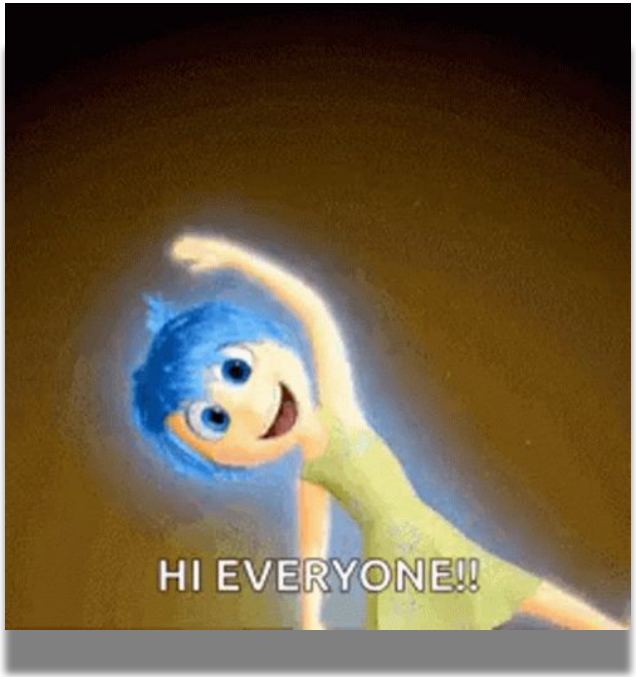
# Icebreaker!

USCMS PURSUE Internship 2024

Matt Bellis, Sudhir Malik, and Julie Hogan

SIENA college
Physics and Astronomy

# Let’s introduce ourselves!




# Name / Pronouns

# What school do you go to?

# Major and year (e.g. junior)

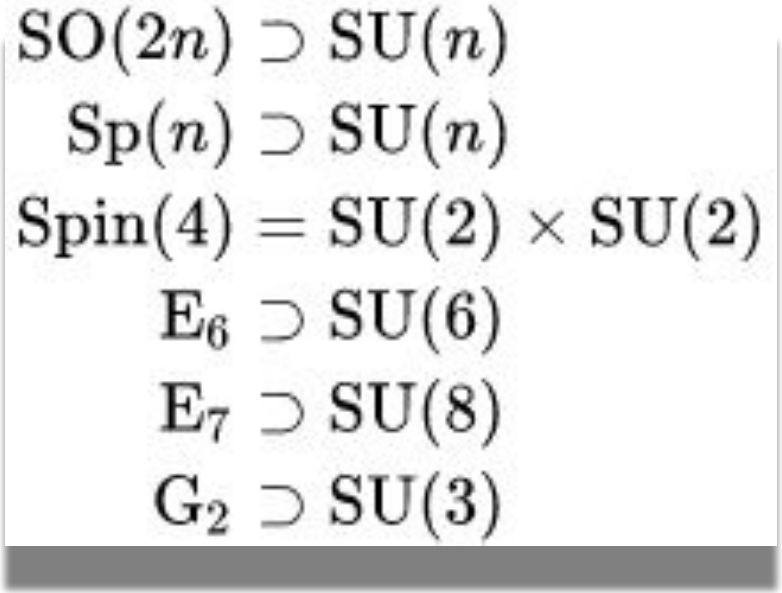
# Something you’re into that is not physics

# Let's break up into groups!

## Introduce yourselves

## What is the best food that your college town / state has?

## Is a hot dog a sandwich?




Someday this joke will be funny to you. :)

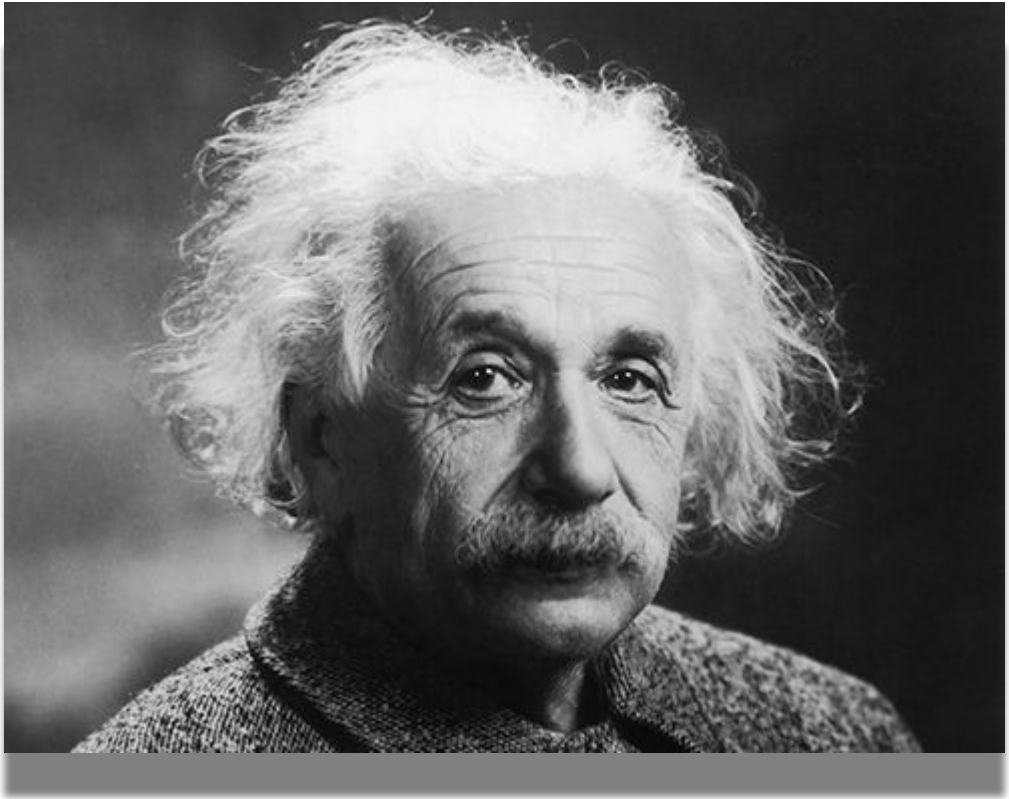
# Pick a team name


TRIVIA
night


TRIVIA
Morning

Question #1 1 point

# Who is this person?



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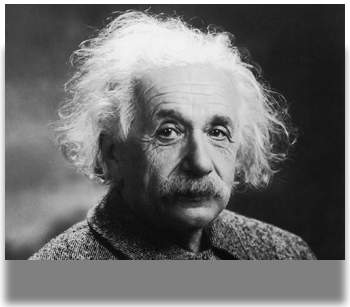


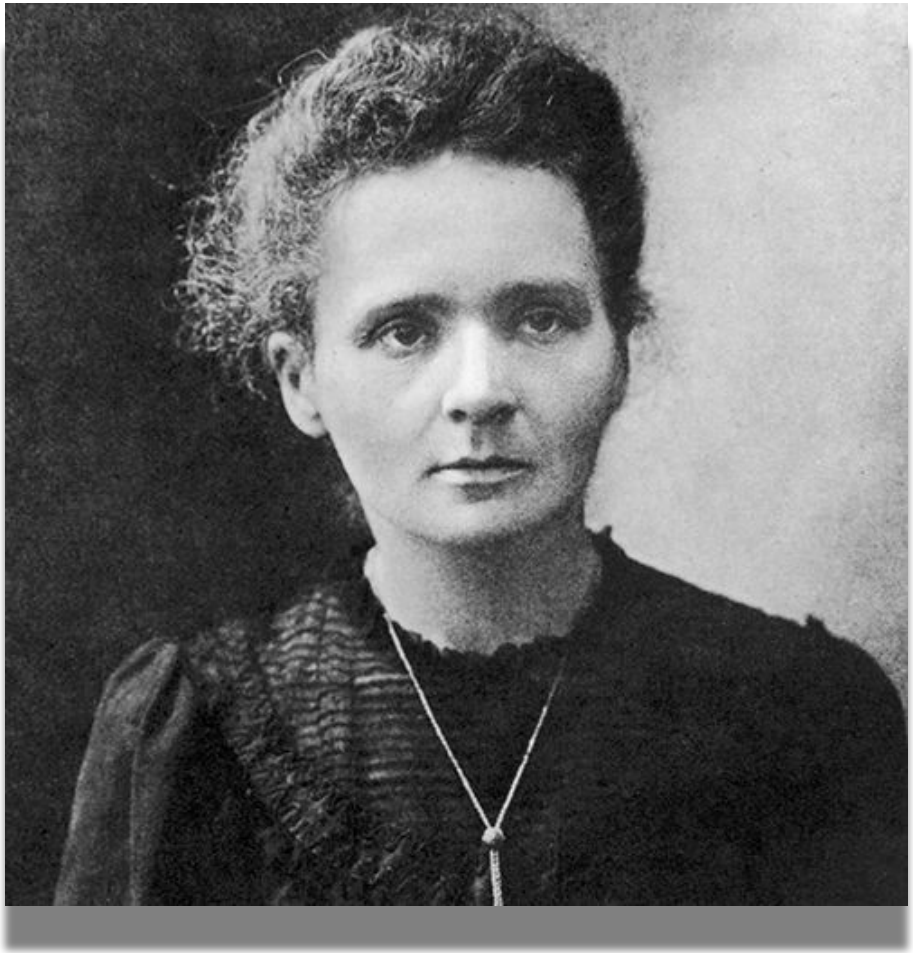
**Albert Einstein**

1905
- Special relativity
- Photoelectric effect
- Brownian motion (atoms)

1915
- General relativity

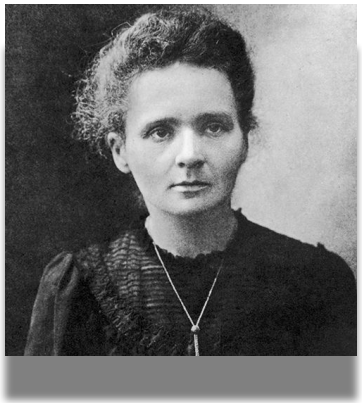
Question #2 2 points

# Who is this person?



Question #2 2 points

# Who is this person?



**Marie Curie**

Nobel Prize in Physics (1903) for radioactivity

Nobel Prize in Chemistry (1911) for discovery of radium and polonium

**Only person to win 2 Nobel Prizes in 2 different fields!**

Question #3 5 x 2 points

# Who is this person?

# Stage name (5 pts)

# Real name (5 pts)

Question #3 5 x 2 points

# Who is this person?


**Mr. Beast (James Donaldson)**

“an American YouTuber and philanthropist. He is credited with pioneering a genre of YouTube videos that centers on expensive stunts.[5] With over 150 million subscribers as of May 2023,[6] he is the most-subscribed individual user on the platform and the third-most-subscribed channel overall.” - Wikipedia

Question #4 5 points

# What is the mass of the Higgs boson?

Question #4 5 points

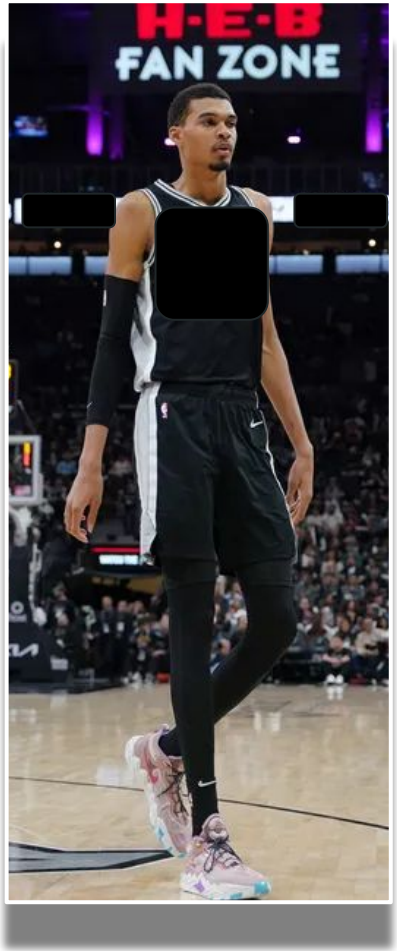
# What is the mass of the Higgs boson?

$125\ \mathrm{GeV}/c^2$

Question #5 3 points x 3

# What teams/clubs do these folks currently play for?

# (3 points for each)





Question #5 3 points x 3

# What teams/clubs do these folks currently play for?

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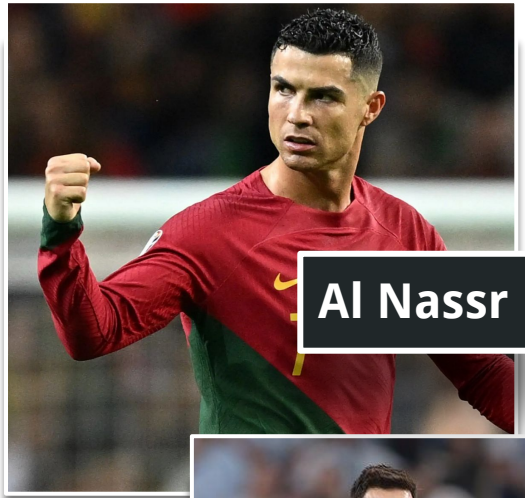
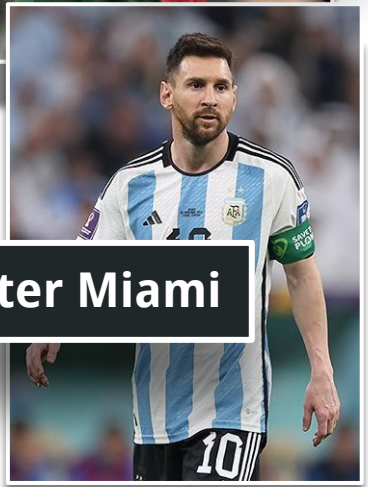
**Bonus!!!! Which one recently discussed dark matter? (5 extra points?)**


San Antonio Spurs



Al Nassr



Inter Miami

Question #5 3 points x 3

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## Video: Victor Wembanyama Gives Science Lesson on Dark Matter After NBA ROY Ceremony

TIMOTHY RAPP

MAY 11, 2024

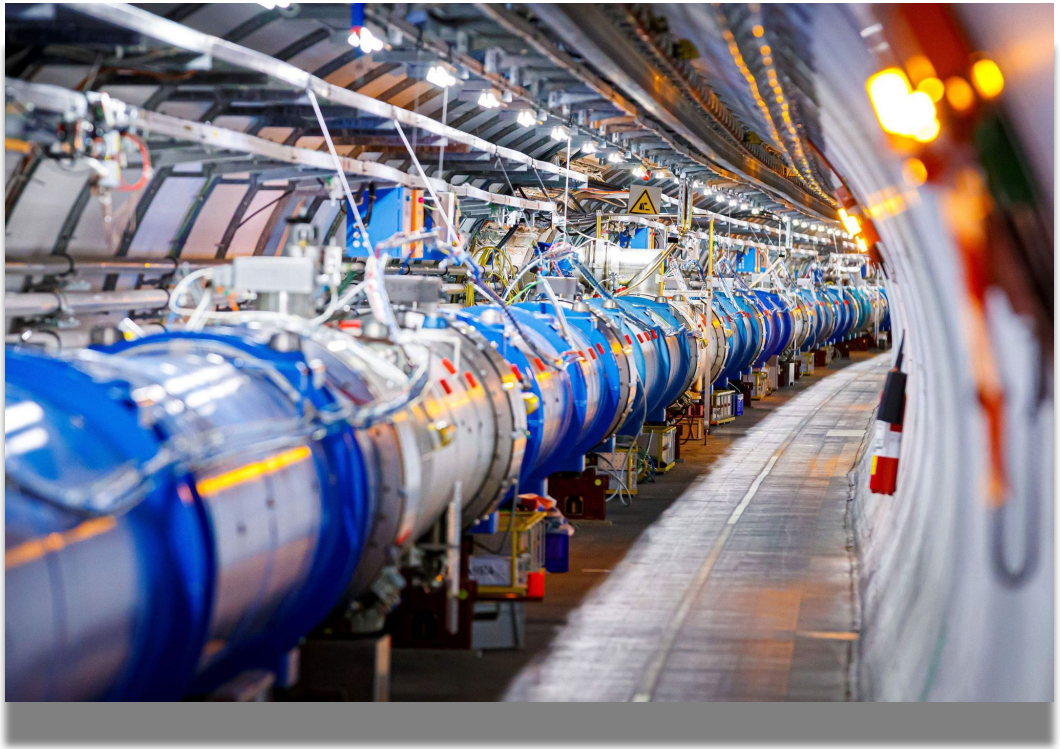

SUZANNE CORDEIRO/AFP via Getty Images

Link

Question #6 5 points

# What do we collide at the Large Hadron Collider?

(no, it is not *large hadrons)*



Question #6 5 points

# What do we collide at the Large Hadron Collider?

(no, it is not *large hadrons)*

Protons

Gluons and / or quarks is also acceptable

Question #7 2 points x 8

# What does LGBTQIA2S stand for?

# (2 pts for each word)

Question #7 2 points x 8

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# (2 pts for each word)

**5 bonus points for explaining what it means if someone is**

- **ace aro**
- **enby**

**L**esbian
**G**ay
**B**isexual
**T**ransgender
**Q**ueer or **Q**uestioning
**I**ntersex
**A**sexual, **A**gender, **A**lly
**2S**pirit

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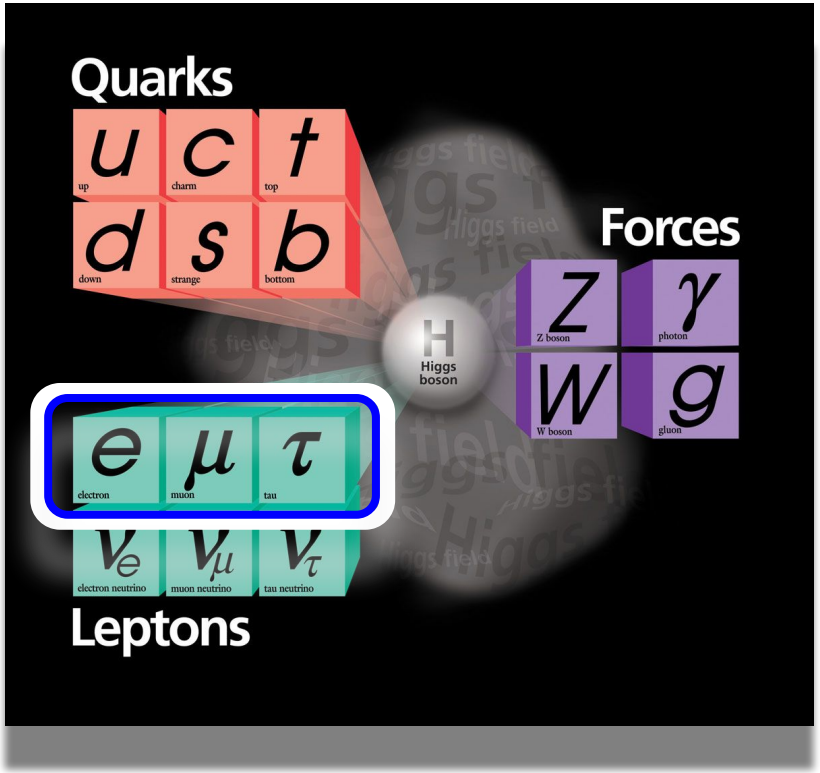
Ace aro → Asexual, aromantic
Enby → NB, non-binary

Question #8 5 points

**Electrons** are a type of particle called a **lepton**. These are particles that do *not* interact with the strong nuclear force, the force that binds quarks together inside of protons.

Some **leptons** have positive or negative electric charge: **electrons**, **muons**, and **taus**.



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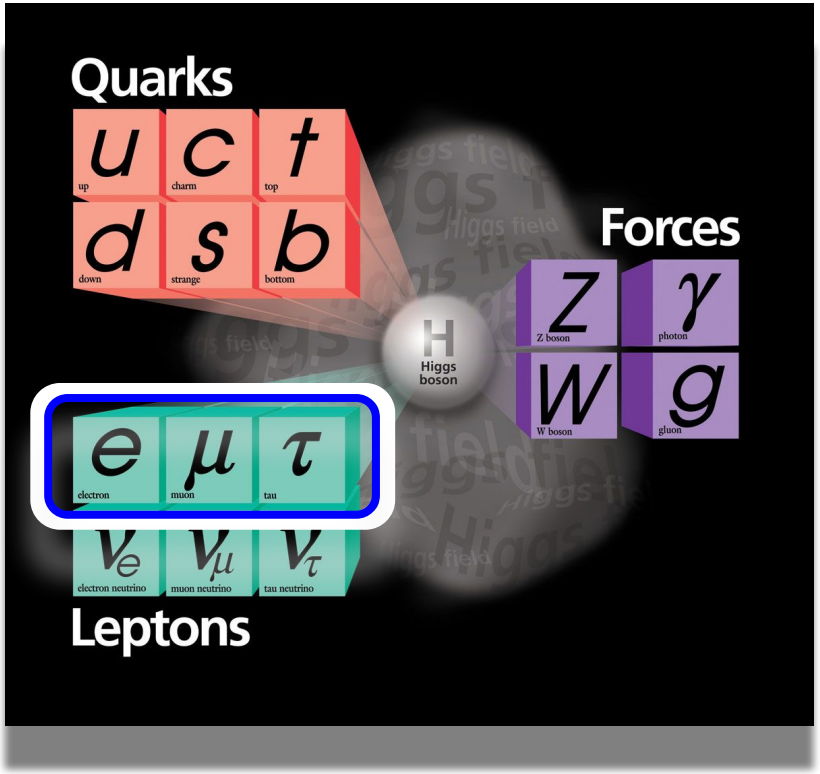


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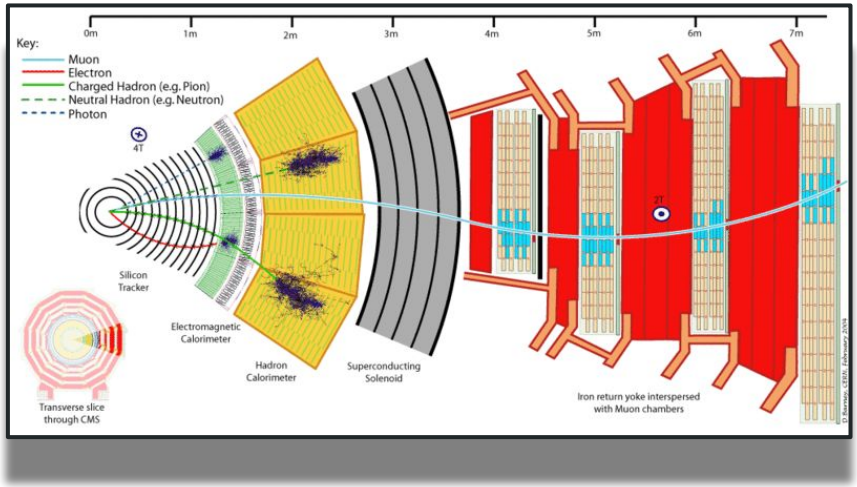
## Which **lepton** is trying to improve its jawline?

Question #8 5 points

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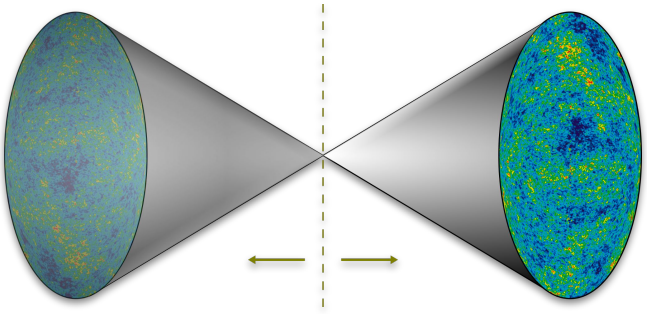
The **mew-on**!

**Which lepton is trying to improve its jawline?**

## Question #9 5 points



**Antimatter** is just like regular **matter**, except it has an opposite electric charge.

For example, **electrons** are negatively charged and **anti-electrons** (**positrons**) are positively charged.

We can make **antimatter** in our labs.

It is believed that in the earliest stages of the universe, there were equal amounts of **matter** and **antimatter**.

However, all we see in the universe is **matter**!

Scientists are trying here did the antimatter go?

PRESSCUT-2001-064

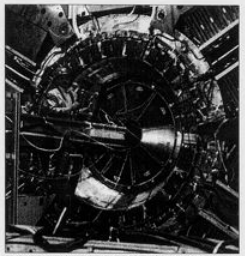
NEWS AND ANALYSIS

# Where did all the antimatter go?

Measurements of B mesons confirm that the Standard Model of particle physics cannot explain why the universe is made of matter rather than antimatter. **Peter Rodgers** reports

One of the biggest mysteries in physics is why the universe is made entirely of matter, even though equal amounts of matter and antimatter should have been created during the big bang. All the matter and antimatter particles should have annihilated with each other since then, leaving only photons, but somehow one matter particle in a billion or so has survived to create the universe as we know it. Physicists at the BaBar experiment at Stanford in the US and the Belle experiment in Japan have now, for the first time, directly measured the amount of matter–antimatter asymmetry allowed by the Standard Model of particle physics.

"The result determines directly for the first time the magnitude of the fundamental matter–antimatter asymmetry in nature," says Paul Harrison of Queen Mary College



What difference does it make? – the BaBar detector

The type of CP violation observed at BaBar and Belle results from the interference of decays with and without mixing. While it is extremely demanding to measure this form of violation – the B mesons only survive for about $10^{-12}$ seconds – it is straightforward to relate the results to the fundamental matter–antimatter asymmetry.

**Beyond the Standard Model**

The next big challenge for both teams is to measure CP violation in the decay of the B meson into particles called pions. This would measure another angle, $\alpha$, in the unitarity triangle to test the internal consistency of the Standard Model.

"If we get lucky," says Harrison, "we might find a flaw in the Standard Model, since the dominance of matter in the uni-

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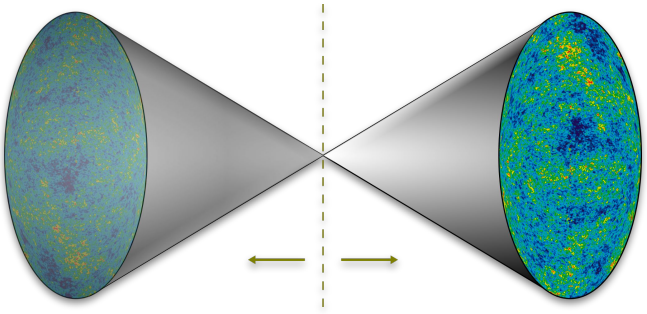

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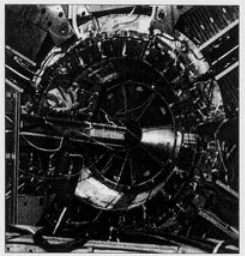

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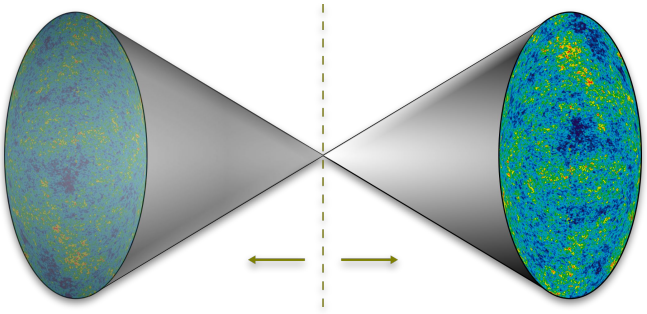
One could ask, who _____ taxed the **antimatter**?

## Question #9 5 points



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Question #10 5 points

In 1924, *100 years ago*, Louis deBroglie postulated that matter has wave-like properties.

Who has the most centuries?

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Who has the most centuries?

Sachin Tendulkar

Question #11 3 points x 3

# K.Dot and Aubrey are ____-ing

- Who is K.Dot?
- Who is Aubrey?
- What are they doing?

Question #11 3 points x 3

# K.Dot and Aubrey are ____-ing

- Who is K.Dot? Kendrick Lamar
- Who is Aubrey? Drake
- What are they doing? Beefing

Question #12 5 points x 2

If you're hanging out at the LHC, what lab are you at?

If you're hanging with blue tie, white shirt, and tomato kid, where are you?

Question #12 5 points x 2

If you're hanging out at the LHC, what lab are you at?


CERN

If you're hanging with blue tie, white shirt, and tomato kid, where are you?

TikTok rizz party

Question #13 3 points x 3


Large language models (LLMs) like ChatGPT are a type of machine learning.

These products are sometimes called AI or artificial intelligences.

LLMs work by trying to guess the next word in a sequence of words based on previous texts.

For example, "sharp" is more likely to be followed by "knife" or "teeth" than "pillow".

*At the end of the day, they're just making predictions of what you would expect to hear.*

Question #13 3 points x 3

What words would you expect to next appear in the following phrases?

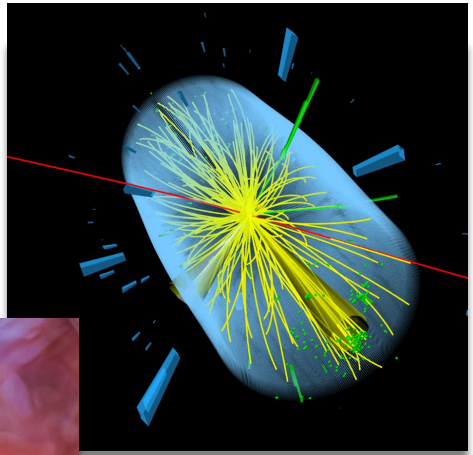
“At CMS we study decays of the Higgs _____”

“Should we get tickets to the Eras _____ ”

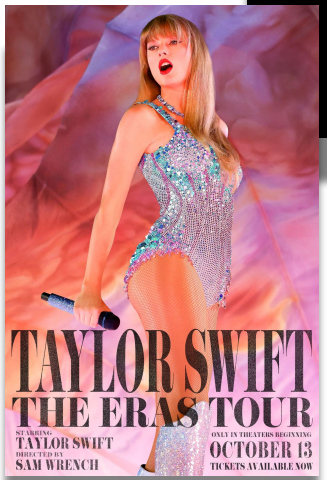
“Skibidi _____ ”

Question #13 3 points x 3

**What words would you expect to next appear in the following phrases?**



“At CMS we study decays of the Higgs boson/particle”



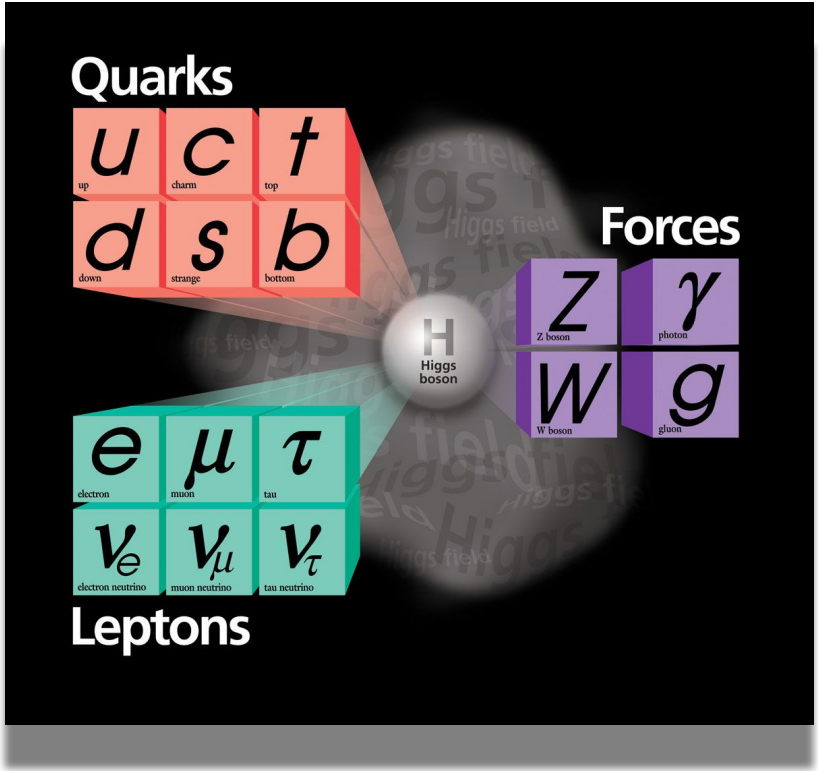

“Should we get tickets to the Eras tour ”

“Skibidi toilet ”

Question #14 5 points

A mystery is why there seems to be three (3) generations of quarks and leptons.

Quarks are subatomic particles that protons and neutrons (as well as other particles) are made of and leptons are a class of particles that electrons, neutrinos, and other particles are a part of.



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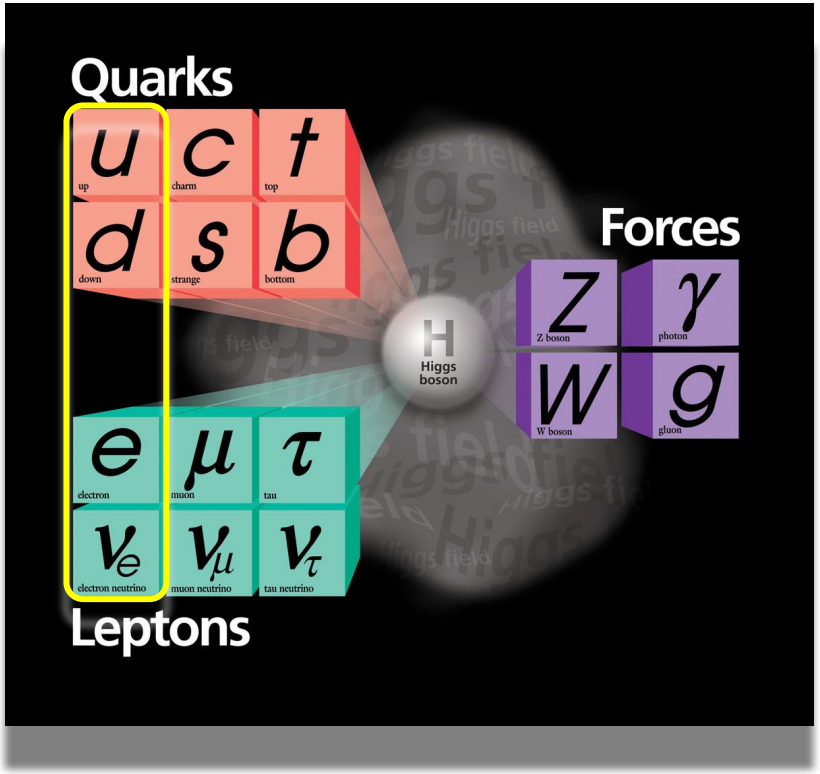

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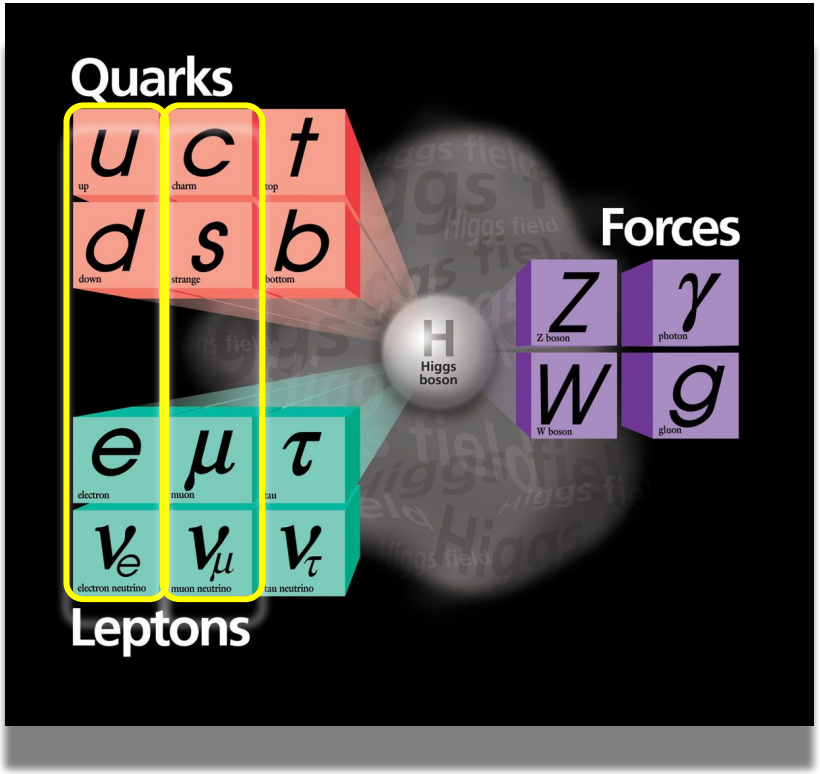

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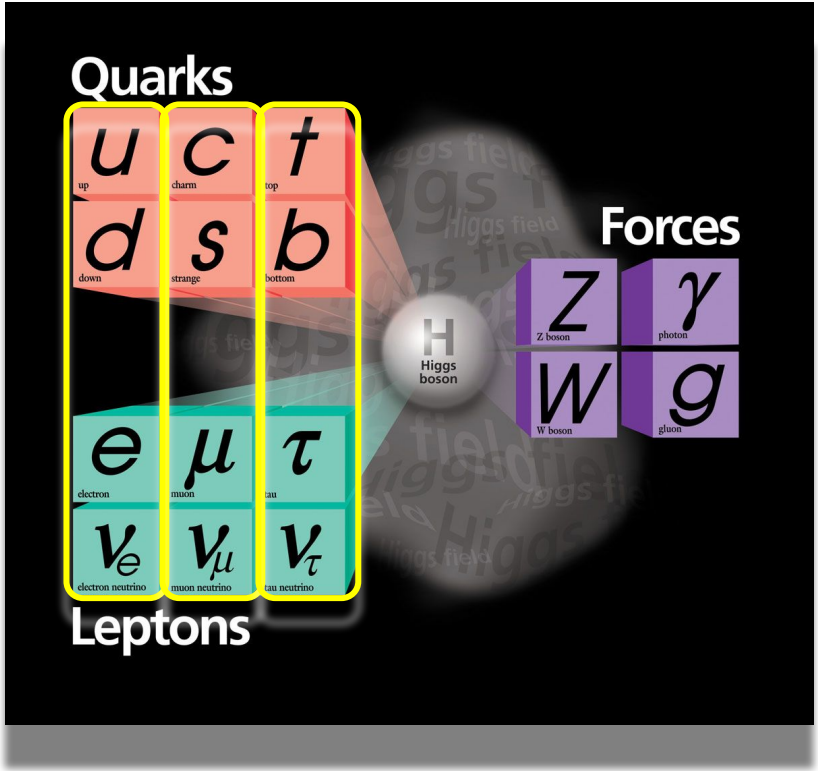

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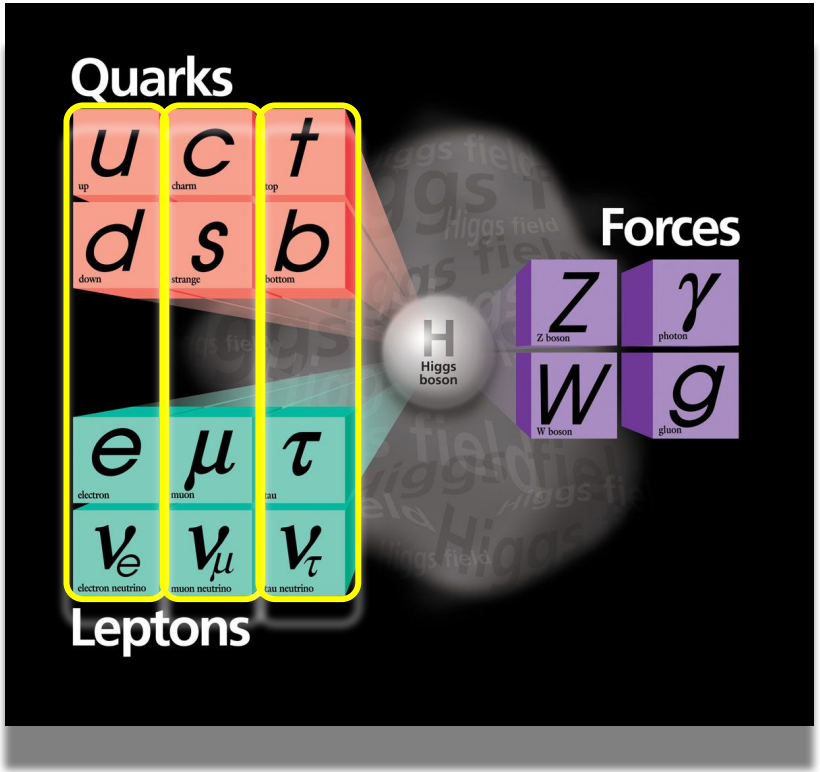
Quarks are subatomic particles that protons and neutrons (as well as other particles) are made of and leptons are a class of particles that electrons, neutrinos, and other particles are a part of.

Who holds the record in women's college basketball for 3pt shooting and is also the all-time points leader (men *or* women)?



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Who holds the record in women's college basketball for 3pt shooting and is also the all-time points leader (men *or* women)?

Caitlin Clark

Question #15 10 points x 2

# Fill in the blanks

“My friend Jennifer’s _____ is probably a 4b or 4c.

Her _____ always suggests a relaxer but she is not interested in that.”

Question #15 10 points x 2

# Fill in the blanks

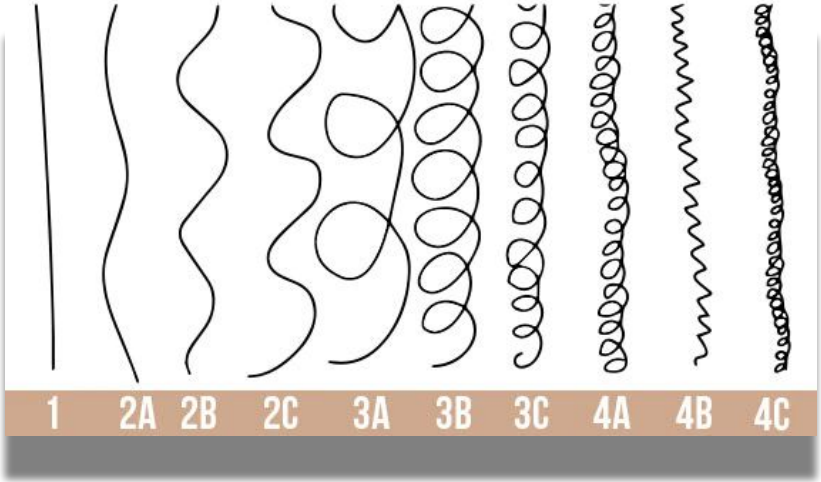
“My friend Jennifer’s _____ is probably a 4b or 4c.

hair

Her _____ always suggests a relaxer but she is not interested in that.”

hairdresser

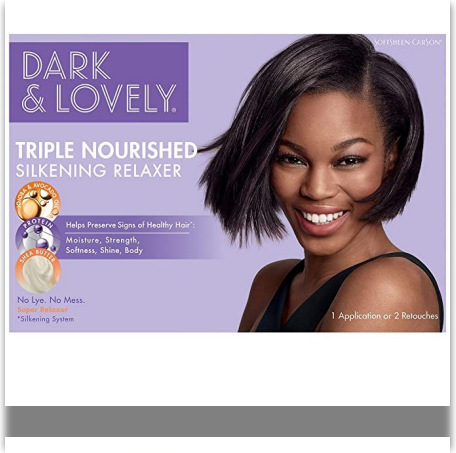
People’s hair can be classified by how kinky it is

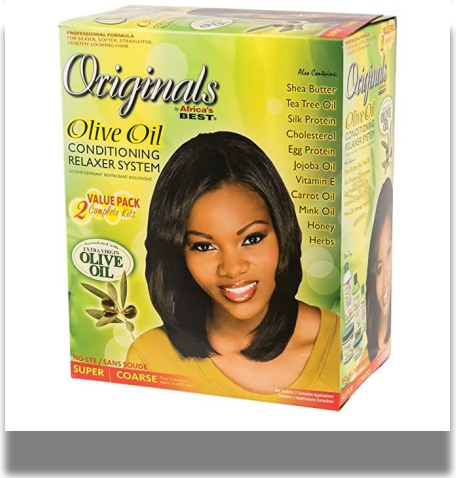



A *relaxer* is a hair product that uses a fairly harsh chemical process to straighten hair out.

This can be perceived as trying fit it with White expectations of beauty.

This probably oversimplifies the situation for most Black women…but most have given it some (a lot?) thought

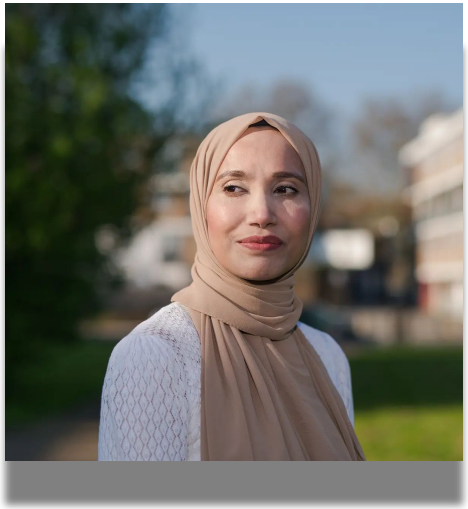


There are different expectations on all of us as to how we should look or behave in society, school, and the workplace

Some people can move through their day without ever thinking about these expectations

Other people make a choice every day that will affect how others perceive them



# Further reading

https://naturalhair.org/blogs/news/what-are-3c-4a-and-4c-hair-types

https://www.teenvogue.com/story/a-brief-history-of-black-hair-politics-and-discrimination

https://www.thezoereport.com/beauty/politics-of-black-hair-crown-act-holly-mitchell-ayanna-pressley-jalina-porter

https://daily.jstor.org/how-natural-black-hair-at-work-became-a-civil-rights-issue/

Matt, you seem to be trying to make a point here

# There is a difference between knowledge and intelligence

You are *all* intelligent people

You are here to gain knowledge…and that takes *time*

Not knowing something doesn’t make you stupid

It just means you haven’t encountered the information

*Mentors, remember this!*

Nothing is trivia!

Everything is interesting and you're going to learn so much!

**You all have a lived experience that is valid**

We want you to bring that experience to this internship and to our community!

Everything is understandable, if you take time to explain it

*Mentors, remember this!*

It may seem hard to see how it all fits together

That’s normal! There’s a lot to learn!

Need to learn pieces before you can put them together

## Learning is hard!

Look out for each other

Your mentors are learning how to do this as well!

Communicate with your mentors.

They can do a better job if they hear from you

Some questions don’t make any sense without context

# You'll hear a lot of words this summer!

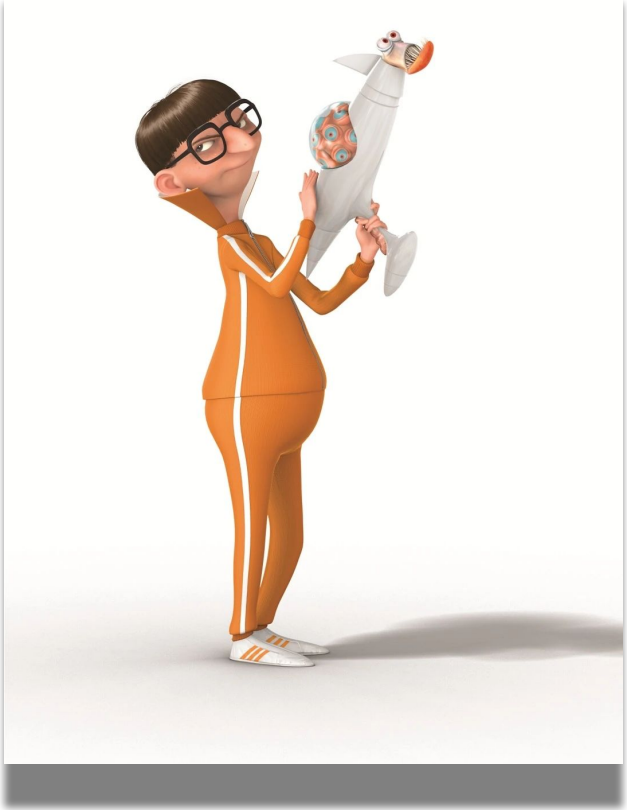
Four-**vectors**: energy and momentum

**Vector** bosons: e.g. W and Z

**Vector**-like quarks: don't get mass from Higgs

**Vector**ized operations: make your python code fast

**Victor** Hess: discovered cosmic rays



# Sometimes the same word!

# Sometimes you'll hear words you don't understand

# Sometimes you'll hear words you don't understand


# Just ask! We're happy to answer any questions!


Mentors
Interns
imgflip.com


We’re really not scary people!  :)

**We're all in this together!**

**Let's have a great summer learning from each other!**

# Backup slides