours: 5am-4pm, M-F
  - We all work different hours
- Response time: 1-2 business days
  - After 2 days, please send me another email/message!
- Email (caball14@msu.edu)
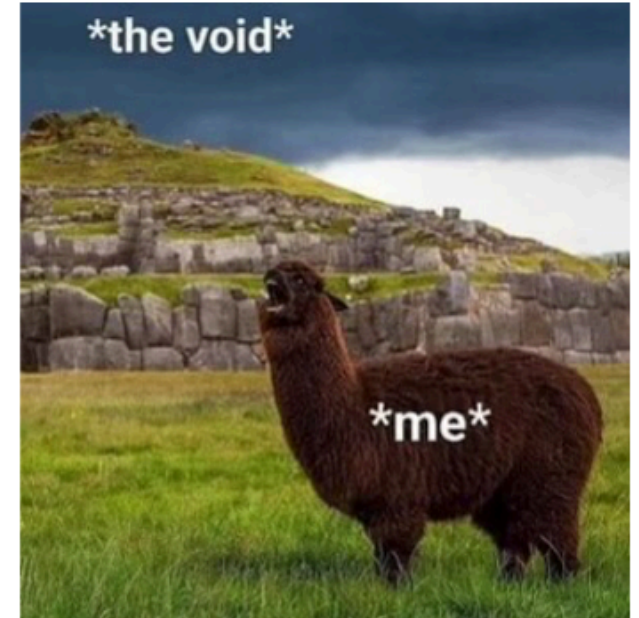
Getting to know you!

- Student Information Survey is on website (Getting Started) and on D2L
  - Name & Pronouns
  - Python Experience
  - Access needs

- Fill this short survey out by **11:59pm Friday, January 17th**

- Why is learning about you important?
  - We care about you as an individual.
  - We should know what you need/want from this course.
  - We learn better in a community that supports us.

Important Links (login with MSU credentials)

- Course website: https://dannycab.github.io/phy321msu/intro.html

- D2L – https://d2l.msu.edu/d2l/home/2127041

- Gradescope – https://www.gradescope.com/courses/944711 (you will need a scanning device such as a phone camera, computer/tablet camera, etc.)

- **Please check that you can access D2L and that you've been added to the course on Gradescope.**

  Contact Danny if you have any issues!

Course Description

- This course is designed to help you to learn classical physics concepts using both analytical and computational methods. Through examination of the fundamental principles of classical mechanics, we will gain a deeper understanding of how objects and systems move.

- Recommended Textbooks

  - (JRT): Taylor, J.R. (2005). *Classical mechanics.* University Science Books.

  - (AMS): Malthe-Sørenssen, A. (2015). *Elementary Mechanics Using Python: A Modern Course Combining Analytical and Numerical Techniques.* Springer.

- Supplementary Textbooks

  - (MLB): Boas, M. L. (2006). *Mathematical methods in the physical sciences.* John Wiley & Sons.

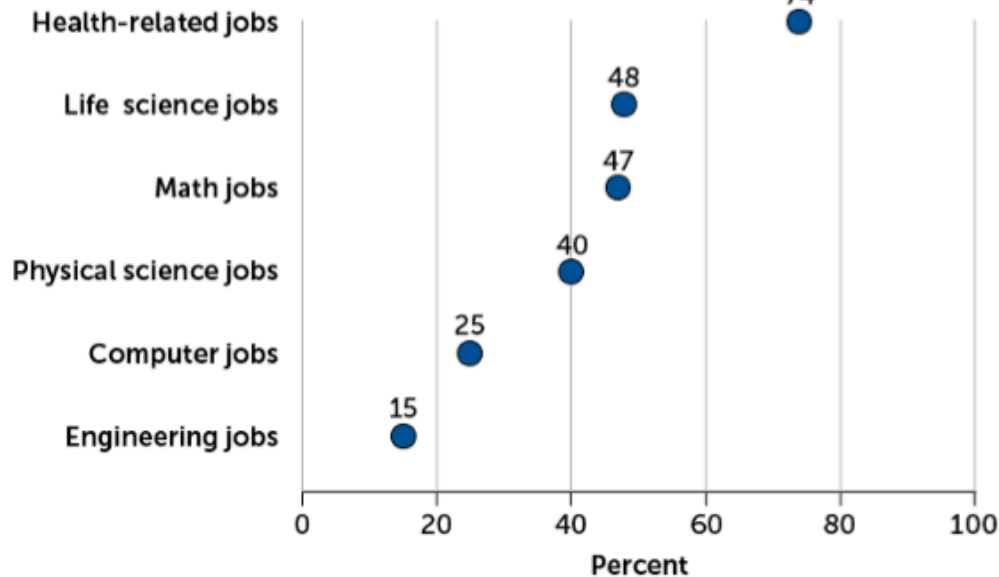**See "Textbooks" folder on D2L for the library catalog resource.**

Inclusive Classrooms

- **Inclusive classroom:** Where instructors and students work together to create and sustain an environment in which everyone feels safe, supported, and encouraged to express their views and concerns (UMich CTL definition)
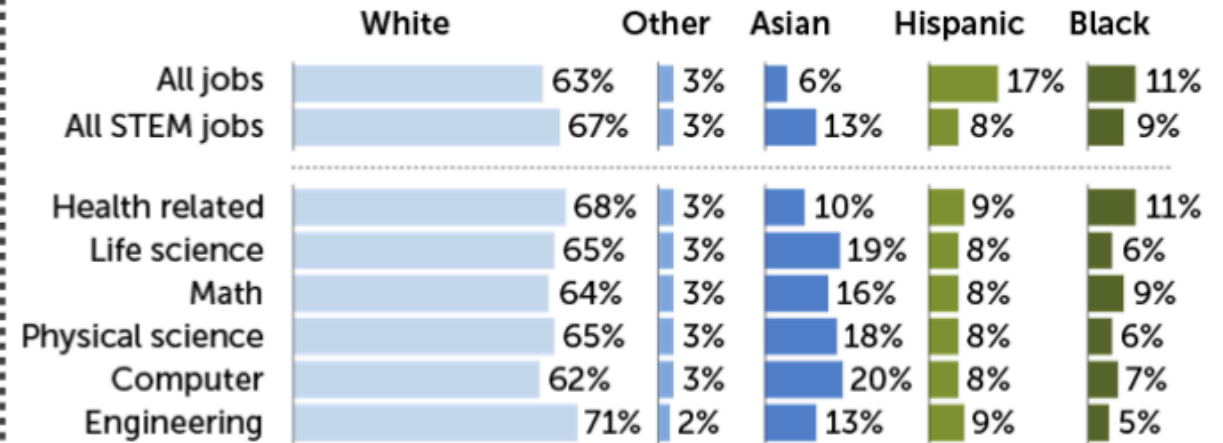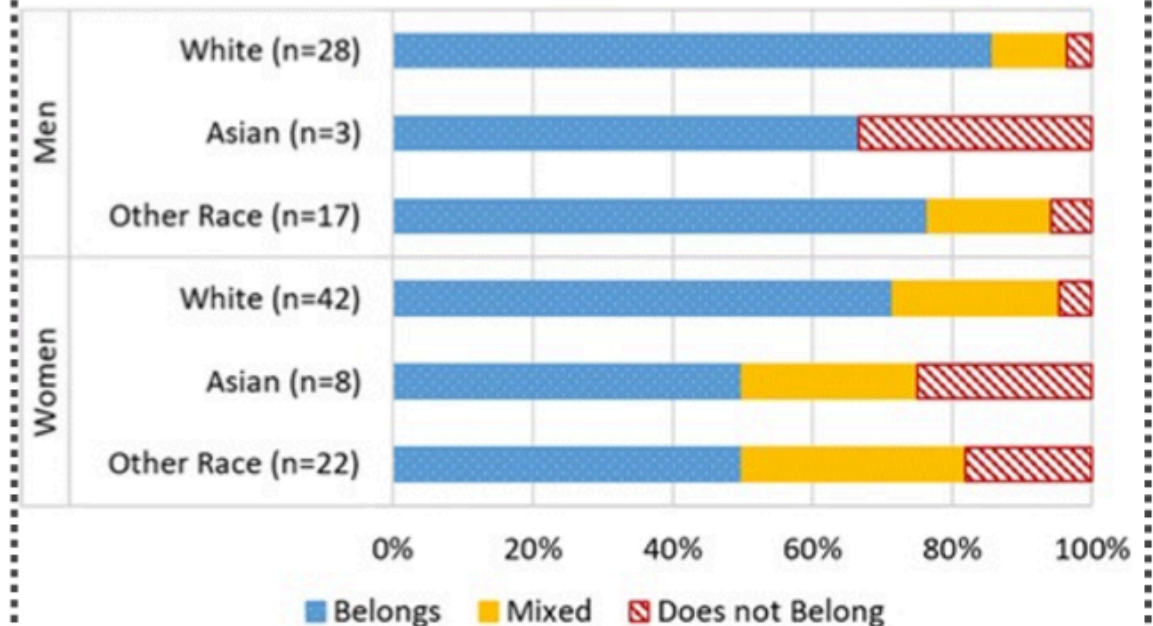
Racial and Gender Gaps Persist in STEM

Percentage of STEM professionals who are women (by field), 2017-2019

Field	Percent
Health-related jobs	74
Life science jobs	48
Math jobs	47
Physical science jobs	40
Computer jobs	25
Engineering jobs	15

Racial and Ethnic representation in STEM jobs (2017-2019)

	White	Other	Asian	Hispanic	Black
All jobs	63%	3%	6%	17%	11%
All STEM jobs	67%	3%	13%	8%	9%
Health related	68%	3%	10%	9%	11%
Life science	65%	3%	19%	8%	6%
Math	64%	3%	16%	8%	9%
Physical science	65%	3%	18%	8%	6%
Computer	62%	3%	20%	8%	7%
Engineering	71%	2%	13%	9%	5%

Feelings of Belonging in STEM (by gender and race)

		Belongs / Mixed / Does not Belong
Men	White (n=28)	
Men	Asian (n=3)	
Men	Other Race (n=17)	
Women	White (n=42)	
Women	Asian (n=8)	
Women	Other Race (n=22)	

Legend: ■ Belongs ■ Mixed ▨ Does not Belong

Figures taken from M. Temming, ScienceNews (2021) and K. Rainey et al., International Journal of STEM Education (2018)

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Inclusive Classrooms

- **Inclusive classroom:** Where instructors and students work together to create and sustain an environment in which everyone feels safe, supported, and encouraged to express their views and concerns (UMich CTL definition)

- We strive to create inclusive classroom spaces, but we can't do it without you

- You will need to work together to solve the problems we present while making sure that everyone has the chance to contribute to the effort

- **Issues or concerns:** Please bring those to Danny. If you prefer, you can also contact our associate chair, Prof. Stuart Tessmer, or, if needed, the department chair, Prof. Steve Zepf.

Course Activities

- Homework (15%) – 9 of them DUE Fridays at 11:59pm ET **via Gradescope**
  - Problem Sessions on Fridays
  - Can work/submit in small groups (2-3 people) OR individually
  - Each part graded on a 3-point rubric (correct, slightly incorrect, incorrect, blank)

- Individual Reflections (5%) -- 9 of them DUE Fridays at 11:59pm ET **via D2L**
  - Designed to encourage you to think critically about your learning process and identify areas for growth
  - Prompts to help you reflect on your experience in 1-2 paragraphs

Learning is a social and collaborative act!

- It's an essential skill in science and engineering (and highly valued by employers)!

- Social interactions are critical to scientists' success – most good ideas grow out of discussions with colleagues, and essentially all physicists work as part of a group.

- **For HW, you can work in small groups (2-3 people) OR by yourself. If you work as a group, you can turn in the assignment as a group – <u>REMEMBER TO WRITE YOUR NAME(S) AND ADD YOUR GROUP MEMBERS TO THE GRADESCOPE SUBMISSION!</u>**

Course Activities

- Midterm Projects (50%) -- 2 of them DUE Feb 28th and Apr 11th at 11:59pm **via Gradescope**
  - Will look like the Homework but slightly beyond what you've already done
  - **Must work/submit individually;** you can work together and with us
  - Encouraged to use the textbook, notes, and other resources when solving the midterms and you can ask any of the teaching staff for help

- Final Exam (30%) -- DUE Friday, May 2nd at 11:59pm **via D2L**
  - Analyze a physical system of your choice and prepare a narrative using Jupyter notebooks
  - Can work in small groups (2-3 people) OR individually
  - **Must submit individually**

Extra Credit Opportunities

- Using iClickers during Class
  - Used in class to gauge your understanding of a topic or concept.
  - Will <u>not</u> be penalized for not knowing the correct answer.
  - Earn up to **1% extra credit to your overall homework grade**

- Attending the Department of Physics & Astronomy Seminar and/or Colloquia
  - Summarize the talk using at least 150 words and turn in your summary along with your homework assignment.
  - Earn up to **5 extra credit points on your homework assignment**

- Completing "Challenge Assignments" on D2L (posted soon)
  - These challenges (5 of them) are designed to aid you in developing a set of skills as you continue to advance in your career.
  - Earn up to **2% extra credit to your overall grade**

Measuring Student Learning
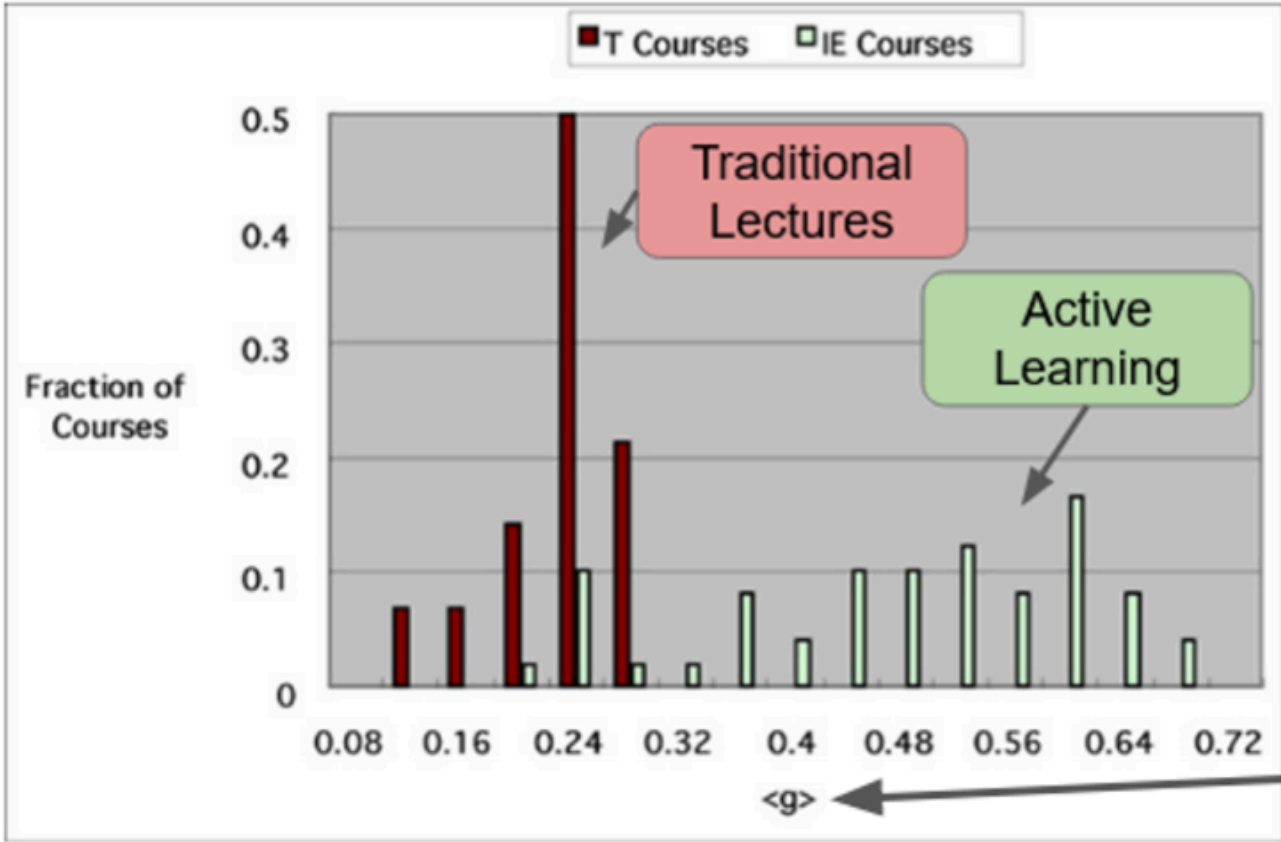
$$<g> = \frac{post - pre}{100 - pre}$$

R. Hake, "…A six-thousand-student survey…" AJP **66**, 64-74 ('98).

Generative AI Policy for PHY 321

- On Friday, we will work together to develop a policy for our class.

- In preparing for that conversation, **please take at least 30 minutes to review the following link.**

  - https://openpraxis.org/articles/10.55982/openpraxis.16.4.777

- If you want more information, there are podcast episodes, videos, etc. posted on course website and D2L as well.

- Ask yourself:

  - What forms of AI use are acceptable to me? Why do I think that?
  - How would I demonstrate that I understand this material (i.e., your work is not just the product of AI)?
  - What forms of documentation should be used to indicate that I used AI tools?
  - When is it unacceptable to me to use AI in this class? Why do I think that?
  - What should happen if someone using AI in this class in a way that I find inappropriate?

Accommodations

If you have a university-documented learning difficulty or require other accommodations, please provide me with your VISA as soon as possible and speak with me about how I can assist you in your learning.

If you do not have a VISA but have been documented with a learning difficulty or other problems for which you may still require accommodation, please contact MSU's Resource Center for People with Disabilities (355-9642) in order to acquire current documentation.

If you need accommodations but do not yet have documentation, please contact me!

Questions?

Think, Pair, Share Activity

- *What are 1-2 things you are excited for this semester?*
- *What are 1-2 things you are nervous/anxious about this semester?*
- *What questions (if any) are still lingering for you?*

- *Think:* Take 4 minutes (I'll set a timer) to document your answers to these questions above
- *Pair:* Discuss your answers with the people around you (5 min).
- *Share:* Turn in your answers (you don't have to put your name on it but you can if you'd like me to know)

Software Set Up

- Double check that you have access to the **D2L** and **Gradescope** webpages

- Download **Python** via the Anaconda distribution (see the "Start Here" folder on D2L for link)

- Set up your **iClicker** account on your smartphone, tablet or laptop (see the "Start Here" folder on D2L for directions)

- Fill out the **Student Information Survey** (see "Start Here" folder on D2L for link)

Next Class (Wednesday 1/15)

- Read **Ch. 3.4** from Mathematical Methods in the Physical Sciences (MLB)
  - MSU library has electronic version (see link on D2L)
  - Download and install Anaconda Python
- Discussion about "Classical Mechanics" and vectors