

# Class 1

- Welcome to my first zoom lecture!
- My name is **Jason Harlow**
- The video of this lecture is available at <https://youtu.be/7XXE8UdRoAw>

Note from Professor Sealfon (a.k.a. “Professor Maple”), the Practicals Coordinator for this course:

- Practicals will start on Friday, Sept. 18; there are *no Practicals* Sept. 10-17.
- Please plan to meet online synchronously for both hours of your first Practical section.



PHY131H1 F LEC0101 20209:Intr...

PHY131H1 F LEC0101  
2020 Fall

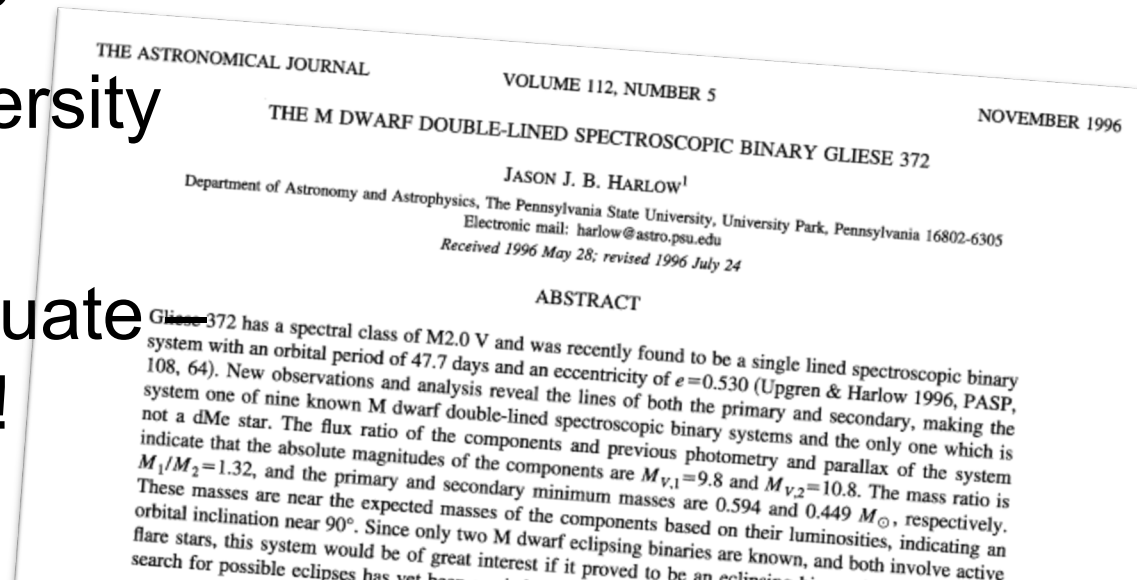


# Today's Outline

- 1. Introductions** – who am I, who are you, what is the Physics Department at U of T?
- 2. Syllabus:** How this course will work
- 3. Demonstration:** rolling balls
- 4. Course content:** Chapter 1, pgs. 1-5

# Who am I?

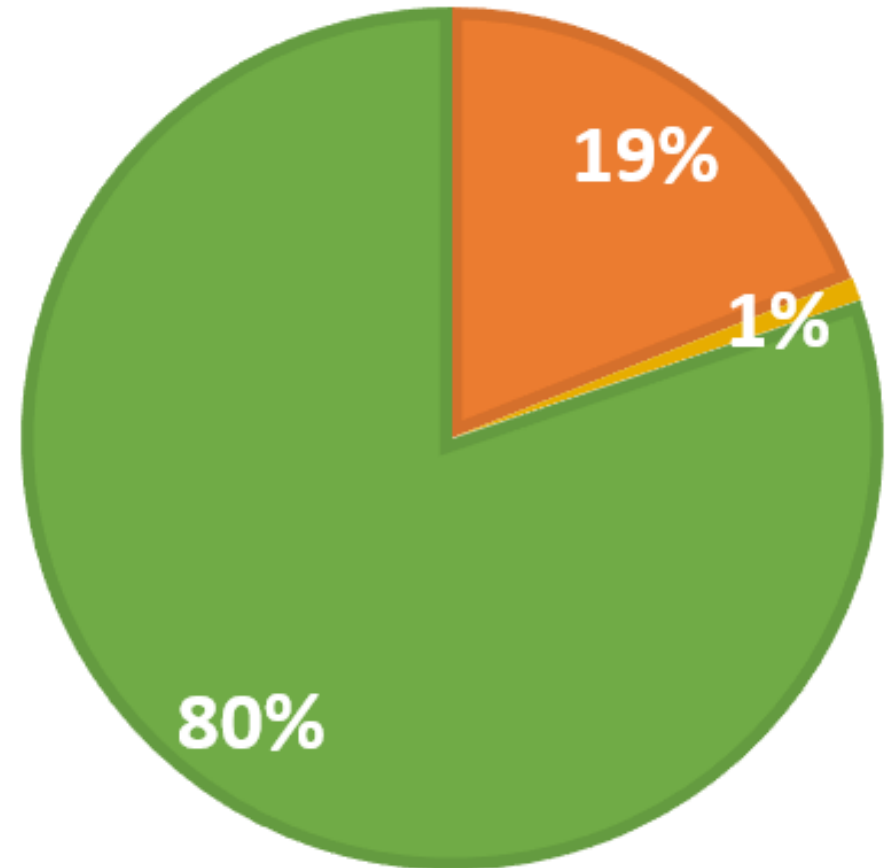
- Jason J.B. Harlow
- Associate Professor, Teaching Stream
- Department of Physics, University of Toronto St. George Campus (since 2004)
- Ph.D. Astronomy and Astrophysics, Pennsylvania State University, 2000
- B.Sc. Physics and Astronomy, University of Toronto, 1993
- I discovered a star as an undergraduate this is what got me into grad school!



# The “Get to Know You Survey”

- Thanks for doing this on Quercus – 595 of you got the 1 “homework credit” for doing this!
- You were asked to drop two fruits: a heavier one, like a grapefruit, and a lighter one, like a grape.
- You were asked: Which fruit hits the floor first?

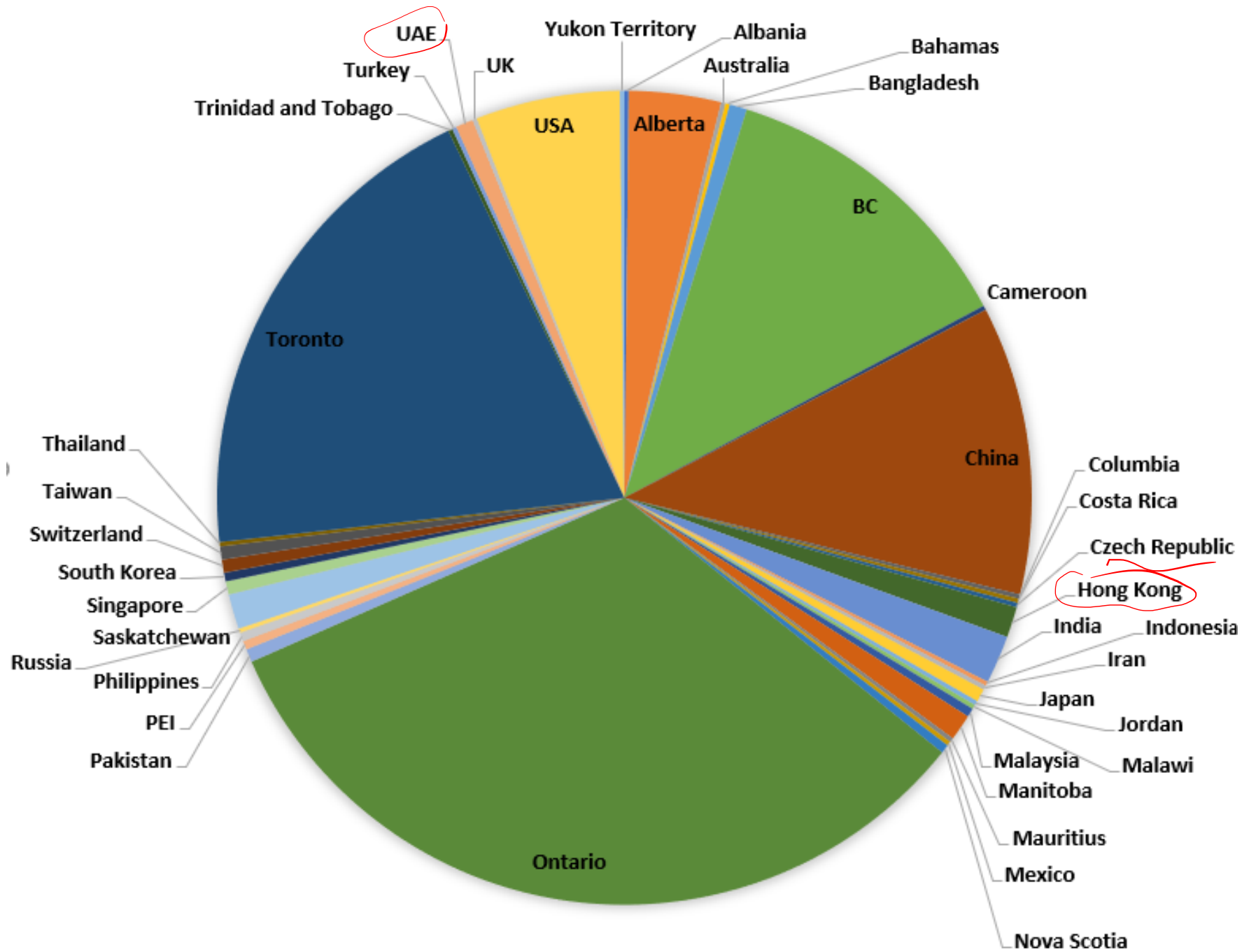
- the heavier fruit
- the lighter fruit
- they hit the floor at the same time (or it's hard to tell)



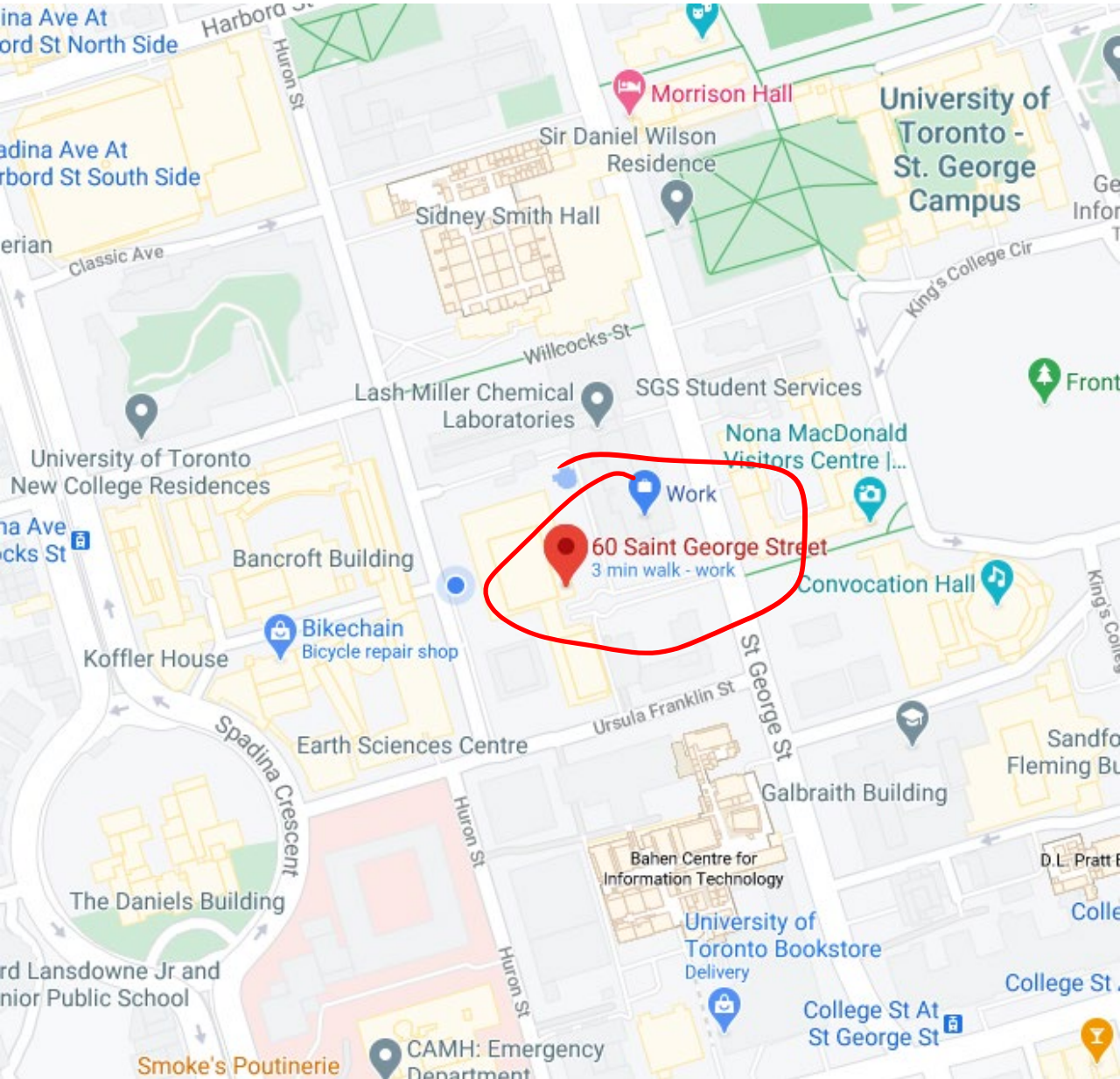
# The “Get to Know You Survey”

- 20% went to high school in Toronto
- 33% went to high school in Ontario, outside Toronto
- 15% Canada outside Ontario (Savana is from Yukon Territory!)
- 11% went to high school in China
- 6% went to high school in the USA
- Minglang, William and Shiyao are from Victoria, BC, which is where I went to high school!
- Khairatun and Ishmam both went to the same high school in Chittagong, Bangladesh
- Antoinette, Eugene, Rachel and Anindita all went to Western Canada High School in Calgary

# WHERE DID YOU GO TO HIGH SCHOOL?



# Where am I?



- McLennan Physical Laboratories (MP)
- 60 Saint George Street
- Room: MP127
- My office is in the same building: MP129E

# Where am I?

MP: 60 Saint George Street





## Poll Question

- What is physics?
  - A. The branch of philosophy that treats first principles, including ontology and cosmology.
  - B. The science of nature and properties of matter and energy, including mechanics, heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms.
  - C. The systematic knowledge of the physical or material world gained through observation and experimentation.
  - D. The science that deals with the composition and properties of substances and various elementary forms of matter.

## Poll Question

- What is physics?
  - A. The branch of philosophy that treats first principles, including ontology and cosmology. [Metaphysics]
  - B. The science of nature and properties of matter and energy, including mechanics, heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms.**
  - C. The systematic knowledge of the physical or material world gained through observation and experimentation. [Science]
  - D. The science that deals with the composition and properties of substances and various elementary forms of matter. [Chemistry]

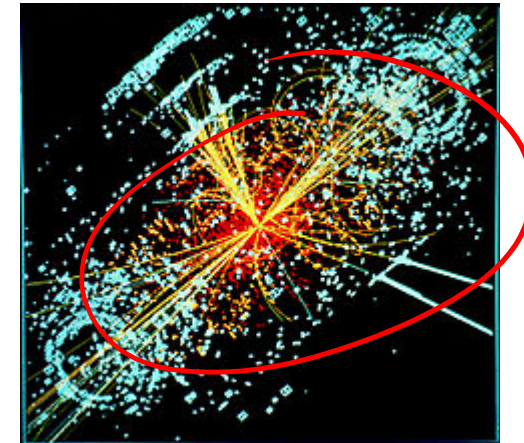
# The Large Hadron Collider



[image from <http://www.universetoday.com/17905/large-hadron-collider-worst-case-scenario/> ]



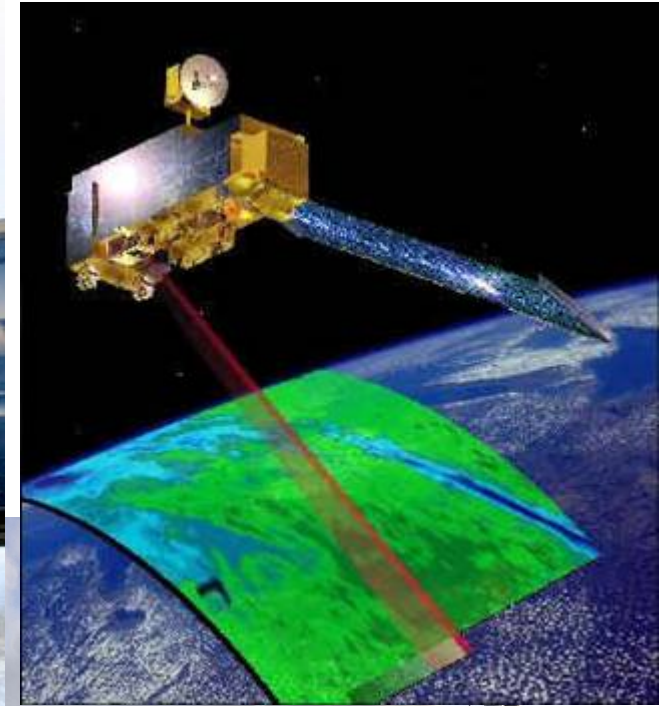
[Photo courtesy of <http://erinjanus.com/the-time-machine-the-most-complicated-thing-created-by-humans/> ]



Achieved 13 TeV collisions  
in June, 2015.

[[http://en.wikipedia.org/wiki/Higgs\\_boson](http://en.wikipedia.org/wiki/Higgs_boson) ]

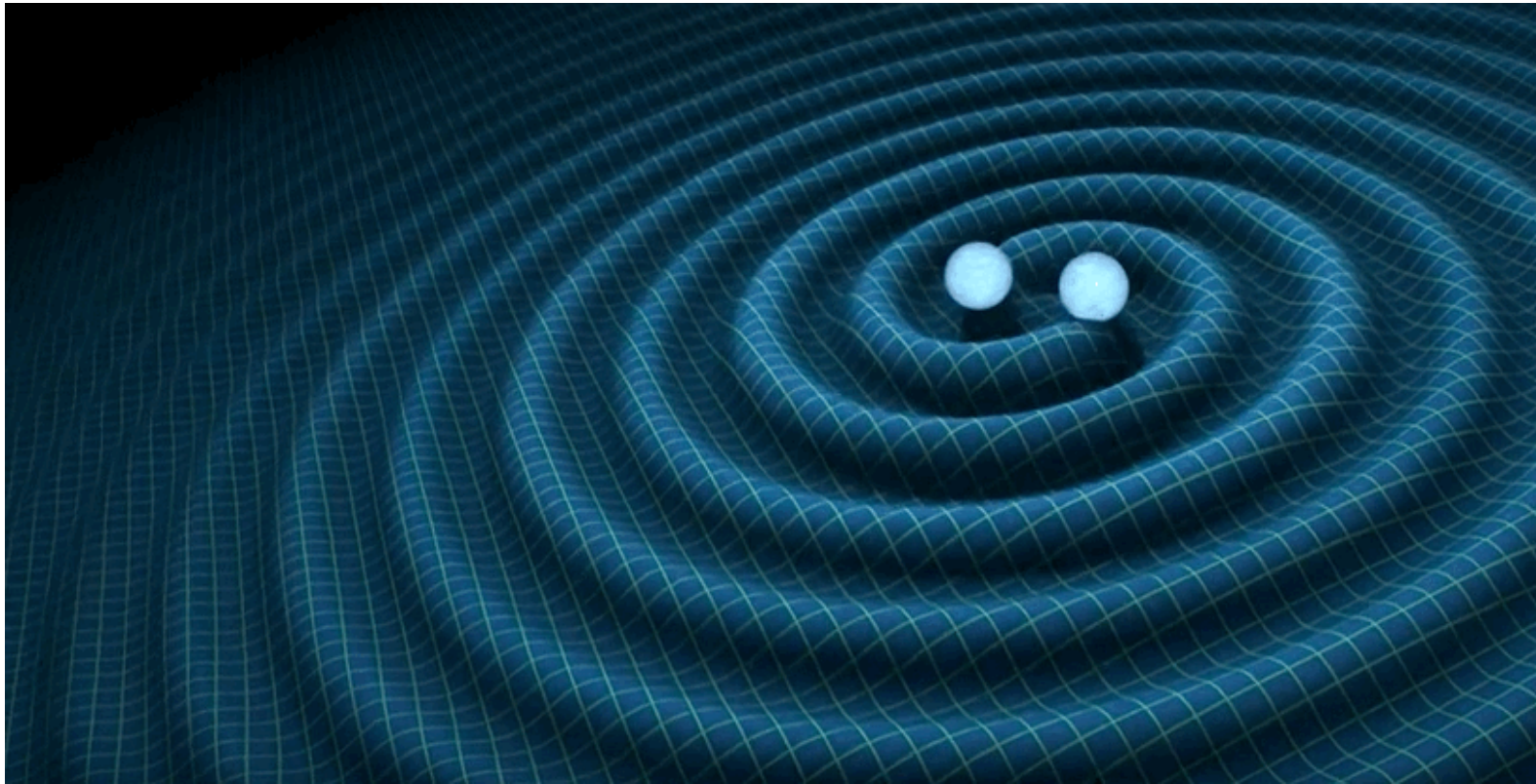
# Atmospheric Physics Research at U of T



# General Relativity: The Theory of Gravity

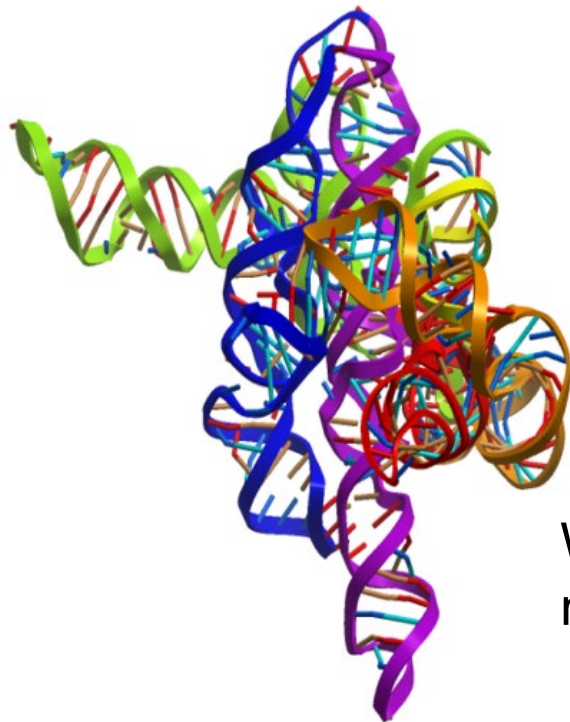
On Feb. 11, 2016, the first detection of gravitational waves was announced.

Two solar mass black holes merged 1.3 billion light-years away, and sent ripples through the fabric of space itself.



# Biological Physics Research at U of T

How do simple creatures like *C. elegans* make decisions?

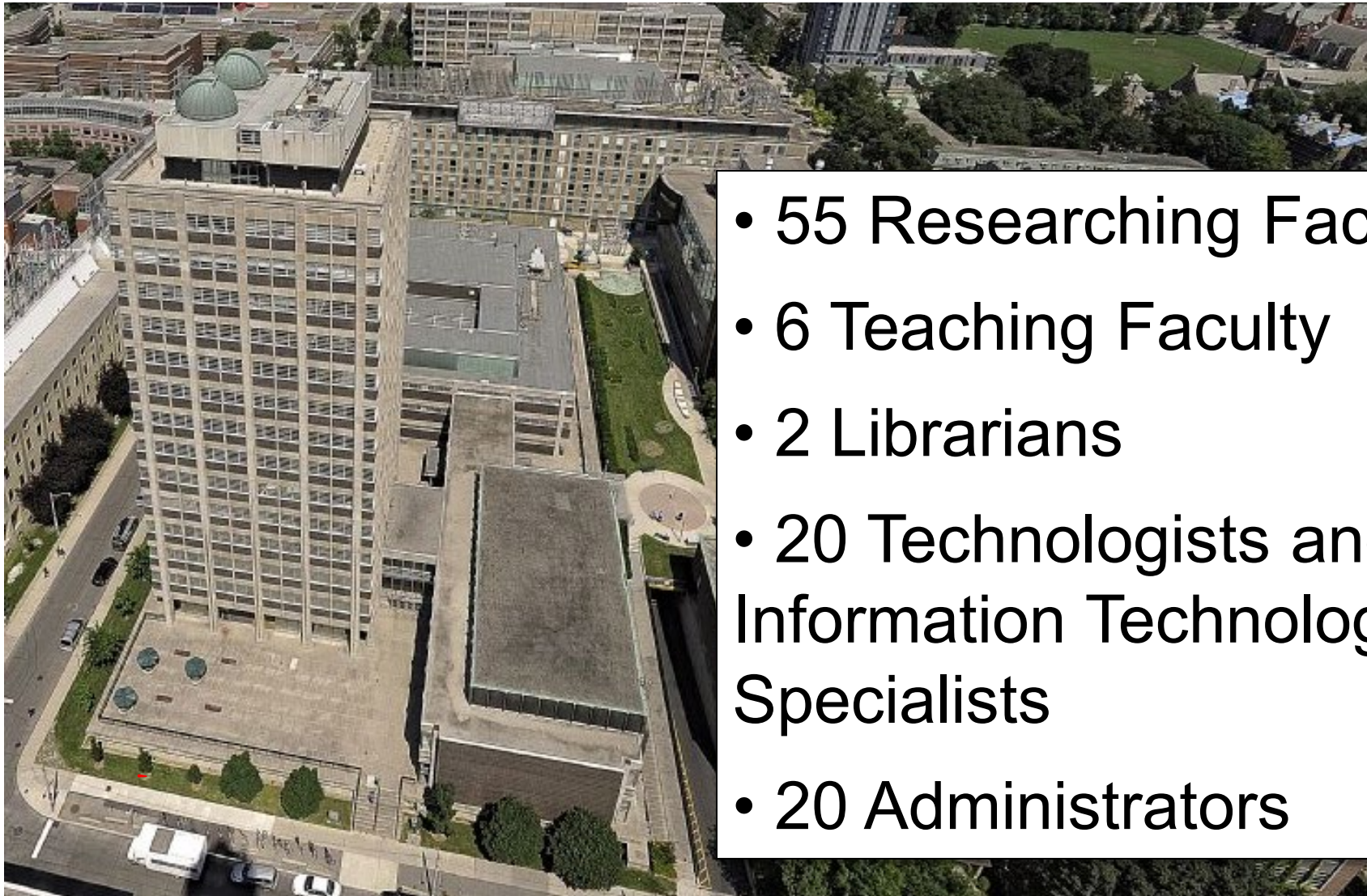


What is the physics behind RNA folding, molecular motors and DNA replication?



# Physics UNIVERSITY OF TORONTO

<http://www.physics.utoronto.ca/>



- 55 Researching Faculty
- 6 Teaching Faculty
- 2 Librarians
- 20 Technologists and Information Technology Specialists
- 20 Administrators

# The Syllabus

- [q.utoronto.ca](http://q.utoronto.ca) (a.k.a. “Quercus”) is the course web-page where everything you need to know is posted.
- PHY131 is an online course intended to give you an introduction to how physicists think, and how we approach problems.
- Physics is one of the oldest sciences, and in some ways it is the most simple.
- Physicists start with a big, messy problem and we first simplify it as much as they possibly can. Only then do we try to analyze the situation.



# The Syllabus

- By the end of this course you will be able to use basic concepts from physics to explain and predict simple situations.
- You will also be able to incorporate physics concepts in order to explain and predict what will happen to messy problems which approximate real life situations.
- You will be able to design experiments for observing physical phenomena. You will be able to propose explanations (hypotheses), and then design and implement testing experiments to test your explanations.

# The Syllabus

## **Required Course Materials:**

- “College Physics: Explore and Apply”, by Etkina, Planinsic, and Van Heuvelen, 2nd Edition, ©2019 by Pearson Education, Inc.
- MasteringPhysics Online Licence (which comes with the textbook when you purchase it through the U of T Bookstore)

# The Syllabus

## Marking Scheme:

- Practicals: **20%**
- Asynchronous Homework Assigned on Quercus:  **$x\%$** , where  $0 \leq x \leq 20$   
depends on earned online homework credits throughout the semester
- Midterm Assessments (best 4 out of 5):  **$(50 - (x/2))\%$**
- Final Assessment:  **$(30 - (x/2))\%$**

# The Syllabus

**Midterm and Final Assessments:** All students must make themselves available for Synchronous Midterm Assessments, on Toronto Time (EDT), five Tuesday evenings.

- **Tue. Sep. 29, 8:10-8:40pm**
- **Tue. Oct. 13, 8:10-8:40pm**
- **Tue. Oct. 27, 8:10-8:40pm**
- **Tue. Nov. 17, 8:10-8:40pm**
- **Tue. Dec. 1, 8:10-8:40pm**

There will also be a synchronous final assessment at a time to be announced during:

- **Dec. 11-22, 2020**

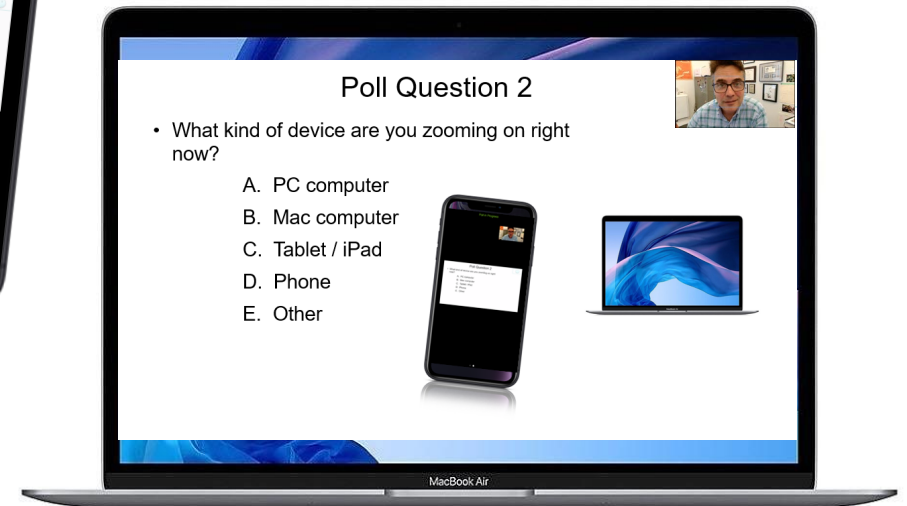
# The Syllabus

- **Midterm and Final Assessments**
- These are challenging online quizzes which will be offered on Quercus for a short duration.
- These quizzes are “open book” – you may use the textbook, course lecture notes, google-searches, etc, as resources.
- You must work on these quizzes *individually*. You may not receive real-time help from any other person, and you may not participate in any form of real-time discussions with others about the quiz while you are completing it.
- The format of the quiz will be a series of multiple-choice and short-answer questions delivered on Quercus using the Quiz function.
- Questions will be delivered to each student in a random order, and the questions must be done one at a time.
- Once you submit a question, you will see the next question; you will not have the ability to change any answer after it has been submitted.

# Poll Question 1

- What kind of device are you zooming on right now?

- A. PC computer
- B. Mac computer
- C. Tablet / iPad
- D. Phone
- E. Other



# Device I recommend

- Starting next week, I recommend you use a **computer** (PC or Mac) with a good internet connection.
- This is preferable for MWF11 classes, as we may be opening up a second window outside of zoom for breakout discussions – not possible on a single phone.
- This will be ***required*** for Practicals, during which you will be presenting to your peers in small groups (starting Sep.18).
- In Practicals you will need a working microphone, a camera, and a quiet space free from other noise but where you feel comfortable speaking.



Zoom  
App

# How To Zoom....

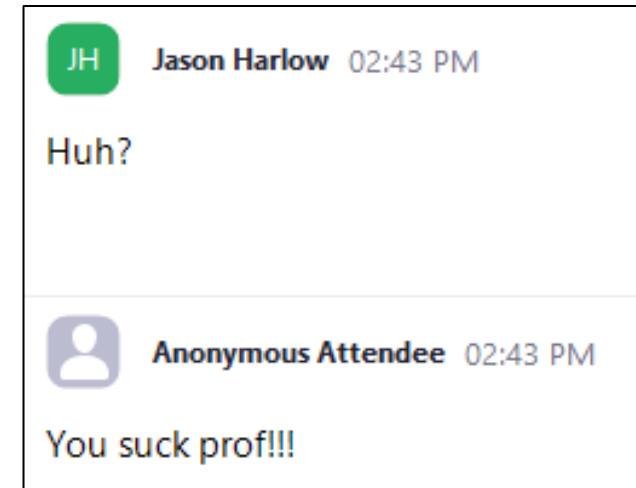
- We are running zoom in “webinar” mode.
- You are currently muted and your video is off – I cannot hear or see any of you, but I can see a list of your names – you are “**Attendees**”, I am a “**Panelist**”.
- There are a few ways you can interact with me during these classes.
- But first, a warning: There are 993 students enrolled in this course, and only one lecturing professor (me) – so I may not be able to truly react to you if you try these.
- But it never hurts to try – I welcome any feedback you send me!





Zoom  
App

- How to try to get my attention:
  1. Click **Raise Hand**. If I see a raised hand, I assume that means you would like me to unmute your microphone to ask a question. Once I have heard your question, I'll mute you again. Please don't forget to **Lower Hand** if you don't want to talk again.
  2. Type in the Q&A – this can be done with your zoom name, or you can click “Send anonymously”, and I won't know who you are!!
  3. Type in the “Chat” – this is set to go only to “All Panelists”, which means me. Only I will see what you chat, so it's really no better than Q&A.



# Chapter 1

Observational Experiment

play! use your curiosity.

Hypothesis

description of why you observe what you did.  
Make a prediction.

Testing Experiment

Be a skeptic

Application Experiment

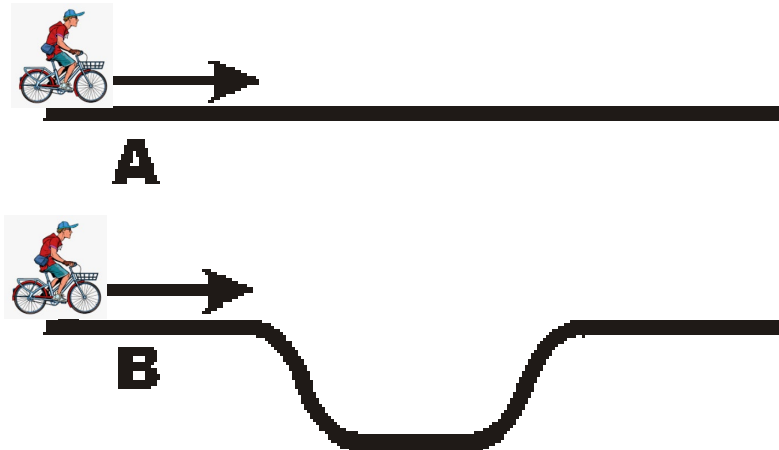
Help make the world a better place.

Repeat until you know what's going on.

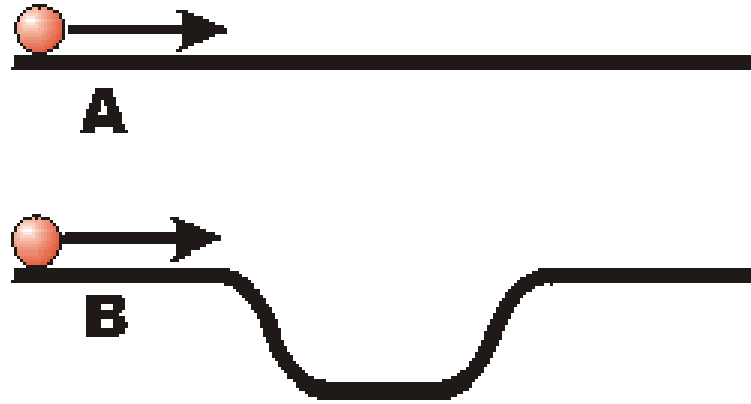
Modelling reality to simplify things.

# Demonstration

- Here is a real-life problem I considered just this morning.
- I am riding my bike along a road, which *splits*.
- One path goes straight ahead (A).
- The other goes down and up (B).
- If I do not peddle, and there is very little friction, which path gets me to the other side in the least time



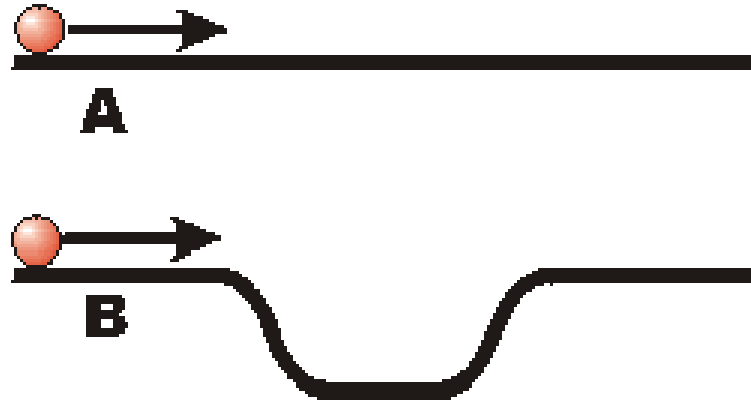
# Poll Question



Two balls are launched along a pair of tracks with equal velocities, as shown. Both balls reach the end of the track. *Predict*: Which ball will reach the end of the track first?

- A
- B
- C: They will reach the end of the track at the same time

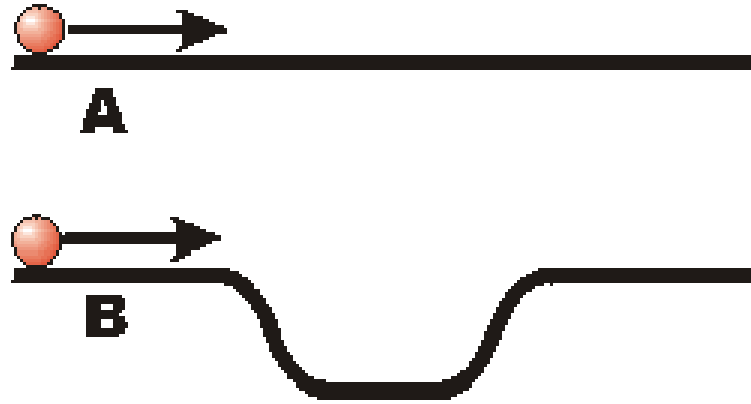
# Poll Question



Demo: Two balls were launched along a pair of tracks with equal velocities. Both balls reached the end of the track. *Observe*: Which ball reached the end of the track first?

- A
- B
- C: They reached the end of the track at the same time

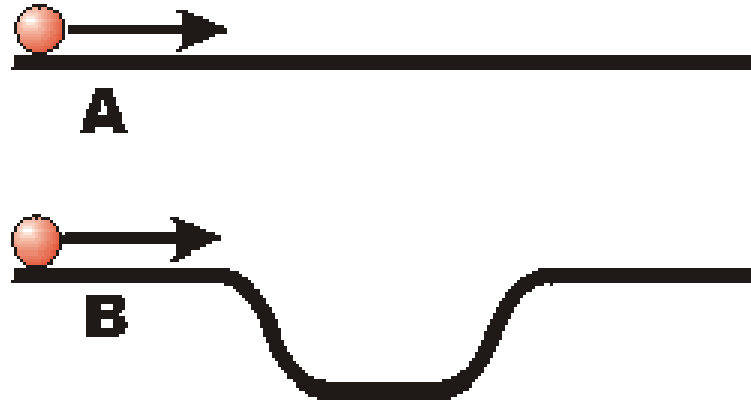
# Poll Question



Demo: Two balls were launched along a pair of tracks with equal velocities. Both balls reached the end of the track. *Observe*: Which ball reached the end of the track first?

- A
- ✓ • B **B always wins.** This does not depend on the exact shape of the track.
- C: They reached the end of the track at the same time

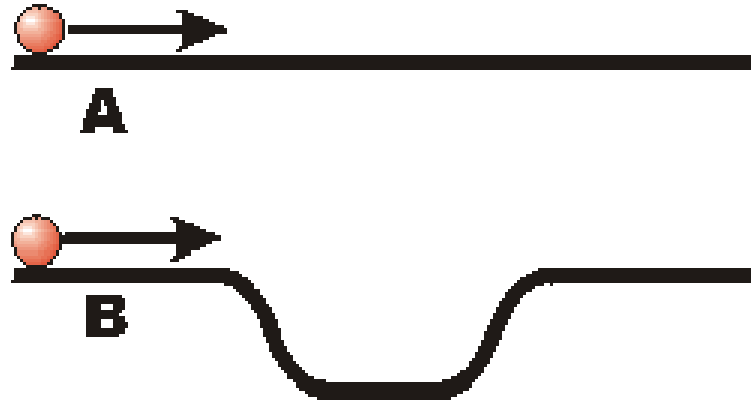
# Poll Question



Explanation: *Why* does ball B reach the end of the track first?

- A. Ball B is always traveling faster than ball A, so it reaches the end of the track first.
- B. Balls A and B start and end with the same speed. But while ball B is on the lower part, it is going faster than ball A because gravity has sped it up. Its *average* speed is greater, so it gets there first.
- C. Ball B travels a shorter distance than ball A.
- D. Ball B travels a longer distance, but is pulled faster by an extra force we cannot know about.
- E. The observation is flawed – ball B should not reach the end first.

# Poll Question



Explanation: *Why* does ball B reach the end of the track first?

- A. Ball B is always traveling faster than ball A, so it reaches the end of the track first.
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- E. The observation is flawed – ball B should not reach the end first.



# Poll Question

- Have you registered for a weekly 2-hour Practical (PRA) section yet?
  - A. Yes, and I'm looking forward to it!
  - B. Yes, but I am hoping to change the time of my Practical.
  - C. No, not yet!

[Practicals](#)

[MyLab and Mastering](#)

[Grades](#)

[Modules](#)

[Library Resources](#)

[Piazza](#)

[PRA Change/Registration Form](#)

☰ [PHY131H1 F LEC0101](#) > [Announcements](#) > [PRA Change/Registration Form](#)



[PRA Change/Registration Form](#)

[April Seeley](#)

[All Sections](#)

The link on the left hand side called PRA Change/Registration form is to be used only if you need to change your practical section permanently from the one you enrolled in on ACORN or if you do not have a practical section chosen yet on ACORN. Do not use if you are happy in the practical section you are in.

# PRACTICALS

- Practicals will start on Friday, Sept. 18; there are (were) no Practicals Sept. 10-17.
- Please plan to meet online synchronously for both hours of your first Practical section.
- You will meet for once per week in zoom or Microsoft Teams room with a maximum of about 18 students
- You will have a Teaching Assistant (TA) who will be there to help you all semester. They will be a graduate student, currently working on a Masters or Ph.D. in physics.
- You will work on activities in teams of 3 or 4.

## How to get more information

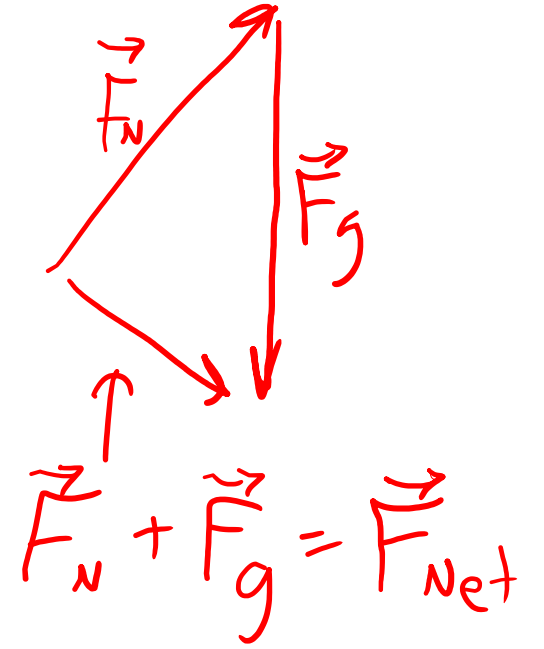
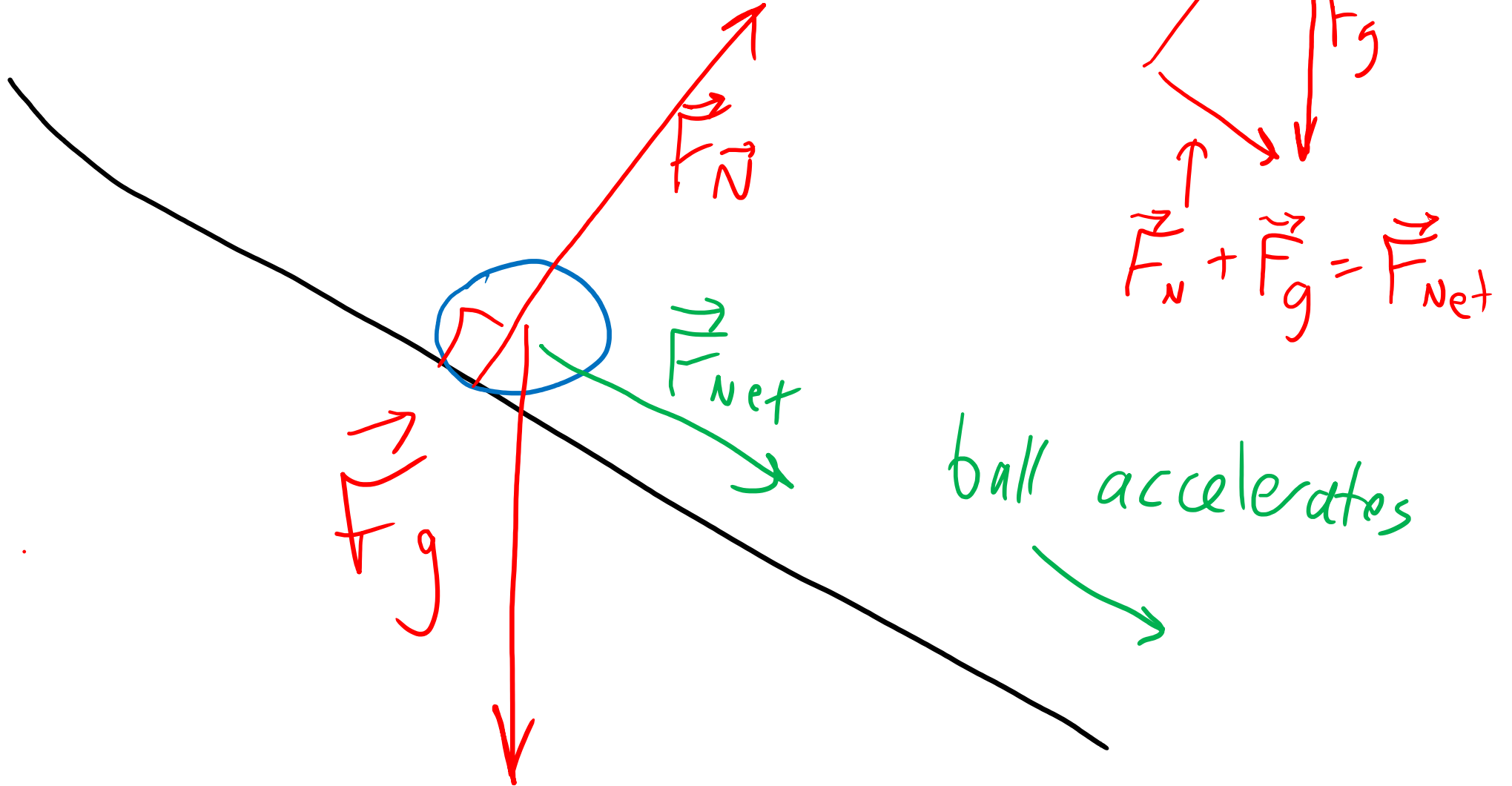
- The main way of keeping up with what's going on in the course is the web-site at:

<https://q.utoronto.ca>

- The Syllabus on the portal page for this course has all the rules for the course – PLEASE READ IT!
- Also, we will email you from time to time at your @mail.utoronto.ca email address

- Monday's reading assignment is **Chapter 1** of Etkina, plus Chapter 2, Section 2.1 What is motion? And Section 2.2 Representing Motion with Diagrams.
- Until 12:30 I will be in my gather.town "office hour" – you can find the link on the Announcement from yesterday on the course page.
- Have a great weekend!!

Q: Why does a ball speed up as it rolls down the hill?



ball accelerates

Q: Why does ball B *always* win, no matter what the shape of the bottom track?

