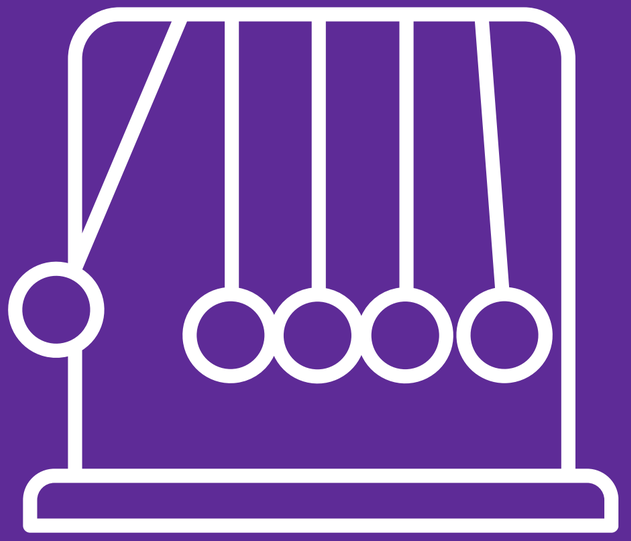
MATHS N PHYSICS
IIT BOMBAY

BAZINGA!

THE ULTIMATE PHYSICS SHOWDOWN

Carnaval de XKCD



Rules

- Pounce: all teams except the one to which the Q is directed can “pounce” on it (submit their answer on paper) within 60 seconds of its release. Scoring is +10 on correct and -5 on wrong attempt.

- Bounce: after pounce is closed, bounce starts. Team *i* answers on their direct; they get +10 if they're correct and 0 otherwise. If they get it wrong, it goes to the next team. Teams who pounced don't get to answer on bounce.
  This goes on until the question is answered or it comes back to team *i* again.
  The round proceeds in cyclic order thereafter.

- FITB: If any question has just a number or a pair of numbers, it’s a fill in the blank question and the numbers denote the number of letters in each word of the answer.

Safety Slide

Q1

FITB (3, 4)

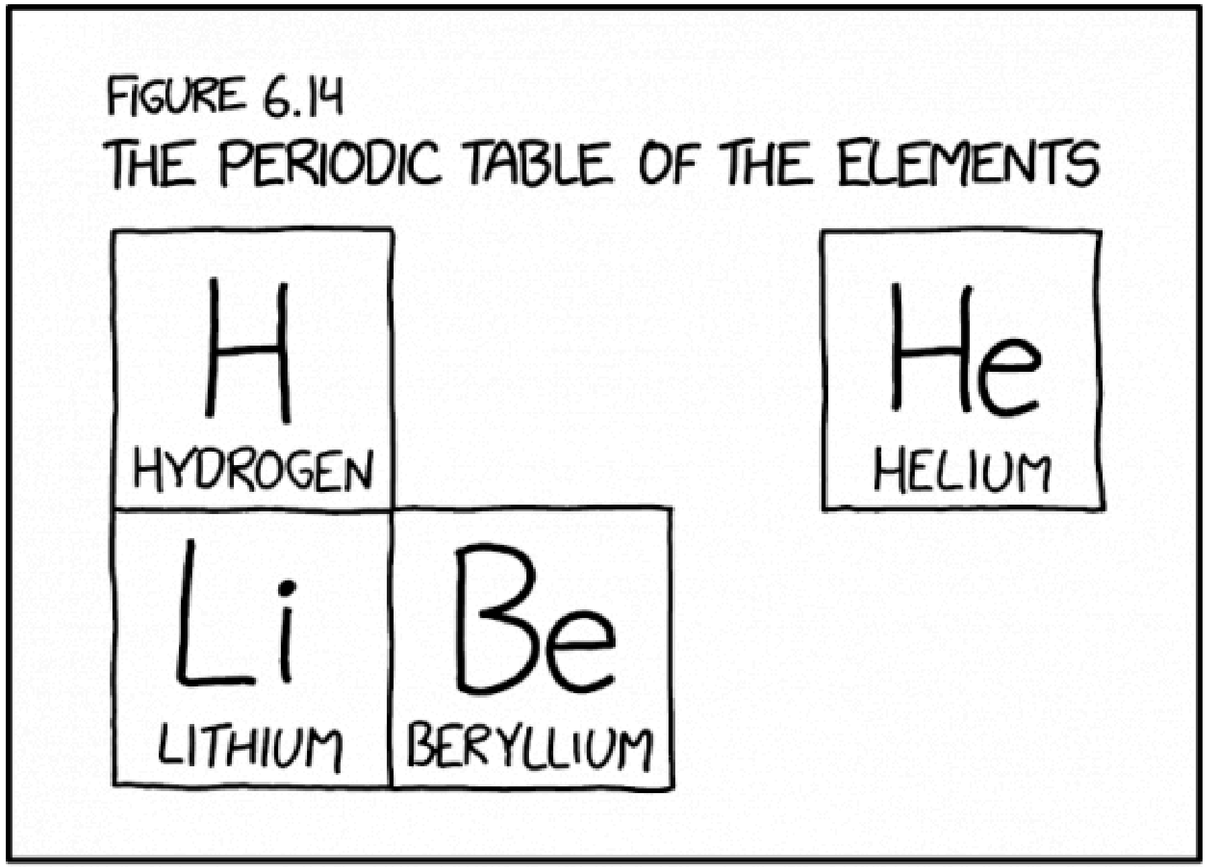
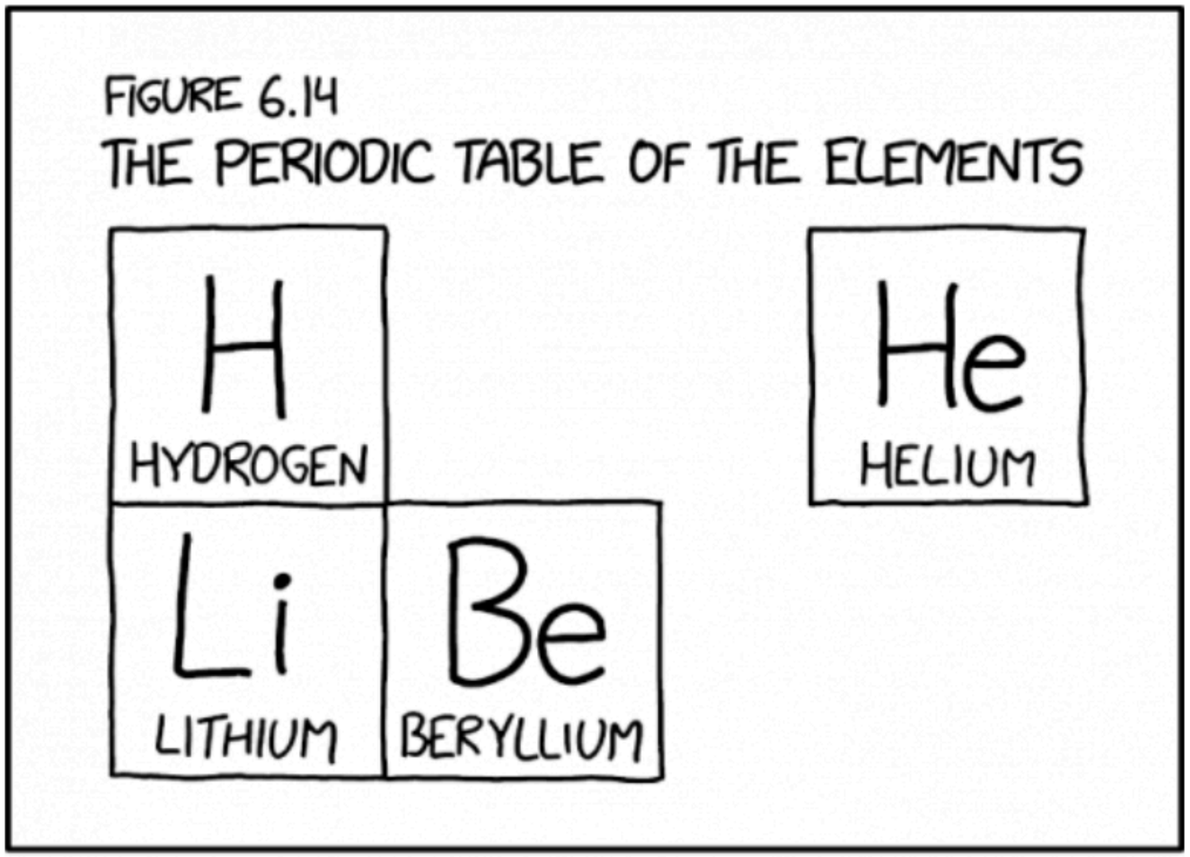


FIGURE 6.14
THE PERIODIC TABLE OF THE ELEMENTS
H
HYDROGEN
He
HELIUM
Li
LITHIUM
Be
BERYLLIUM
YOU CAN SPOT AN OUTDATED SCIENCE TEXTBOOK BY CHECKING THE BOTTOM OF THE PERIODIC TABLE FOR MISSING ELEMENTS. FOR EXAMPLE, MINE WAS PUBLISHED HALF AN HOUR AFTER THE _____

Safety Slide

Big Bang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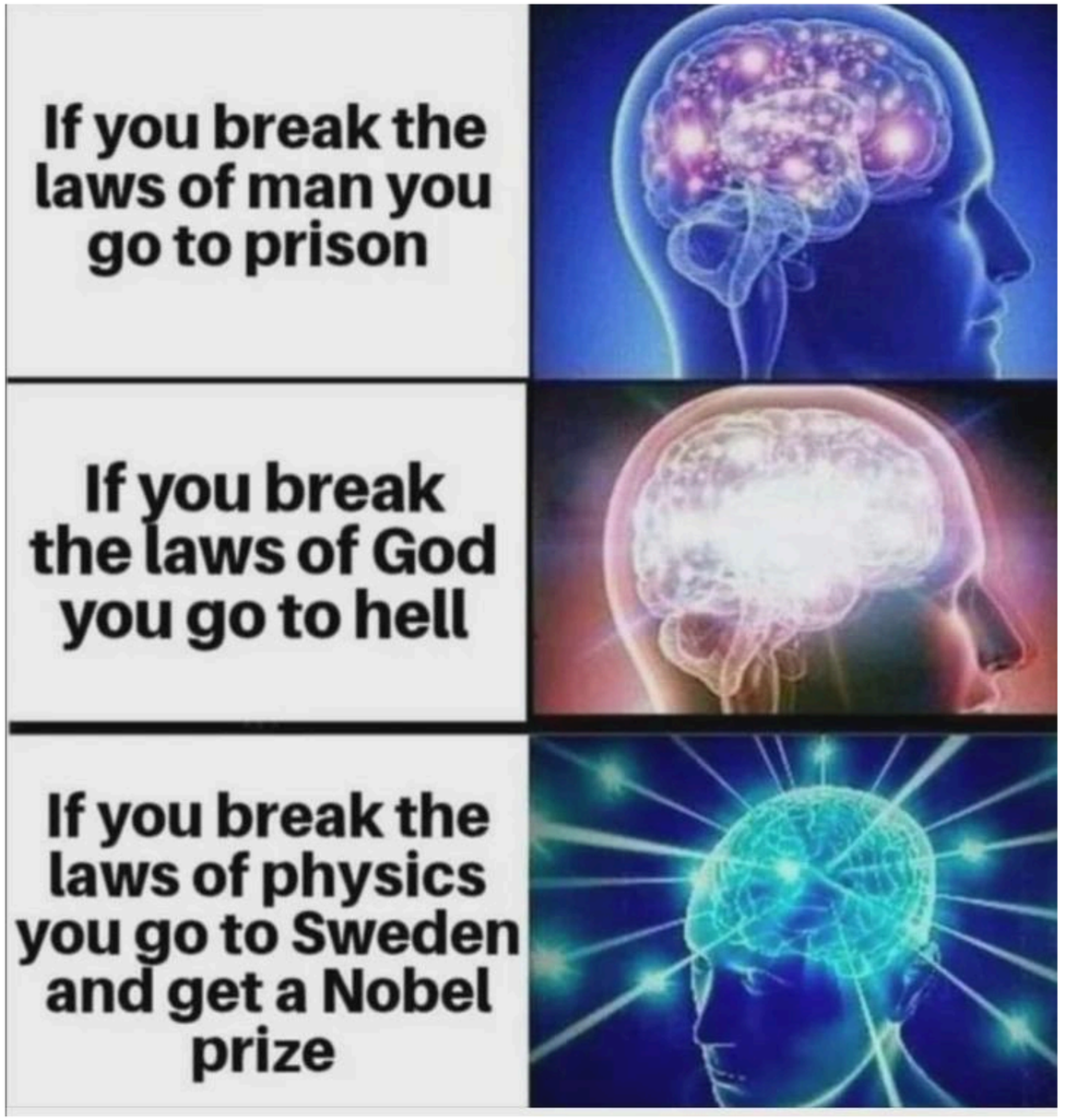
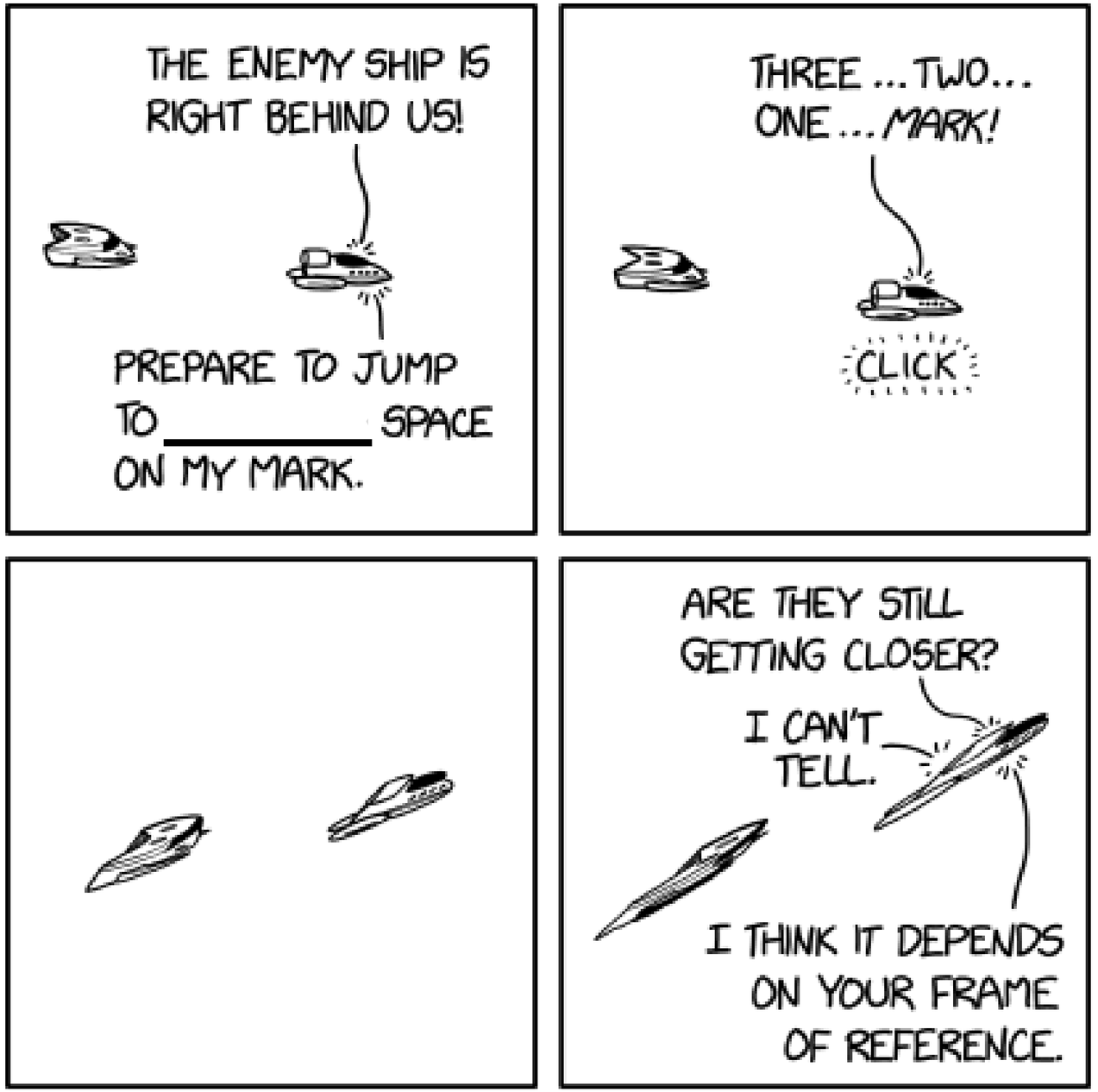
Safety Slide



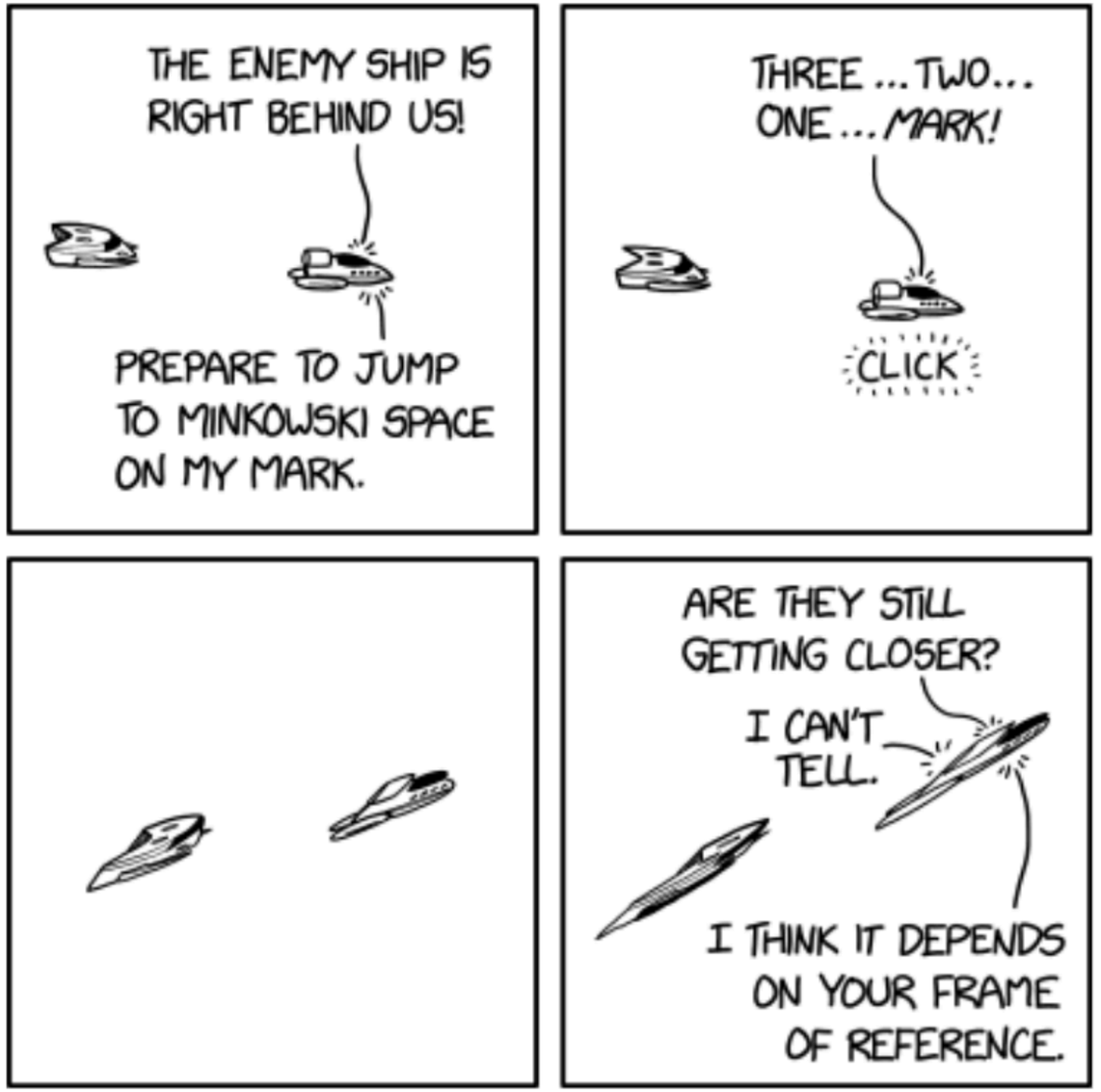
Q2

FITB (9)


THE ENEMY SHIP IS RIGHT BEHIND US!
PREPARE TO JUMP TO _____ SPACE ON MY MARK.
THREE ... TWO... ONE ... MARK!
CLICK
ARE THEY STILL GETTING CLOSER?
I CAN'T TELL.
I THINK IT DEPENDS ON YOUR FRAME OF REFERENCE.

Safety Slide

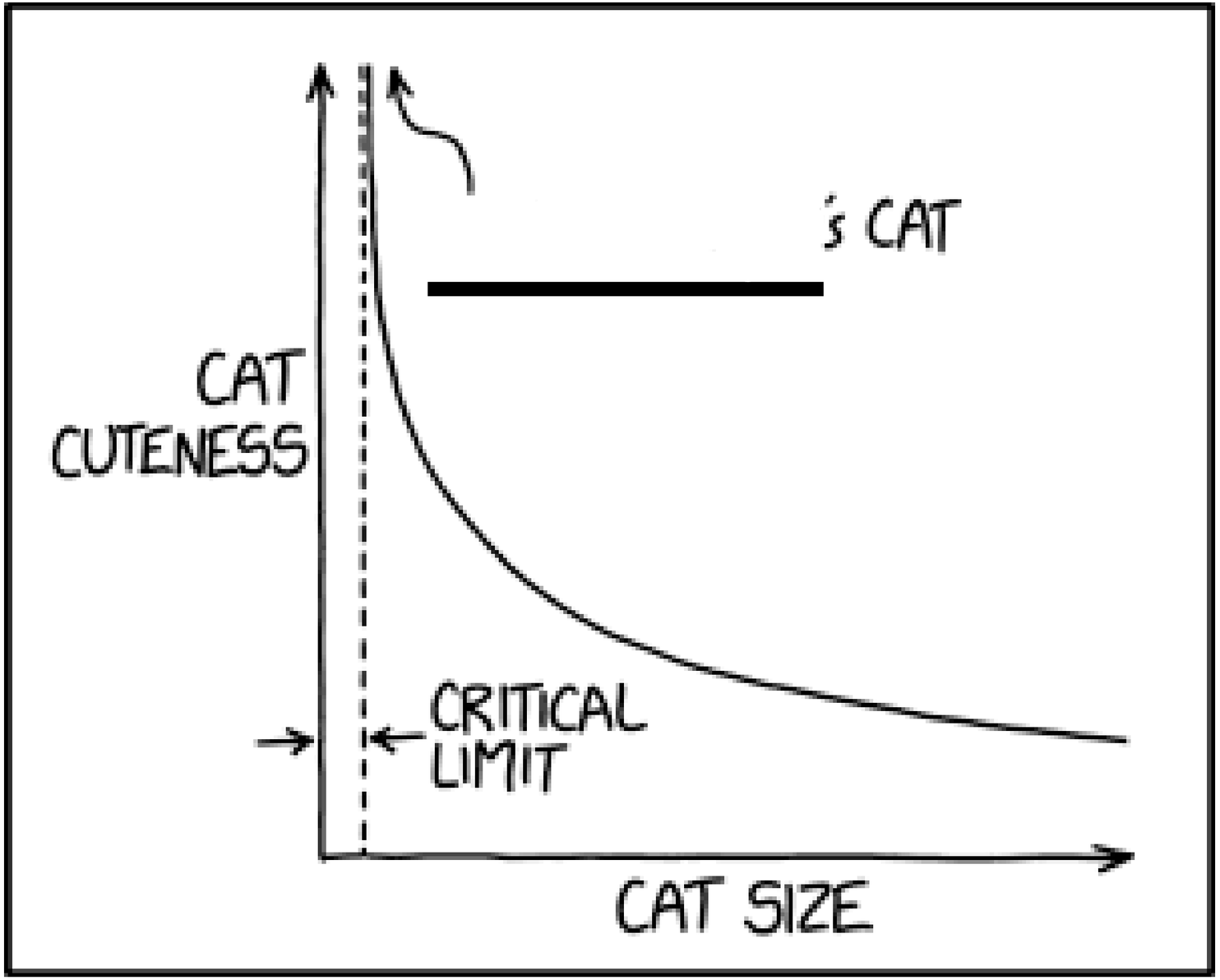
Minkowski


THE ENEMY SHIP IS RIGHT BEHIND US!
PREPARE TO JUMP TO MINKOWSKI SPACE ON MY MARK.
THREE ... TWO... ONE ... MARK!
CLICK
ARE THEY STILL GETTING CLOSER?
I CAN'T TELL.
I THINK IT DEPENDS ON YOUR FRAME OF REFERENCE.

Safety Slide

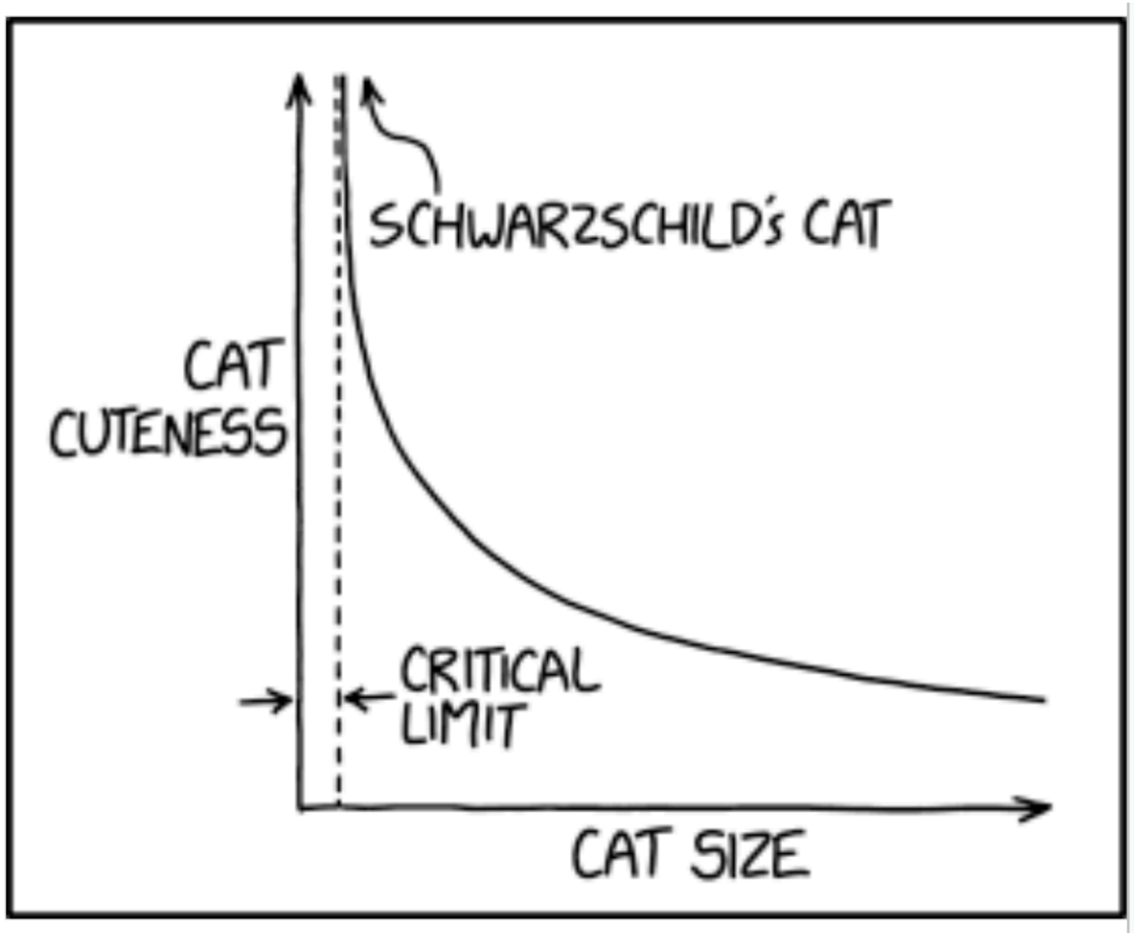
Q3

FITB (13)



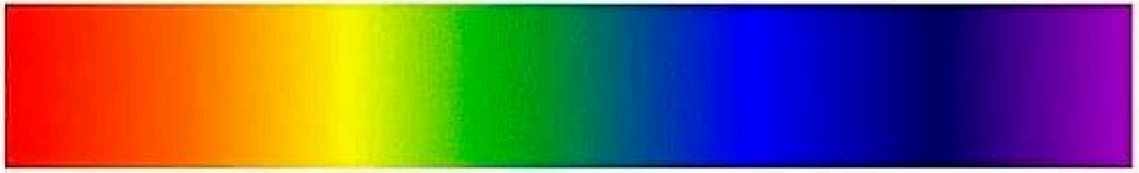
Safety Slide

Schwarzschild (Karl Schwarzschild)

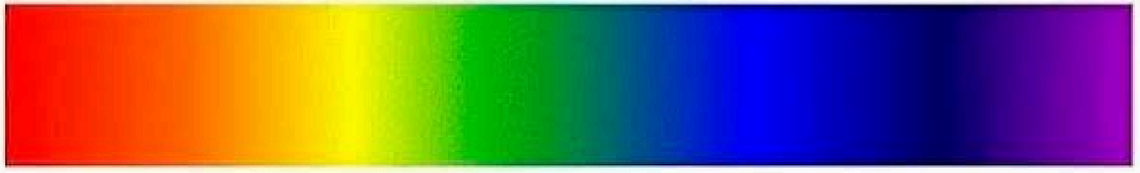


Safety Slide

What we see:

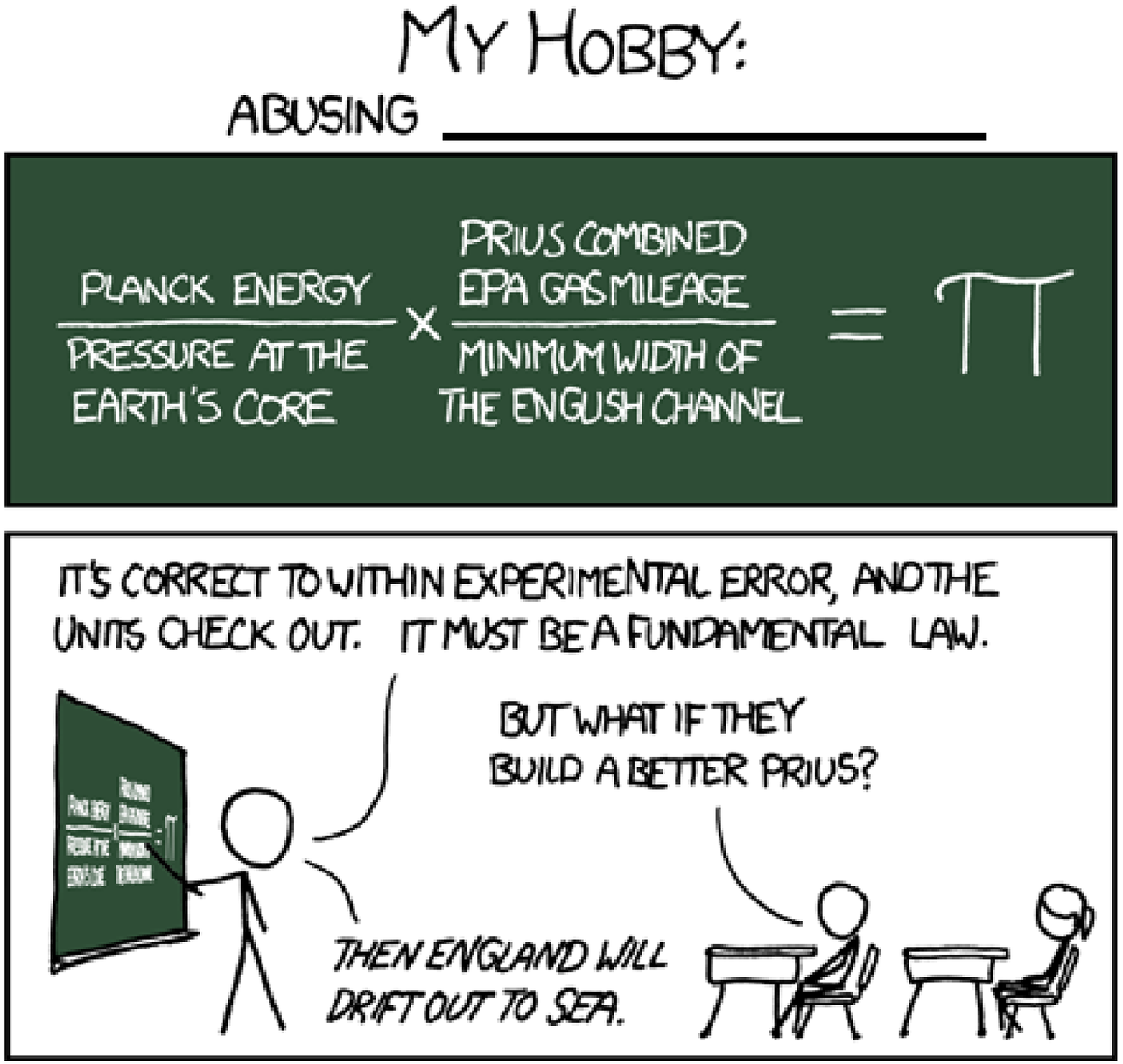


What animals with a larger color range than ours see:



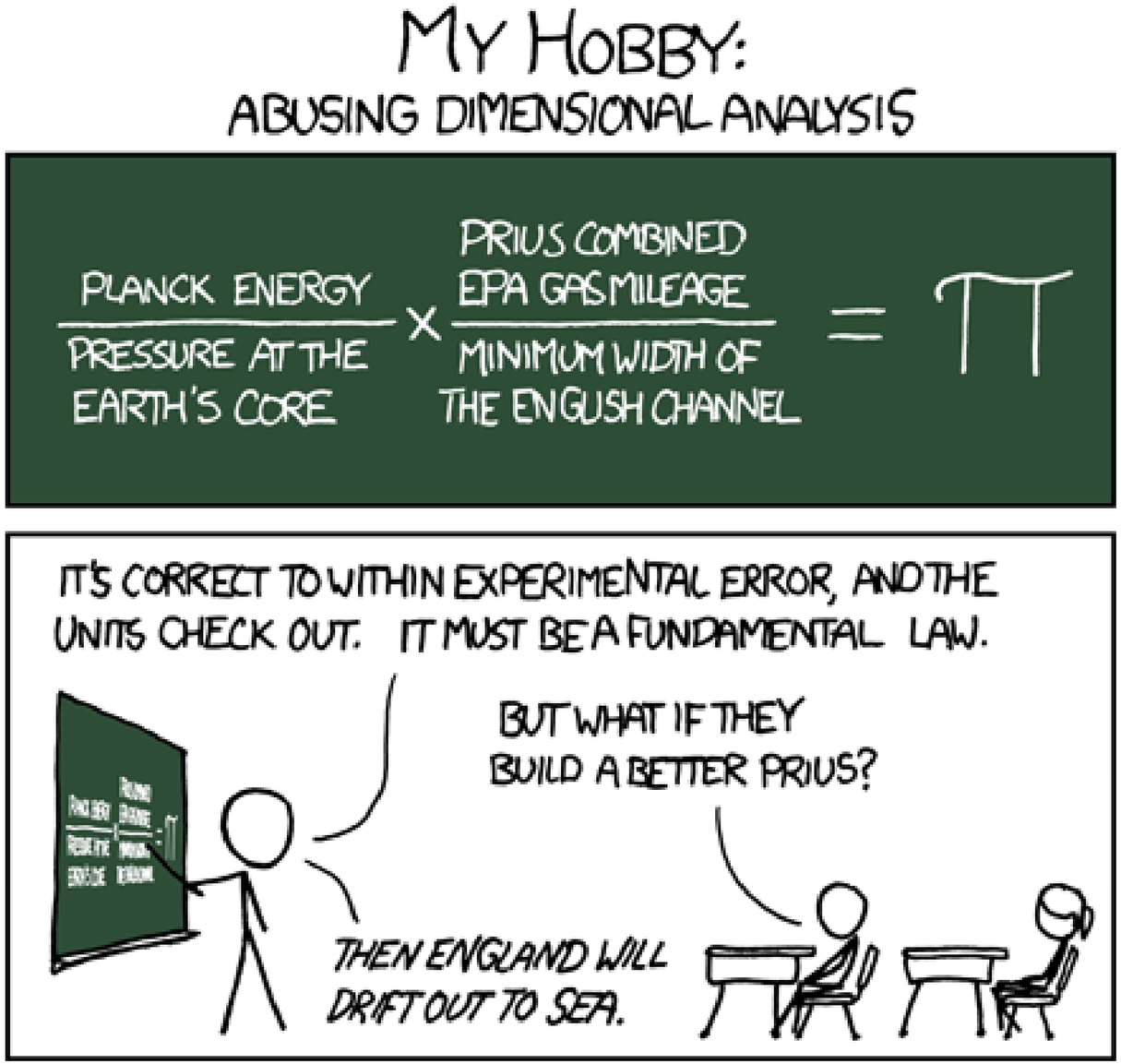
Q4

FITB
with the name of an extremely basic analysis technique.



Safety Slide

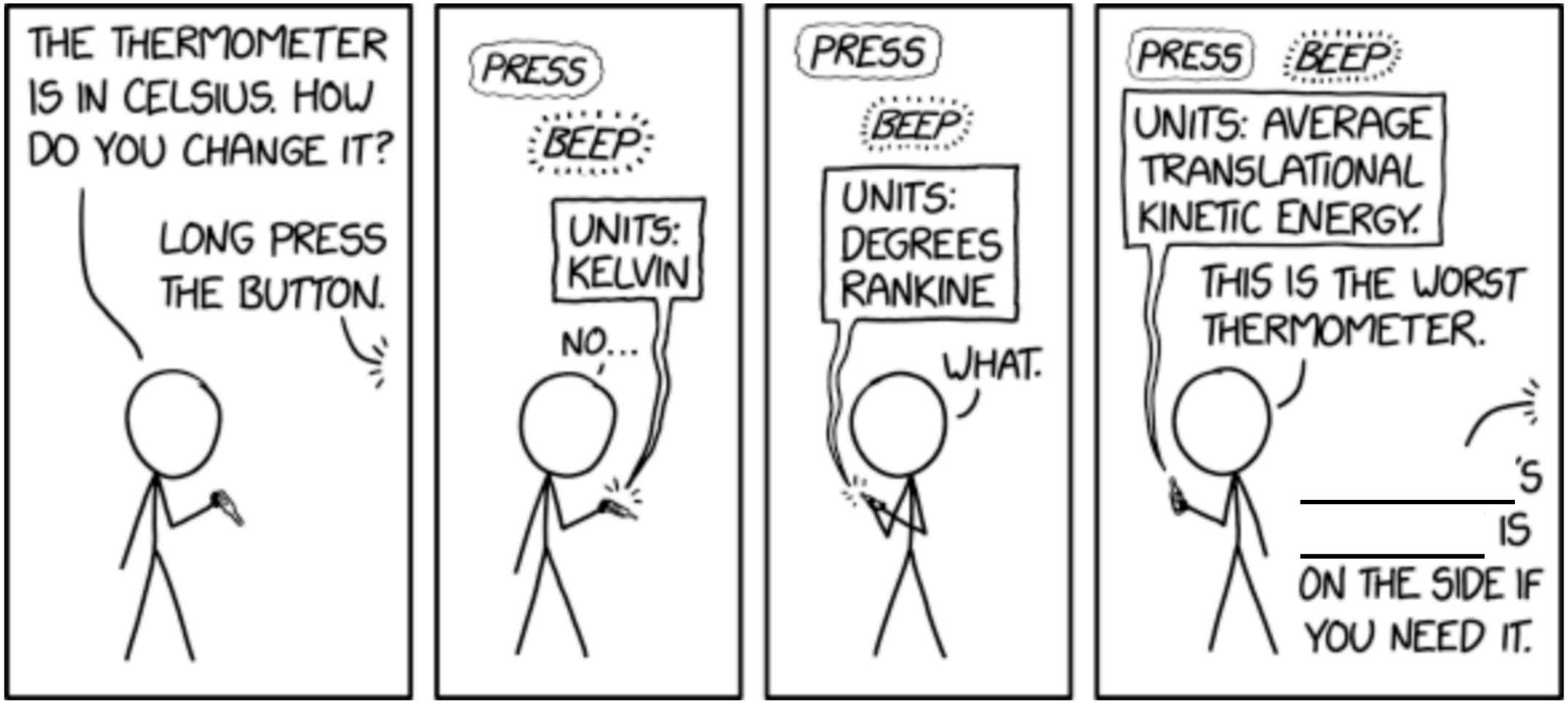
Dimensional Analysis



Safety Slide

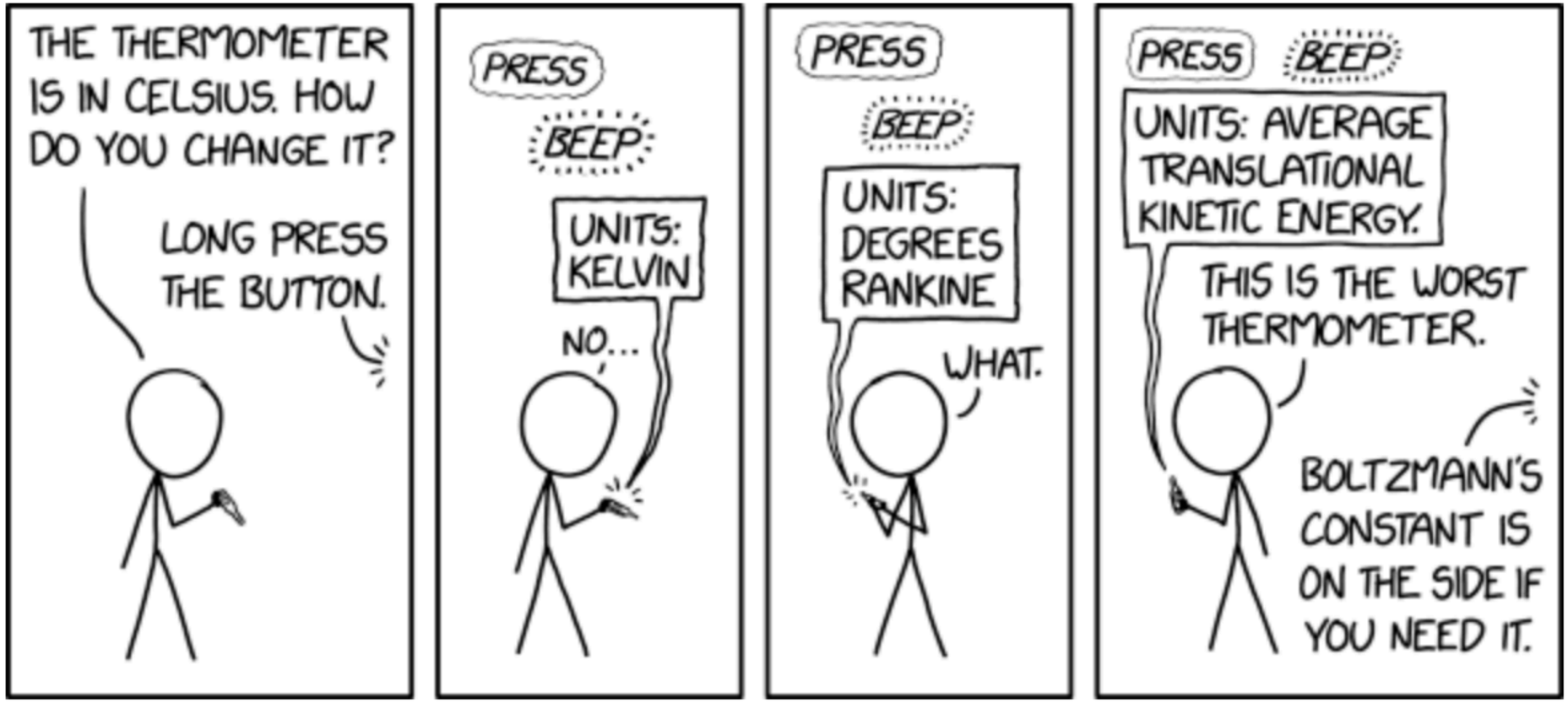
When the bell is 20,001Hz

Q5 FITB (9, 8)


THE THERMOMETER IS IN CELSIUS. HOW DO YOU CHANGE IT?
LONG PRESS THE BUTTON.
PRESS
BEEP
UNITS: KELVIN
NO...
PRESS
BEEP
UNITS: DEGREES RANKINE
WHAT.
PRESS
BEEP
UNITS: AVERAGE TRANSLATIONAL KINETIC ENERGY.
THIS IS THE WORST THERMOMETER.
'S
IS
ON THE SIDE IF YOU NEED IT.

Safety Slide

Boltzmann's constant



Safety Slide

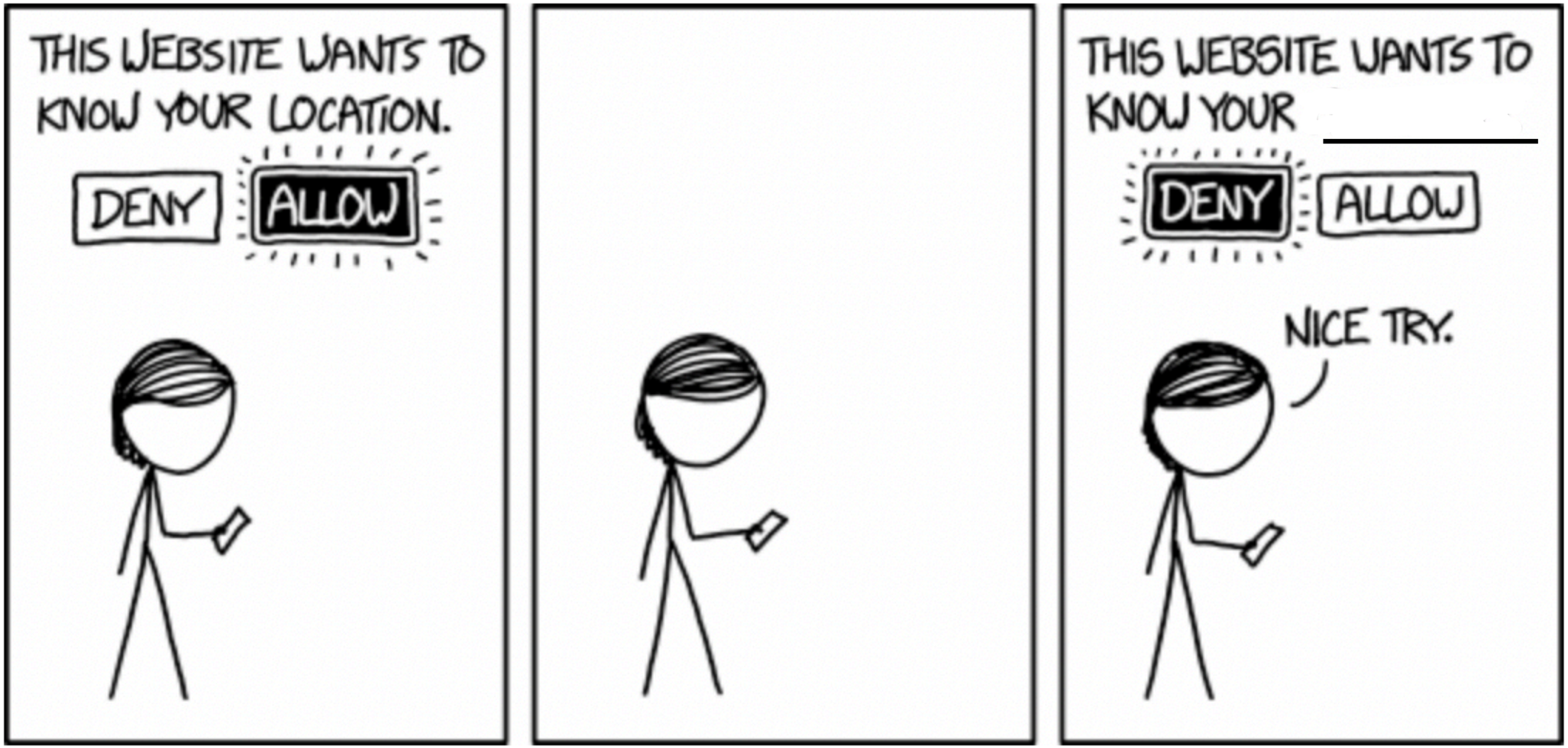
Plague is raging in Europe

Newton:

haha colors

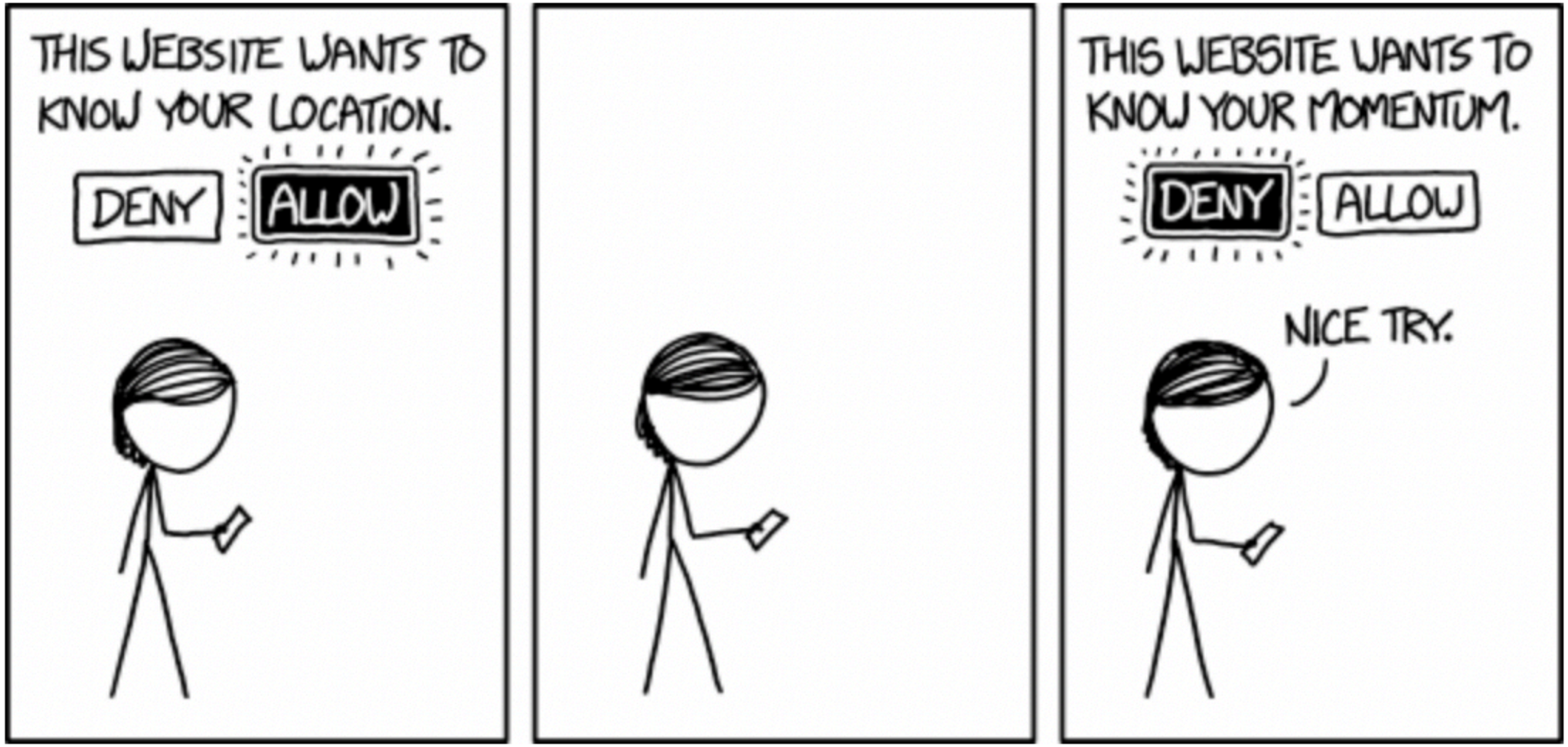
Q6

FITB (8)

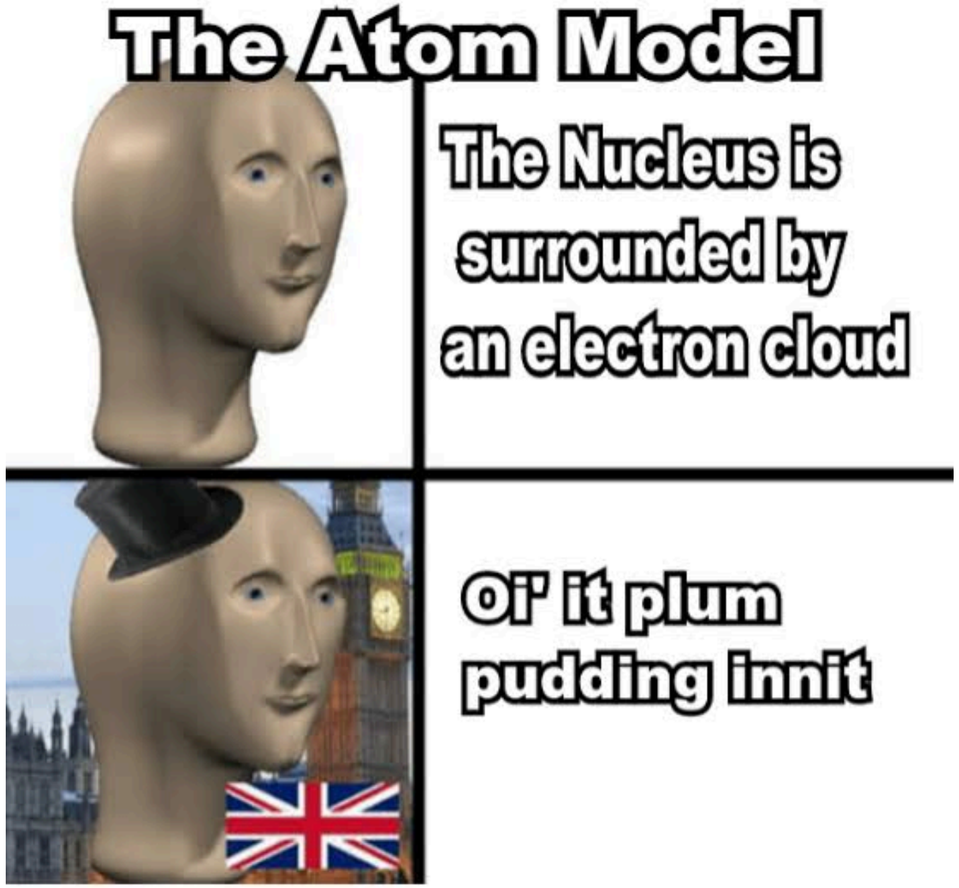

THIS WEBSITE WANTS TO KNOW YOUR LOCATION.
DENY
ALLOW
THIS WEBSITE WANTS TO KNOW YOUR _____
DENY
ALLOW
NICE TRY.

Safety Slide

Momentum

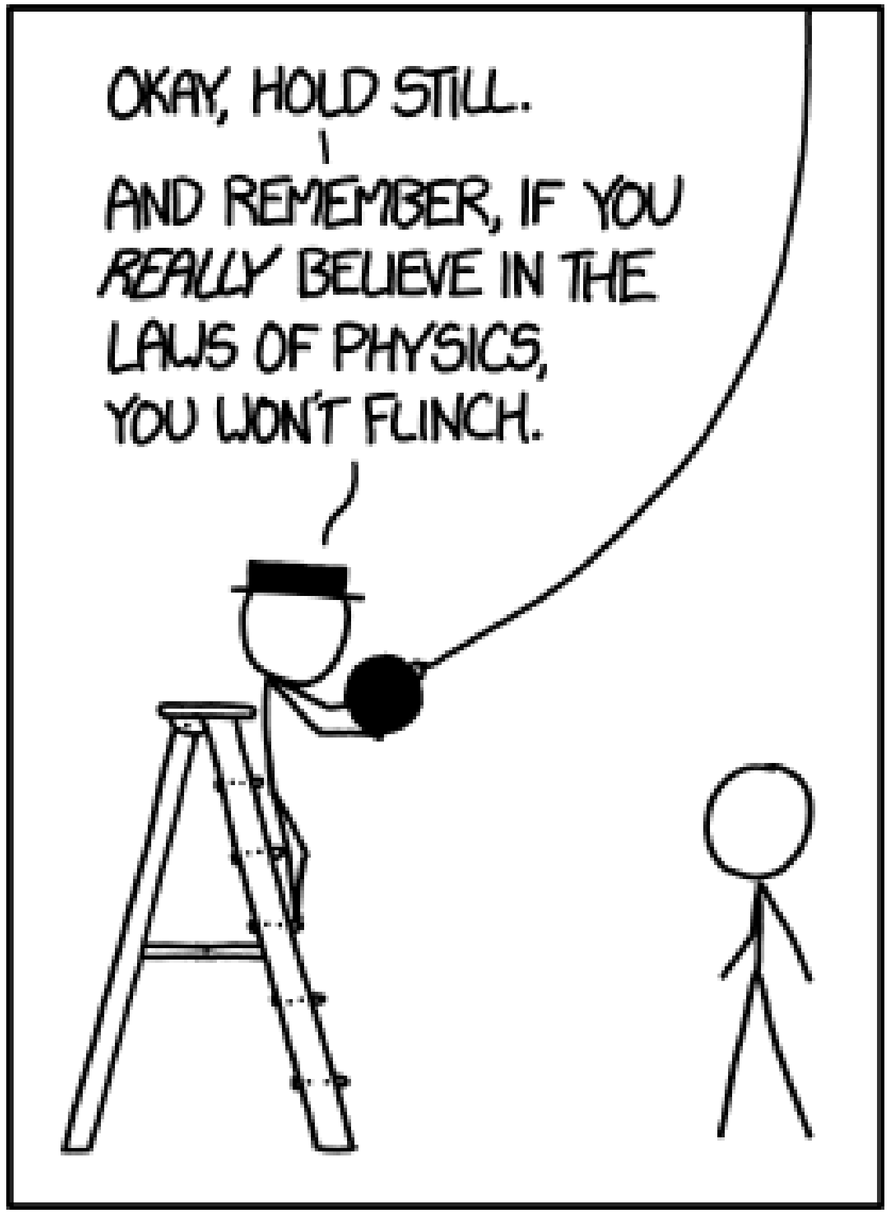

THIS WEBSITE WANTS TO KNOW YOUR LOCATION.
DENY
ALLOW
THIS WEBSITE WANTS TO KNOW YOUR MOMENTUM.
DENY
ALLOW
NICE TRY.

Safety Slide



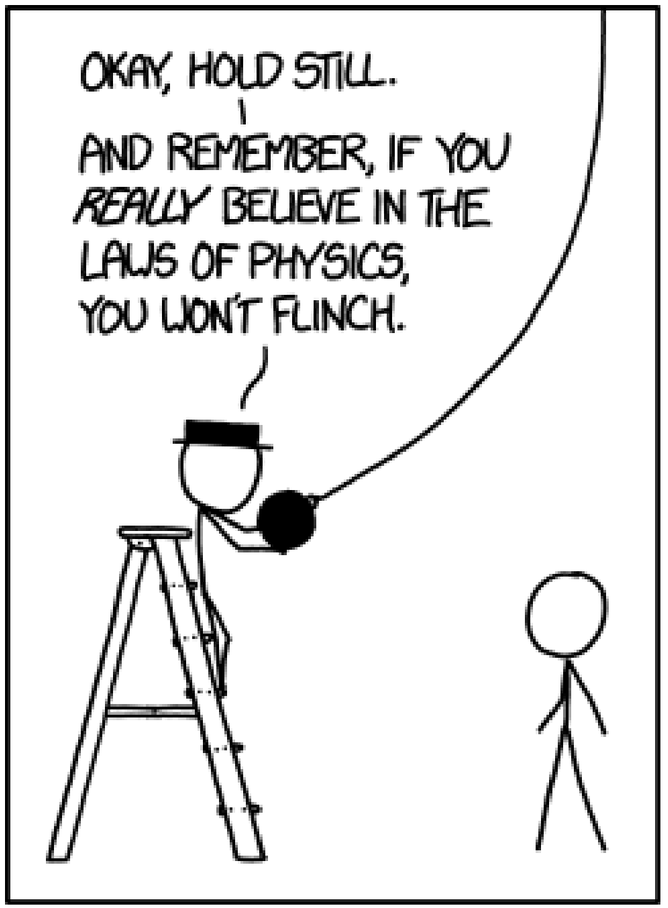
For le Audience

Which famous physics professor does the below xkcd refer to?



Safety Slide

Walter Lewin



Safety Slide

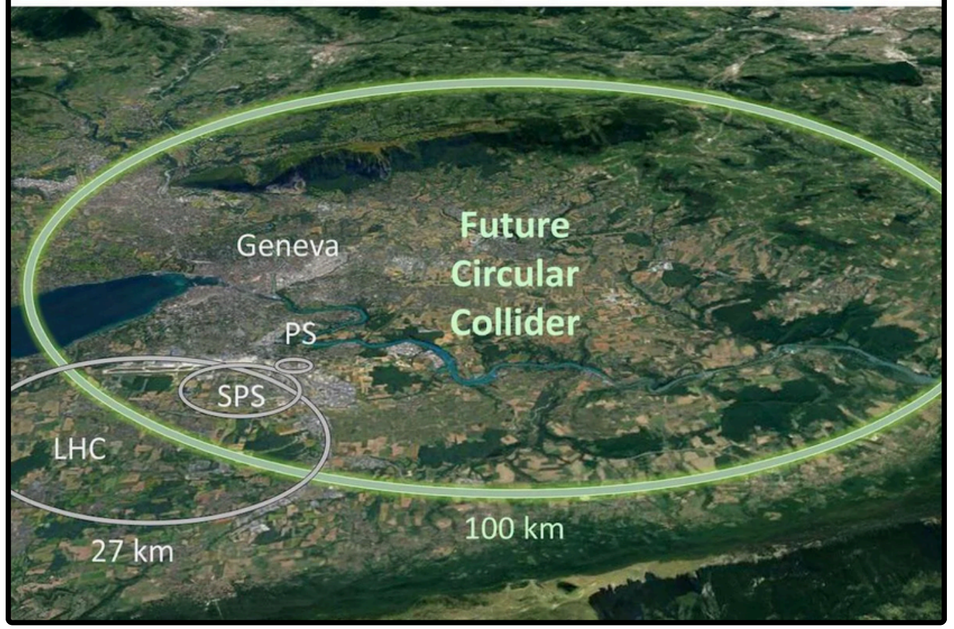
Q7

FITB (6)


Nice store. How do you keep the floors so clear?
Oh, we hired this dude named ____, he's really good. Hard worker. Doesn't mind the monotony. Sweeps out the same area every night.

SaFeTy sLiDe

just one more collider bro. i promise bro just one more collider and we'll find all the particles bro. it's just a bigger collider bro. please just one more. one more collider and we'll figure out dark matter bro. bro cmon just give me 22 billion dollars and we'll solve physics i promise bro. bro bro please we just need to build one more collider t



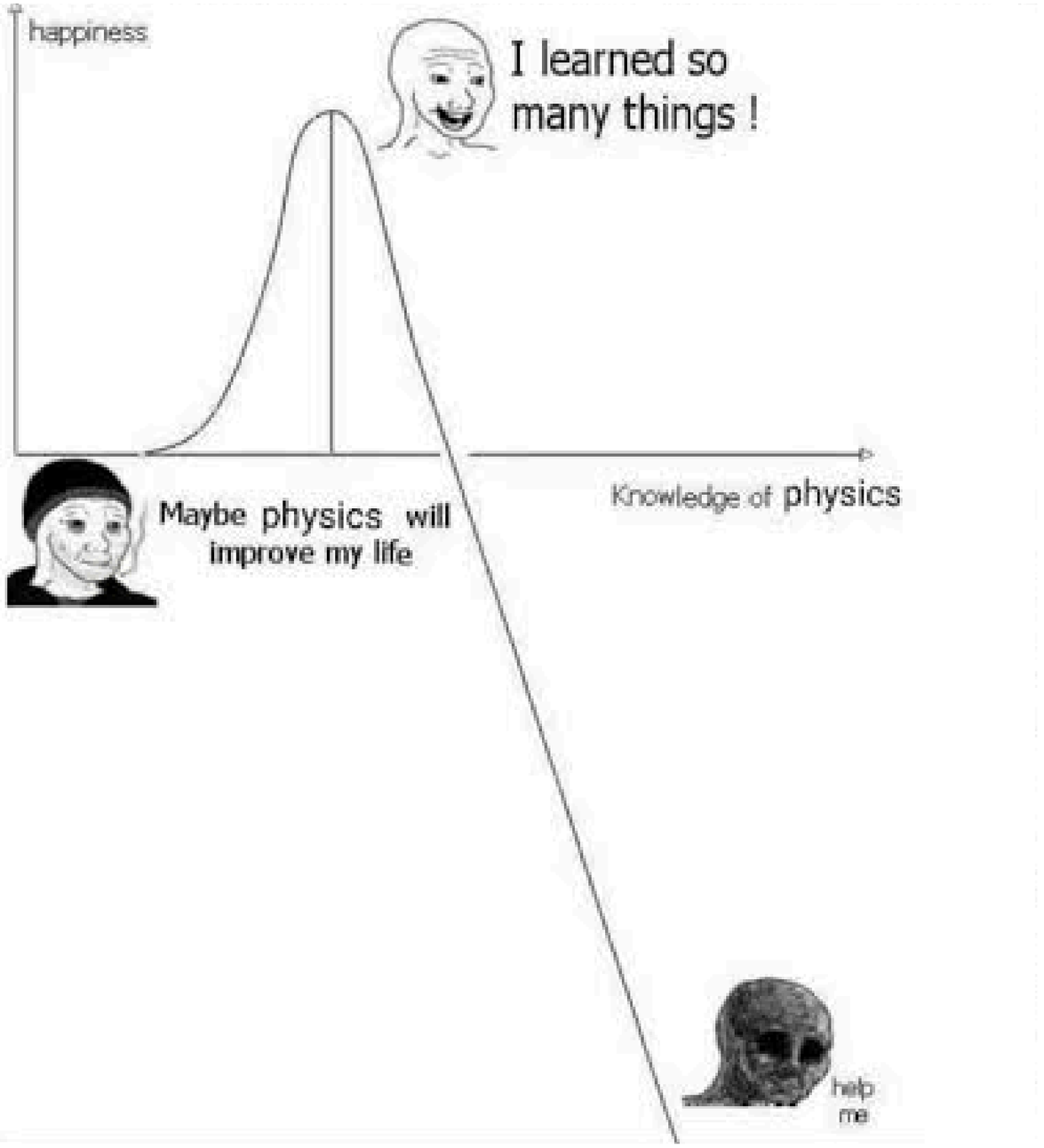
Kepler


Nice store. How do you keep the floors so clear?
Oh, we hired this dude named Kepler, he's really good. Hard worker. Doesn't mind the monotony. Sweeps out the same area every night.

Safety Slide

Q8 FITB (5, 5) - PS comic was made in 2014

Safety Slide



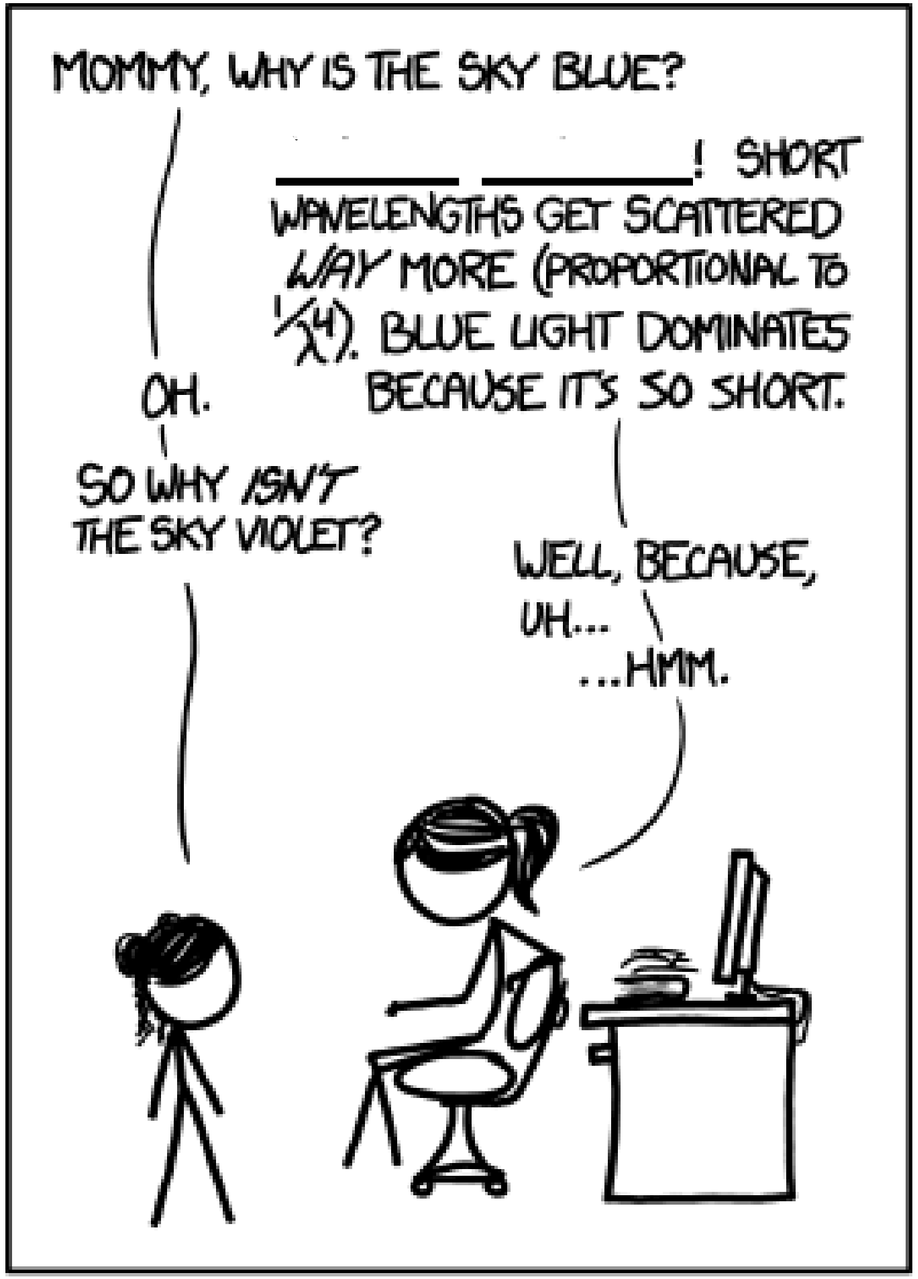
Higgs Boson


TELL US ABOUT YOUR PROPOSAL.
WE'RE REQUESTING $3 BILLION IN FUNDING TO FIND THE HIGGS BOSON.
...WAIT. DIDN'T YOU ALREADY FIND IT A YEAR OR TWO AGO?
YES, WELL, UM.
... OK, THIS IS EMBARRASSING.
SEE, THE THING IS-
DON'T TELL US YOU LOST IT ALREADY.
LOOK.
IN OUR DEFENSE, IT'S REALLY SMALL.

Safety Slide

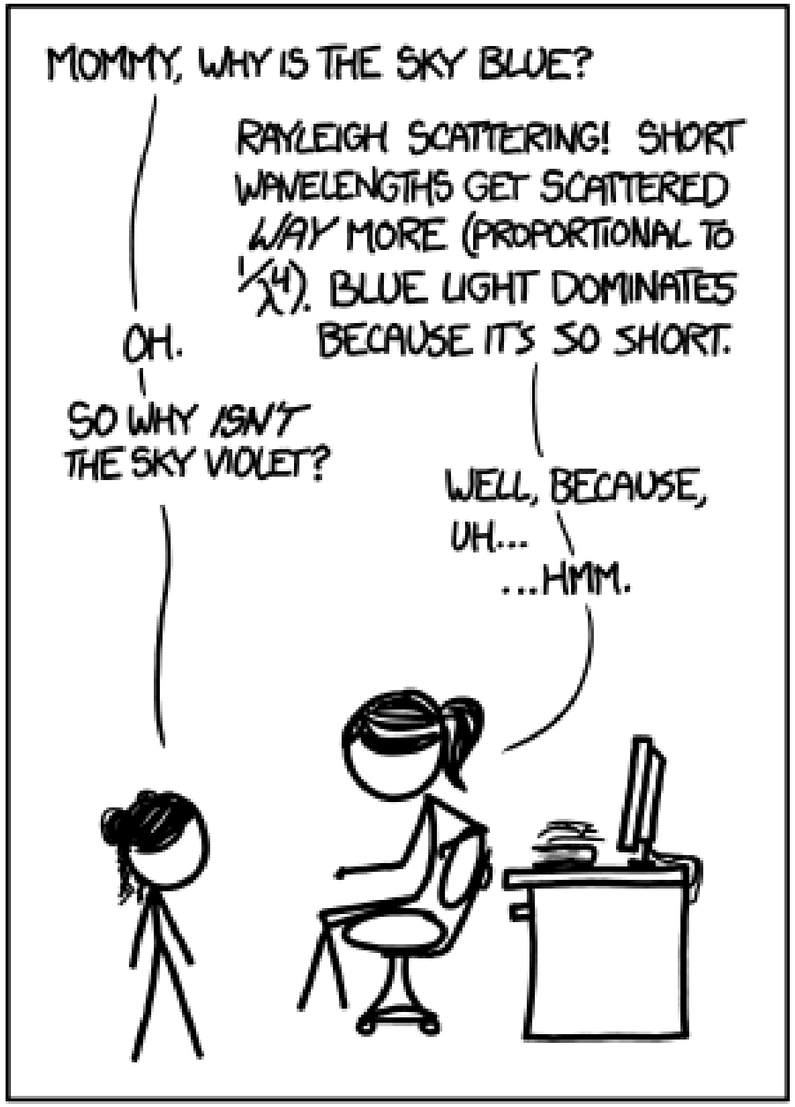
Q9

FITB (8, 10)


MOMMY, WHY IS THE SKY BLUE?
OH.
SO WHY ISN'T THE SKY VIOLET?
_____ _____! SHORT WAVELENGTHS GET SCATTERED WAY MORE (PROPORTIONAL TO 1/λ⁴). BLUE LIGHT DOMINATES BECAUSE IT'S SO SHORT.
WELL, BECAUSE, UH...
...HMM.
MY HOBBY: TEACHING TRICKY QUESTIONS TO THE CHILDREN OF MY SCIENTIST FRIENDS.

Safety Slide

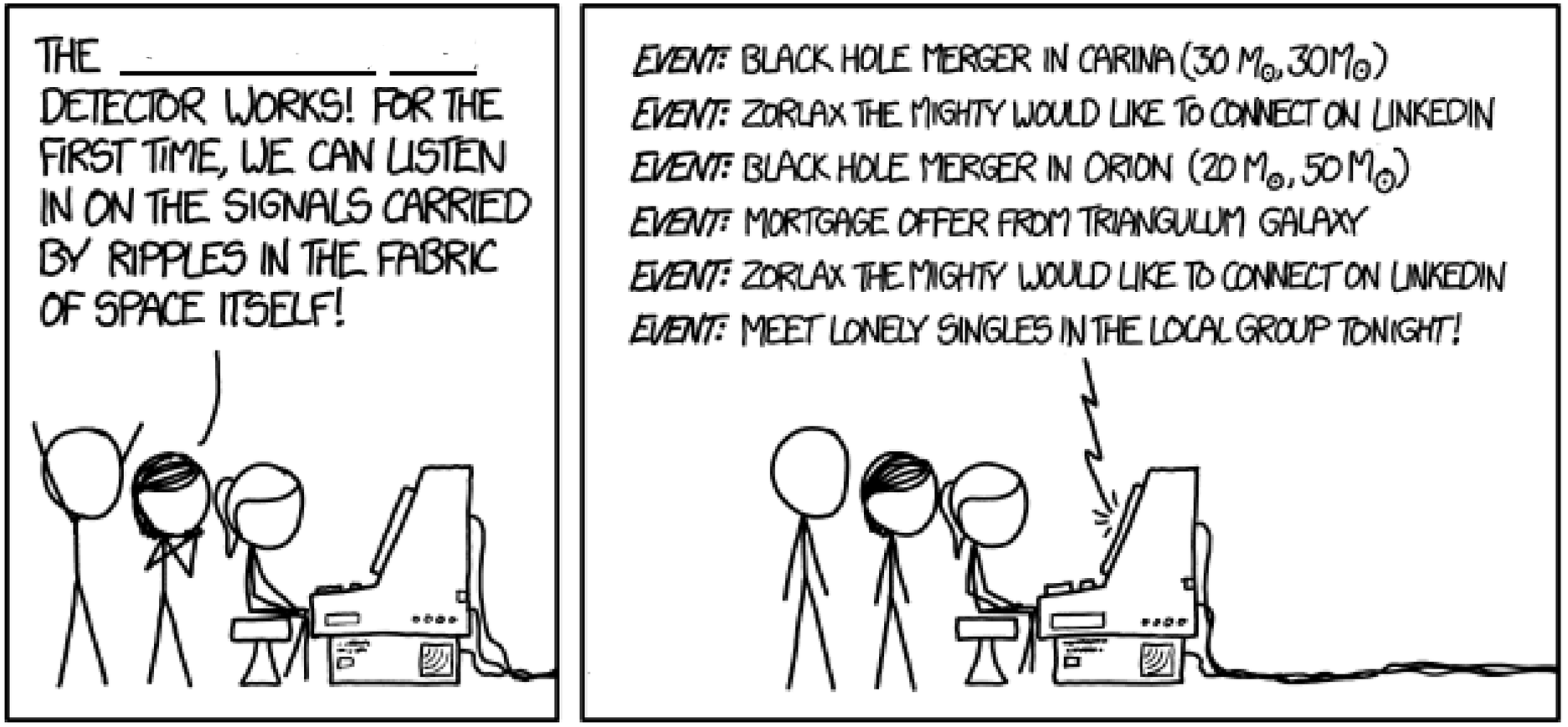
Rayleigh Scattering



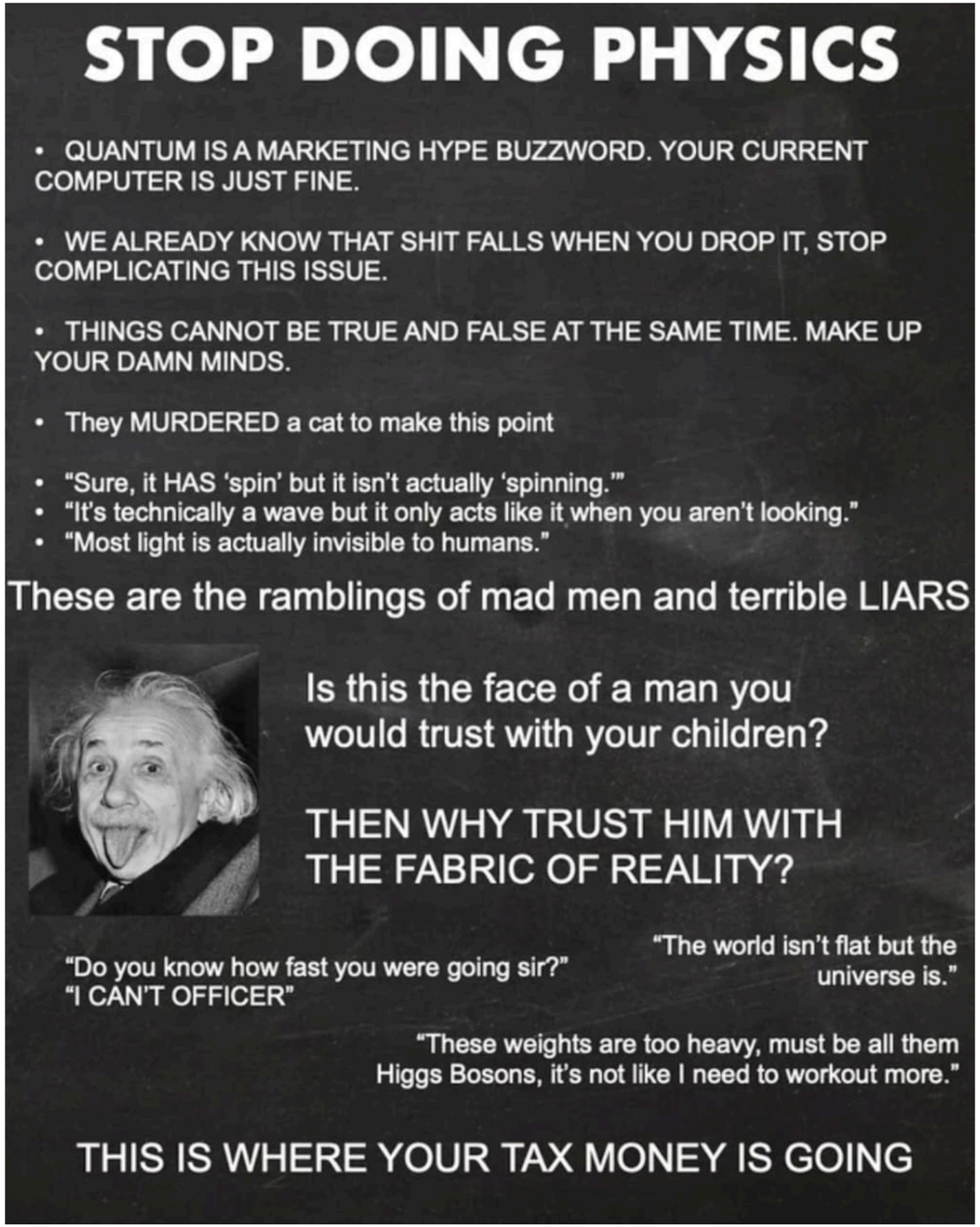
Safety Slide

Q10

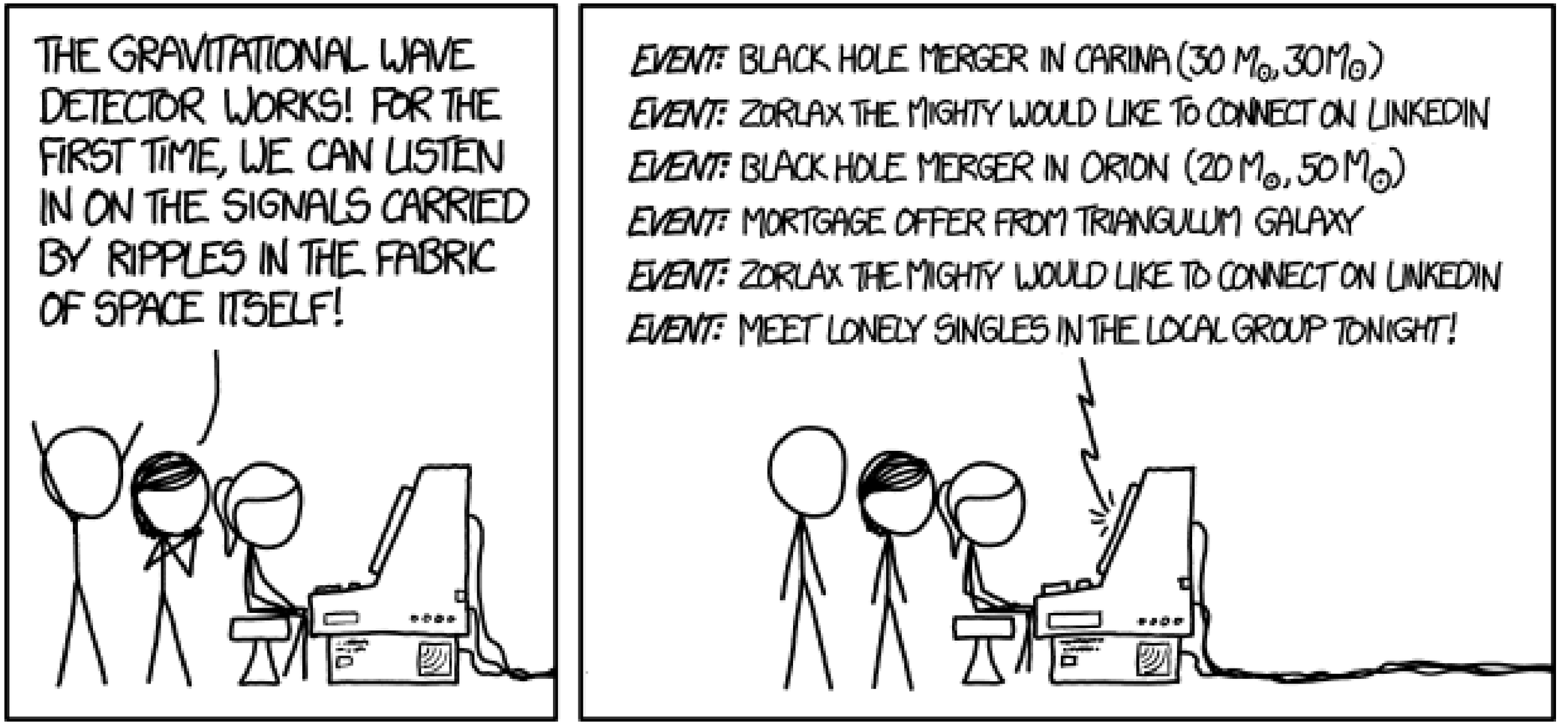
FITB (13, 4)


THE _____ ____ DETECTOR WORKS! FOR THE FIRST TIME, WE CAN LISTEN IN ON THE SIGNALS CARRIED BY RIPPLES IN THE FABRIC OF SPACE ITSELF!
EVENT: BLACK HOLE MERGER IN CARINA (30 $M_\odot$, 30 $M_\odot$)
EVENT: ZORLAX THE MIGHTY WOULD LIKE TO CONNECT ON LINKEDIN
EVENT: BLACK HOLE MERGER IN ORION (20 $M_\odot$, 50 $M_\odot$)
EVENT: MORTGAGE OFFER FROM TRIANGULUM GALAXY
EVENT: ZORLAX THE MIGHTY WOULD LIKE TO CONNECT ON LINKEDIN
EVENT: MEET LONELY SINGLES IN THE LOCAL GROUP TONIGHT!

SaFeTy sLidE



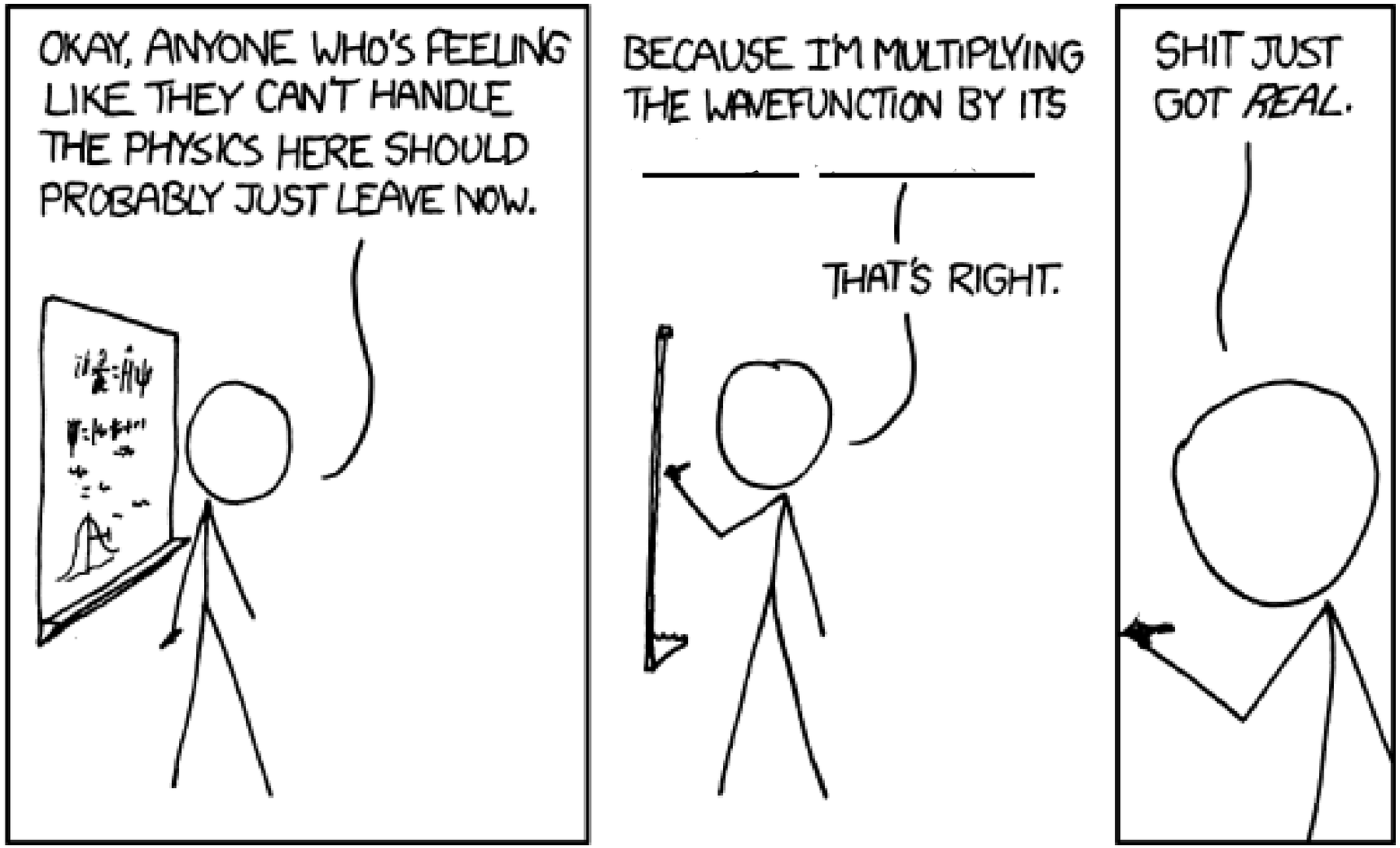
Gravitational Wave



Safety Slide

Q11

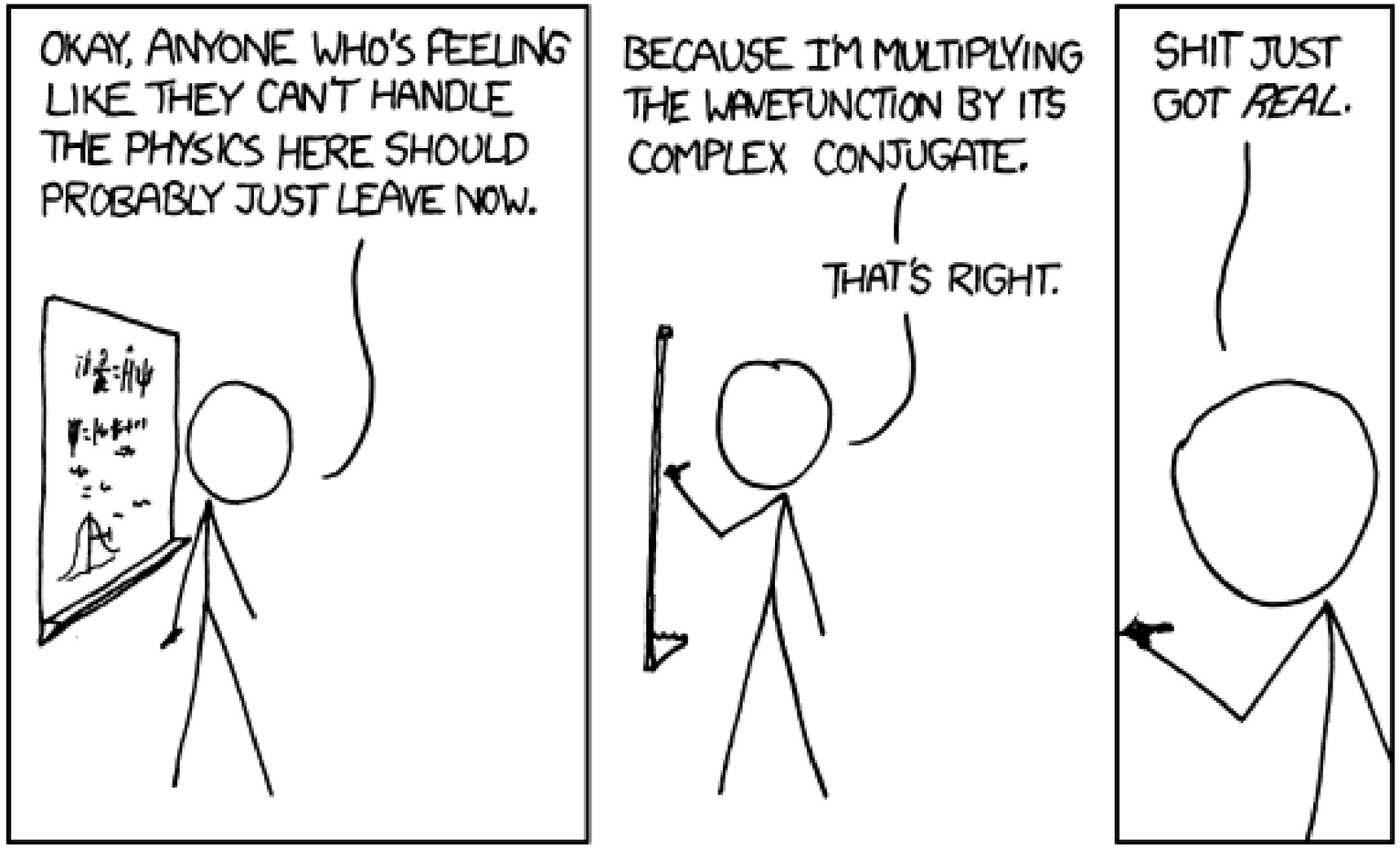
FITB (7, 9)


OKAY, ANYONE WHO'S FEELING LIKE THEY CAN'T HANDLE THE PHYSICS HERE SHOULD PROBABLY JUST LEAVE NOW.
BECAUSE I'M MULTIPLYING THE WAVEFUNCTION BY ITS
THAT'S RIGHT.
SHIT JUST GOT REAL.

Safety Slide????

will u go salsa wid me uwu?

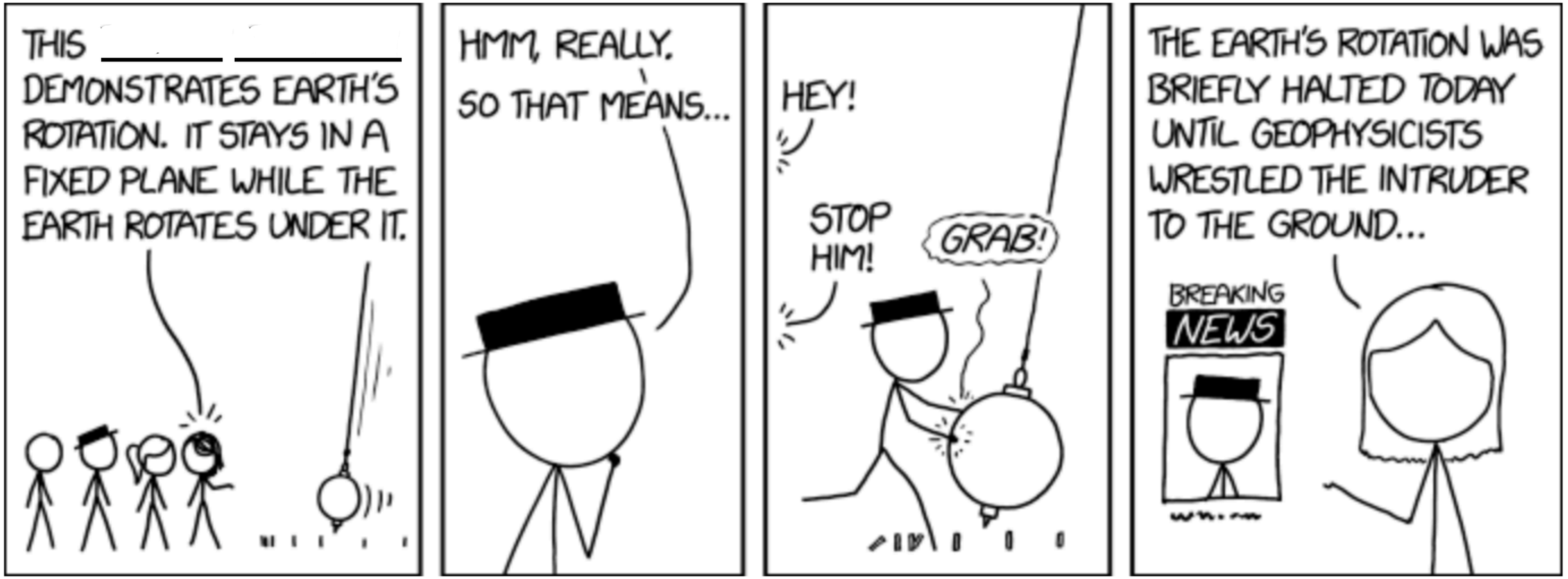
Complex Conjugate



Safety Slide huh

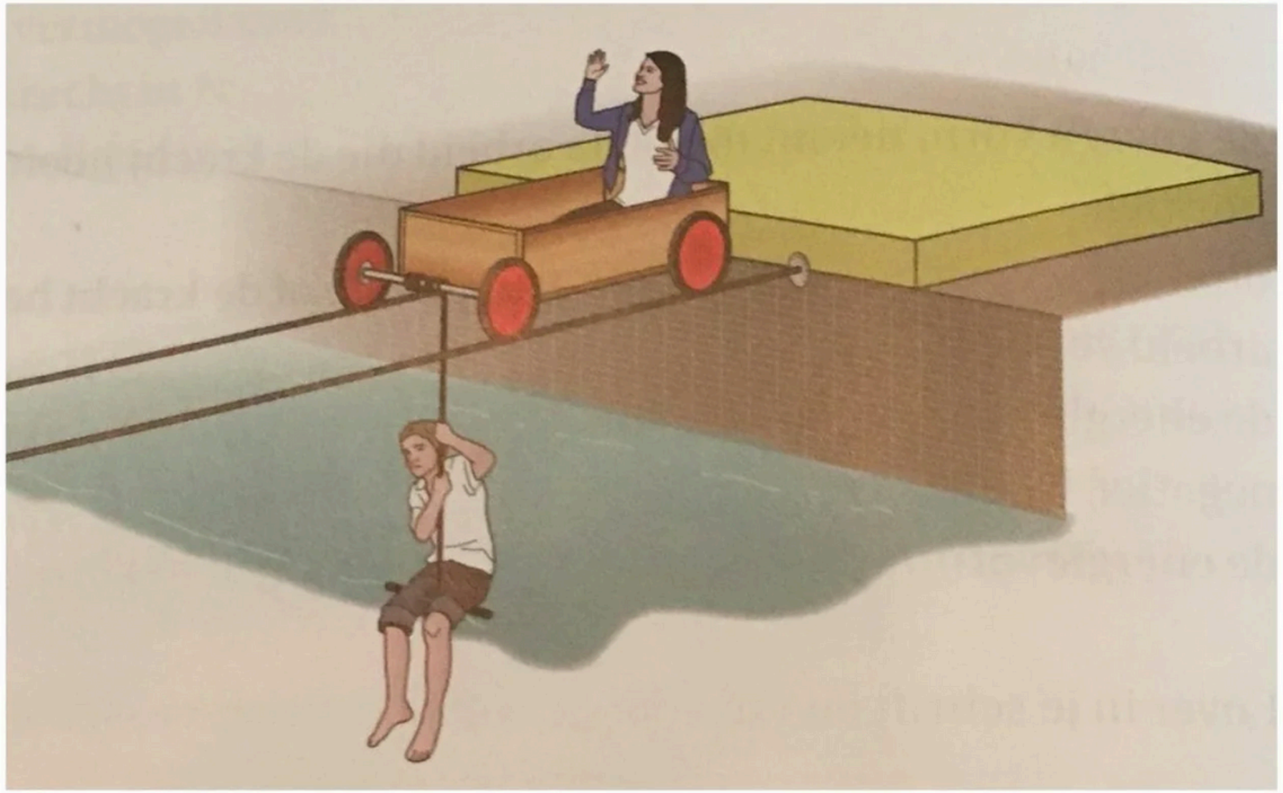
Q12

FITB (8, 8)

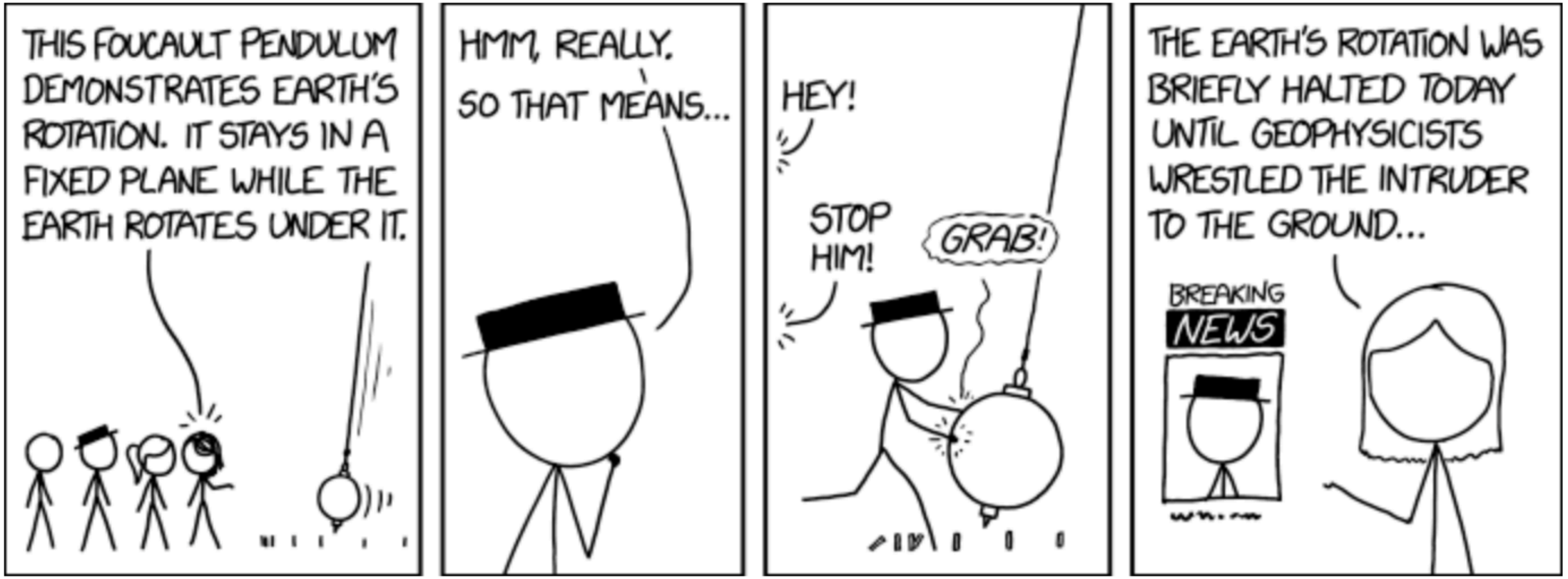

THIS _____ _____ DEMONSTRATES EARTH'S ROTATION. IT STAYS IN A FIXED PLANE WHILE THE EARTH ROTATES UNDER IT.
HMM, REALLY.
SO THAT MEANS...
HEY!
STOP HIM!
GRAB!
THE EARTH'S ROTATION WAS BRIEFLY HALTED TODAY UNTIL GEOPHYSICISTS WRESTLED THE INTRUDER TO THE GROUND...
BREAKING NEWS

Safety Slide

Problems in physics books be like:



Foucault Pendulum

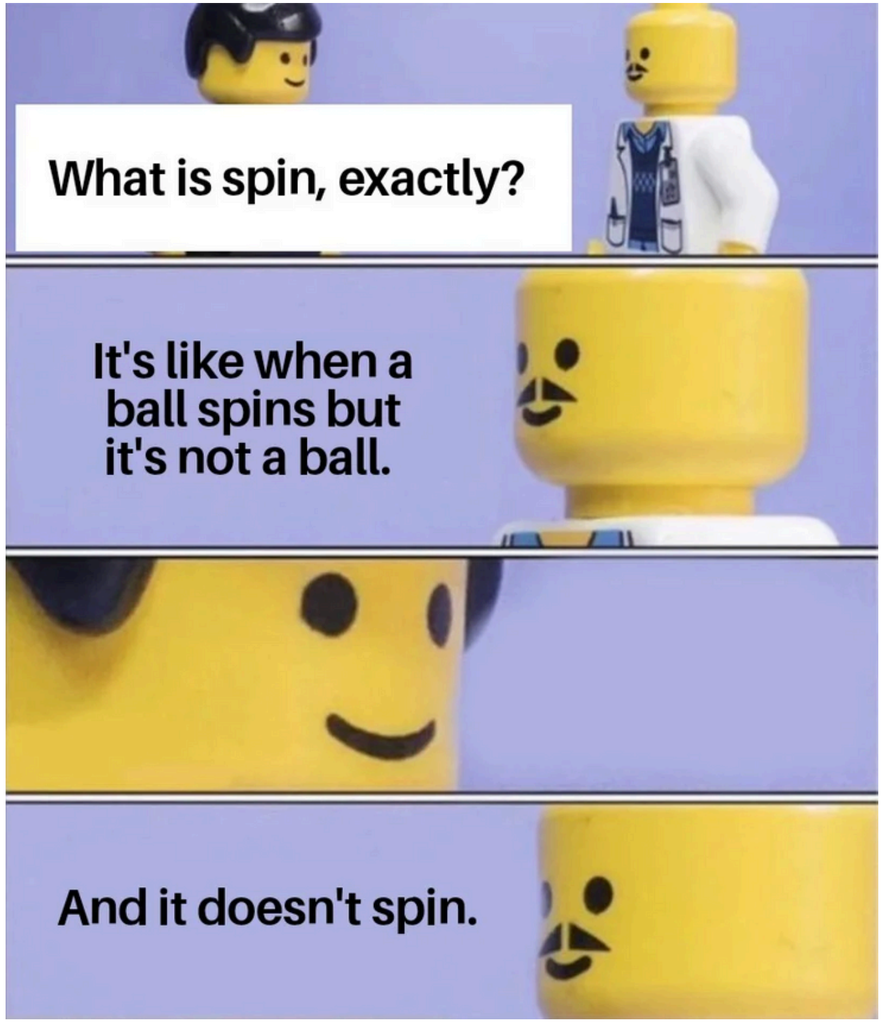


Safety Slide

For le audience again

FITB with the name of something that is theorized and futuristic.

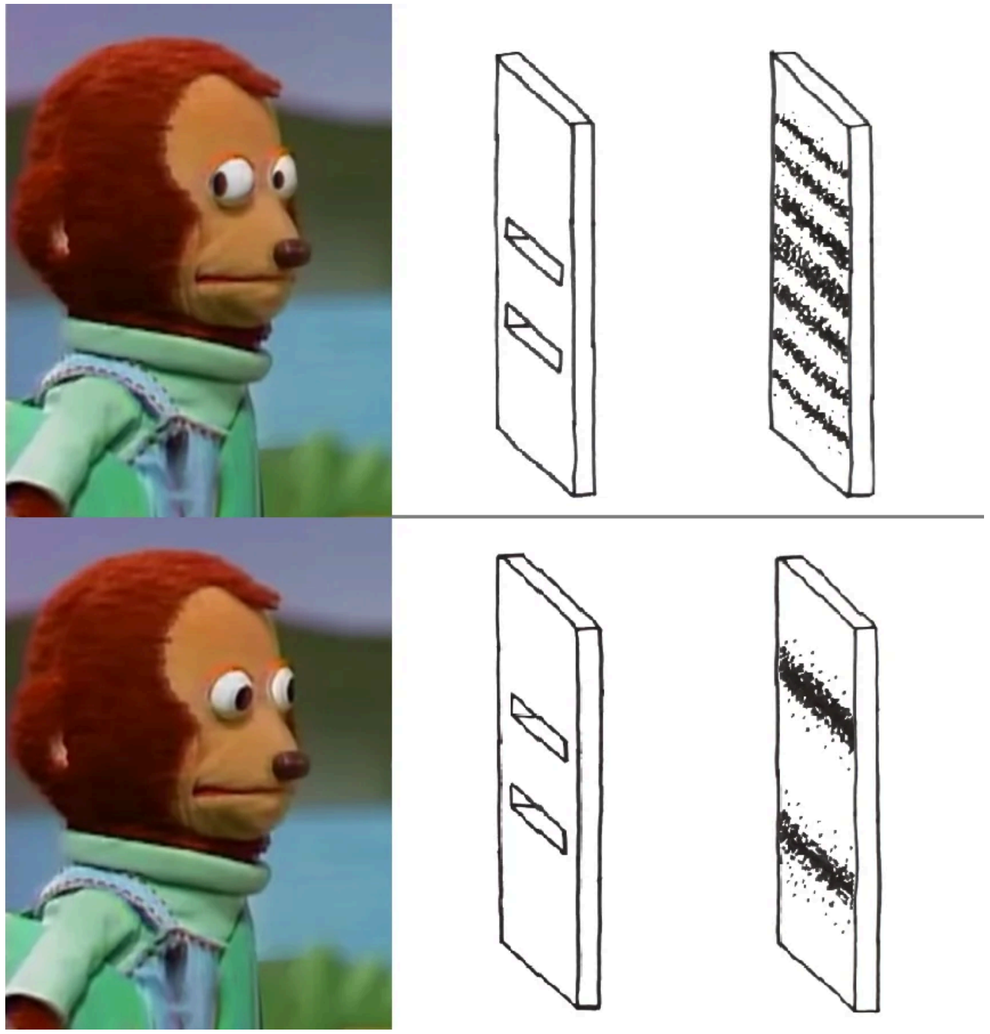
Safety Slide



Tachyon


IN LOCAL NEWS, CITY COUNCIL ELECTIONS WERE HELD TODAY.
IN NONLOCAL NEWS, I KILLED MY PAST SELF WITH A TACHYON BEAM.

Safety Slide



Danger is here :D

Jeopardy!: RULES

There are 18 questions in this round - 3 of each difficulty across 6 topics
The questions will proceed sequentially, as per the Round 1 scores

At each turn, the team gets to choose a question from the given set of unused questions and answer it as per the said marking scheme.

Marking scheme for the questions is as follows:

1. Easy: +10 -0
2. Medium: +20 -10
3. Hard: +30 -15

After choosing attempting the question is mandatory - if you pick a Hard question and are unable to answer you get -15

Safety Slide

Let the Buzzing Begin!

Buzzer Round: RULES

Every team has a buzzer on their phone, right at their desk.

- The quizmaster (QM) will start reading the question, and the moment the question begins, the buzzers are live!
- The fastest team to hit their buzzer gets to answer.
- Once a buzzer is pressed, the QM will stop reading immediately, and the buzzing team must give their answer on the spot - start yelling the answer within 2 secs!
- If they nail it, they score full points (+30), and we move forward.
- If they miss or hesitate, they'll lose points (-15), and the question reopens for the rest of the teams. Once again, speed is key!
- If the next team buzzes incorrect as well, or if nobody gets the answer correct within 60 seconds of opening the question, the question passes to the audience.

Question 1

This system comprises a gain medium enclosed within a highly reflective optical cavity, with a mechanism to provide energy to the gain medium. In its most basic configuration, the cavity includes two mirrors positioned such that light reflects back and forth, traversing the gain medium each time. An electromagnetic wave of a specific wavelength that passes through the gain medium undergoes amplification; the surrounding mirrors ensure that the majority of the wave makes multiple passes through the gain medium, resulting in repeated amplification.

What is being explained here?

Safety Slide

LASER

SAFETY SLIDE

Question 2

William Herschel named them after magical spirits from English literature defying conventional naming convention. He chose fairies from ‘A Midsummer Night’s Dream’, an air spirit and a gnome from the works of Alexander Pope. Later other Shakespearean characters were chosen including Margaret, Miranda, Stephano, Prospero, etc. What am I talking about?

SAFETY SLIDE

URANUS' MOONS

SAFETY SLIDE

Question 3

This material, often dubbed the "miracle substance" of the 21st century, is composed of carbon atoms arranged in a perfect hexagonal lattice. It's been hailed as a game-changer in fields ranging from nanotechnology to high-speed electronics, and even ultra-strong, lightweight fibres that could revolutionise construction and aerospace industries. Following in the footsteps of silicon, it's poised to become a crucial element in the tech world. What is the name of this remarkable carbon allotrope?

SAFETY SLIDE

GRAPHENE

SAFETY SLIDE

Question 4

“Since I was aware that there exists an infinite number of points on the orbit and accordingly an infinite number of distances, the idea occurred to me that the sum of these distances is contained in the area of the orbit.

For, I remembered that in the same manner, Archimedes too divided the area of a circle into an infinite number of triangles.”

These profound words were spoken by a pioneering scientist, whose groundbreaking work laid the foundation for physics —and no, this isn't an exaggeration!

SAFETY SLIDE

Johannes Kepler

SAFETY SLIDE

Question 5

This elastic cord, often referred to as a shock cord, is composed of one or more elastic strands that form a core, typically covered in a woven cotton or polypropylene sheath. While the sheath itself isn't elastic, it’s braided in such a way that when stretched, it compresses the core, allowing the cord to extend and then retract. This type of cord has become famous for its use in extreme sports and high-adrenaline activities, where safety and flexibility are critical. Identify this essential gear.

SAFETY SLIDE

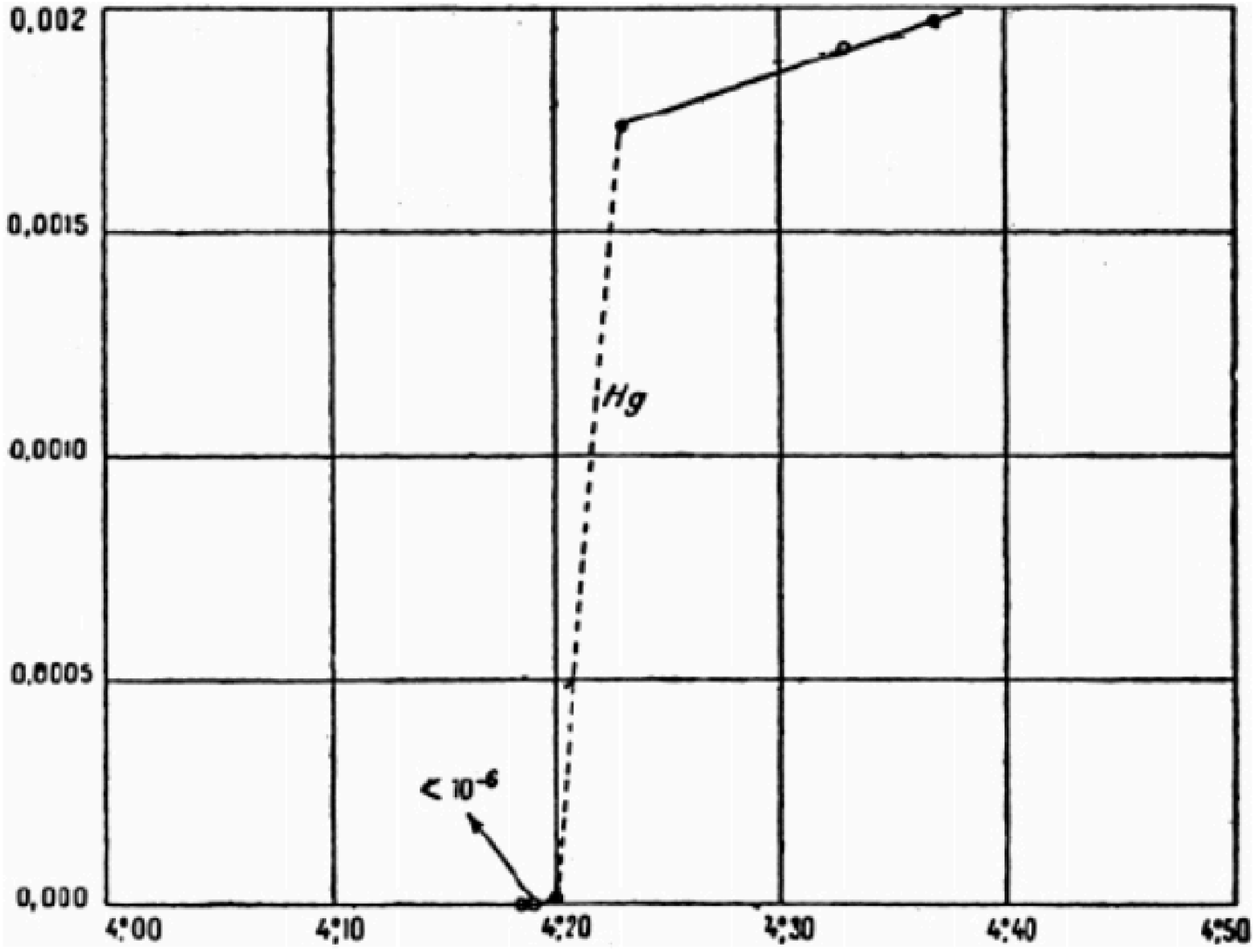
BUNGEE/BUNGEE JUMPING

SAFETY SLIDE

QUESTION 6

X is a cool phenomenon observed only in certain materials. At a critical temperature, a material's electrical resistance suddenly vanishes, and magnetic fields are completely expelled—welcome to the Meissner Effect. X was first discovered by Dutch physicist Heike Kamerlingh Onnes in 1911, and guess what? It was a total accident! Onnes never even claimed to have discovered X—it just showed up in his notebook while he was studying liquid helium. Fun fact, right?

X is one of those phenomena that only makes sense through quantum mechanics. There are two types of X, creatively named Type I and Type II, and it’s also known for creating quantum vortices. And here's the kicker: if we could harness X at room temperature, its applications would be nothing short of groundbreaking.


0,002
0,0015
0,0010
0,0005
0,000
Hg
< 10⁻⁶
4:00
4:10
4:20
4:30
4:40
4:50

SAFETY SLIDE

SUPERCONDUCTIVITY

SAFETY SLIDE

QUESTION 7

What is the phenomenon behind such a drastic collapse of this shown bridge?

SAFETY SLIDE

STANDING WAVES / RESONANCE

SAFETY SLIDE

Question 8

The fascinating phenomenon of superconductivity is hypothesised to involve _____ pairs or BCS pairs of electrons. These BCS pairs are pairs of electrons that are bound together at low temperatures in a superconductor. These electrons have opposite momenta and spin, allowing them to move through a lattice without scattering off atoms, thereby theoretically not experiencing electrical resistance. What is the common name for these pairs, which is also the name of a beloved TV show physicist?

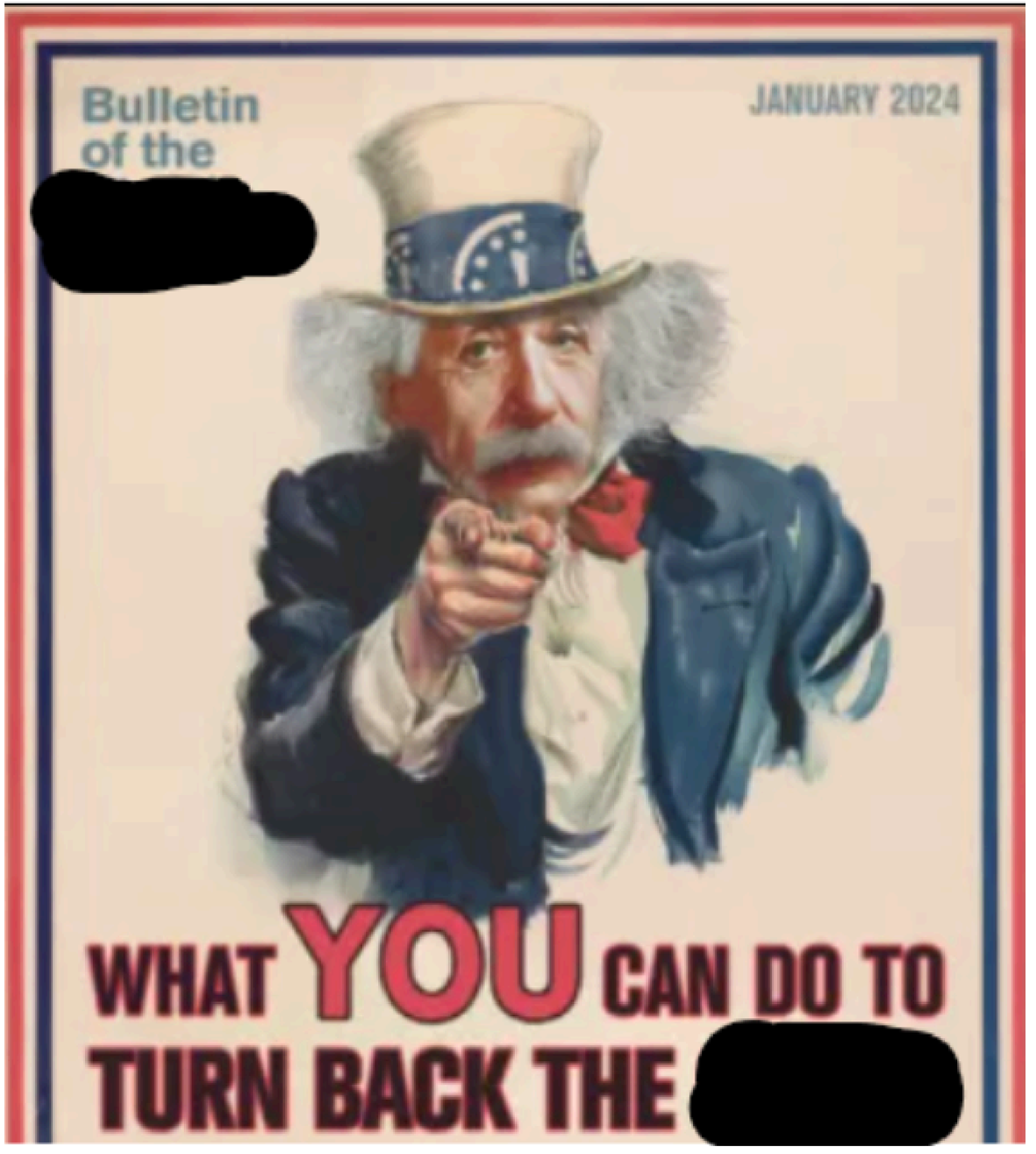
SAFETY SLIDE

COOPER PAIRS

SAFETY SLIDE

Question 9

Y is a design that warns the public about how close we are to destroying our world with dangerous technologies of our own making. Y's origin can be traced to the international group of researchers called the Chicago Atomic Scientists, who had participated in the Manhattan Project. It is a metaphor, a reminder of the perils we must address if we are to survive on the planet. The main factors influencing Y are nuclear warfare, climate change, and artificial intelligence. What is Y?


Bulletin
of the
[redacted]
JANUARY 2024
WHAT YOU CAN DO TO
TURN BACK THE
[redacted]

SAFETY SLIDE

DOOMSDAY CLOCK

SAFETY SLIDE

Question 10

X is a symbol widely used in both physics and chemistry, with its roots tracing back to Old Norse. This distinct letter is part of the Swedish, Danish, Norwegian, and Finnish alphabets. The symbol is formed by placing an overring on the third most common letter in the English alphabet. Interestingly, at least 8 towns in Norway and 5 in Sweden share the name **X**, pronounced “Oaa” or [o:], and these towns are tiny in both area and population. Despite their size, they attract tourists who come solely to snap a selfie with **X**. It's no surprise that Niels Bohr, with his Danish background, reached the radius of the hydrogen atom using this symbol. What is this radius?

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0.529 Angstrom

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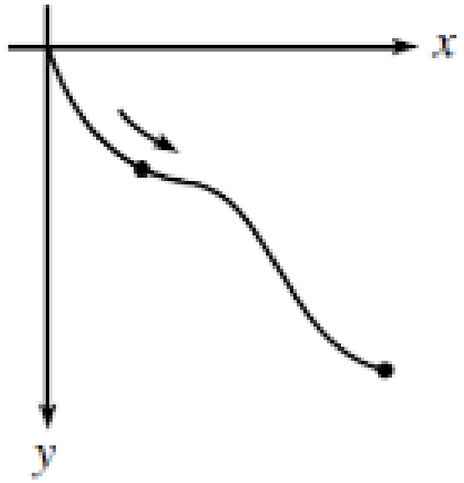
Question 11

A bead is released from rest at the origin and slides down a frictionless wire that connects the origin to a given point, as shown. What shape should the wire take so that the bead reaches the endpoint in the shortest possible time?



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Cycloid / Brachistochrone

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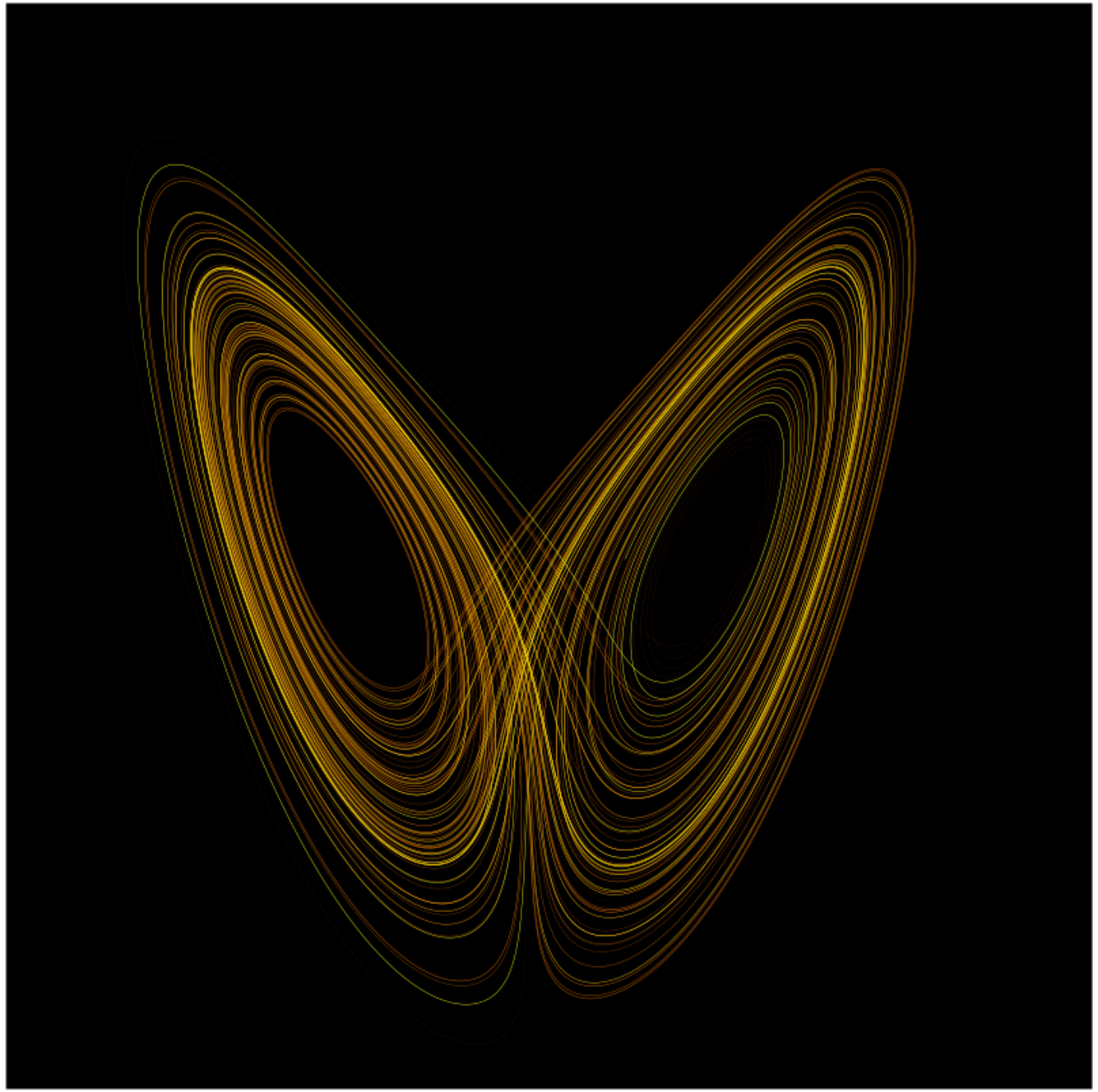
Question 12

Although widely recognized in the 20th century, the phenomenon X was first hinted at by James Clerk Maxwell in the 1870s. X emphasizes its sensitive dependence of initial conditions in which small change in one state results in large differences in a later state. This phenonmenon is known as X, as it is derived from the metaphorical example of the details of a tornado (the exact time of formation, the exact path taken) being influenced by minor perturbations such as a distant seagull flapping its wings several weeks earlier. X is now a well studied topic, particularly due to its applications in stock markets. What are we talking about?

HINT:



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BUTTERFLY EFFECT

Lorenz used seagull as an example earlier but was forced to use butterfly to make it more poetic

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Question 13

Organized by the Annals of Improbable Research, X is a unique event that adds a lighthearted twist to serious scientific achievements. Held annually at MIT, X is presented by Nobel laureates and is known for its humorous and unconventional atmosphere. The ceremony is filled with running jokes, including the memorable Miss Sweetie Poo—a little girl who interrupts long speeches by saying, "Please stop: I'm bored!" in a high-pitched voice. The event traditionally ends with the words, "If you didn't win a prize—and especially if you did—better luck next year!" The purpose of X is to honor research that first makes people laugh, and then think. Some of the past winning topics include the magnetic levitating frog, Administratium, and the buttered toast phenomenon. Can you identify X?

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The Ig Nobel Prize

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Question 14

The aesthetic impact of a softly blurred background when capturing a subject with a fast lens at its widest aperture is known as _____. This term originates from the Japanese word _____, which translates to "blur" or "haze". What is the term?

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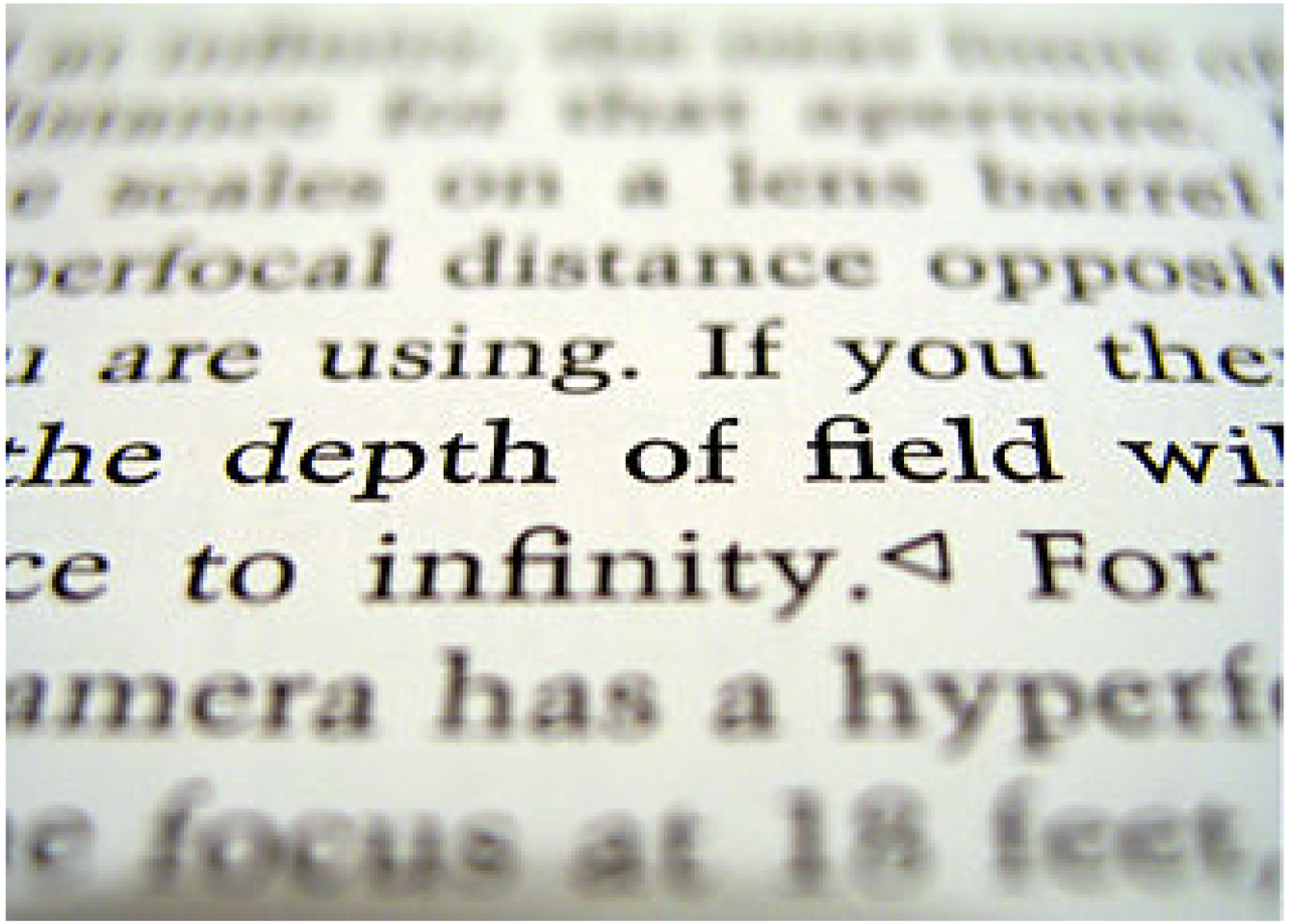
BOKEH EFFECT



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Thank You bbg