Title: Minutephysics and the GUT of Youtube Videos

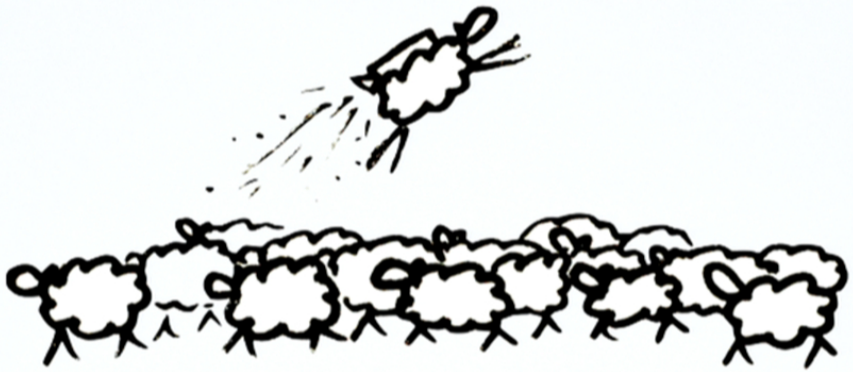
Date: Nov 30, 2011 02:00 PM

URL: http://pirsa.org/11110110

Abstract: It's usually assumed that youtube is just for kittens, babies, and music videos. However, youtube is also the highest-traffic site on the internet and it turns out it's actually a darn good place to teach people about physics! We'll start with the story and analysis of how my video series Minutephysics grew from a fun project to a youtube channel with 120,000 subscribers and 9 million views in just a few months, then discuss how media & technology (especially videos) can facilitate good (and bad) communication, and finally talk about how you can harness the power of the internet in your own physics outreach. And of course we'll watch a few cool videos along the way. As a primer, feel free to check out www.youtube.com/minutephysics

Minutephysics and the GUT of Youtube videos

Henry Reich
youtube.com/minutephysics



1st PSI Colloquium?

perimeter scholars
international™

Plan of Attack

- History/background of Minutephysics & youtube

Plan of Attack

- History/background of Minutephysics & youtube
- Effective communication on (& off) the internet.
  - ✳fun videos here

Plan of Attack

- History/background of Minutephysics & youtube
- Effective communication on (& off) the internet.
  - ✳fun videos here
- Thoughts on teaching physics

Plan of Attack

- History/background of Minutephysics & youtube
- Effective communication on (& off) the internet.
  - ✳fun videos here
- Thoughts on teaching physics
- Questions

A BRIEF HISTORY OF

MINUTE PHYSICS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MinutePhysics
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minute
fihziks
0:03 / 1:48
360p
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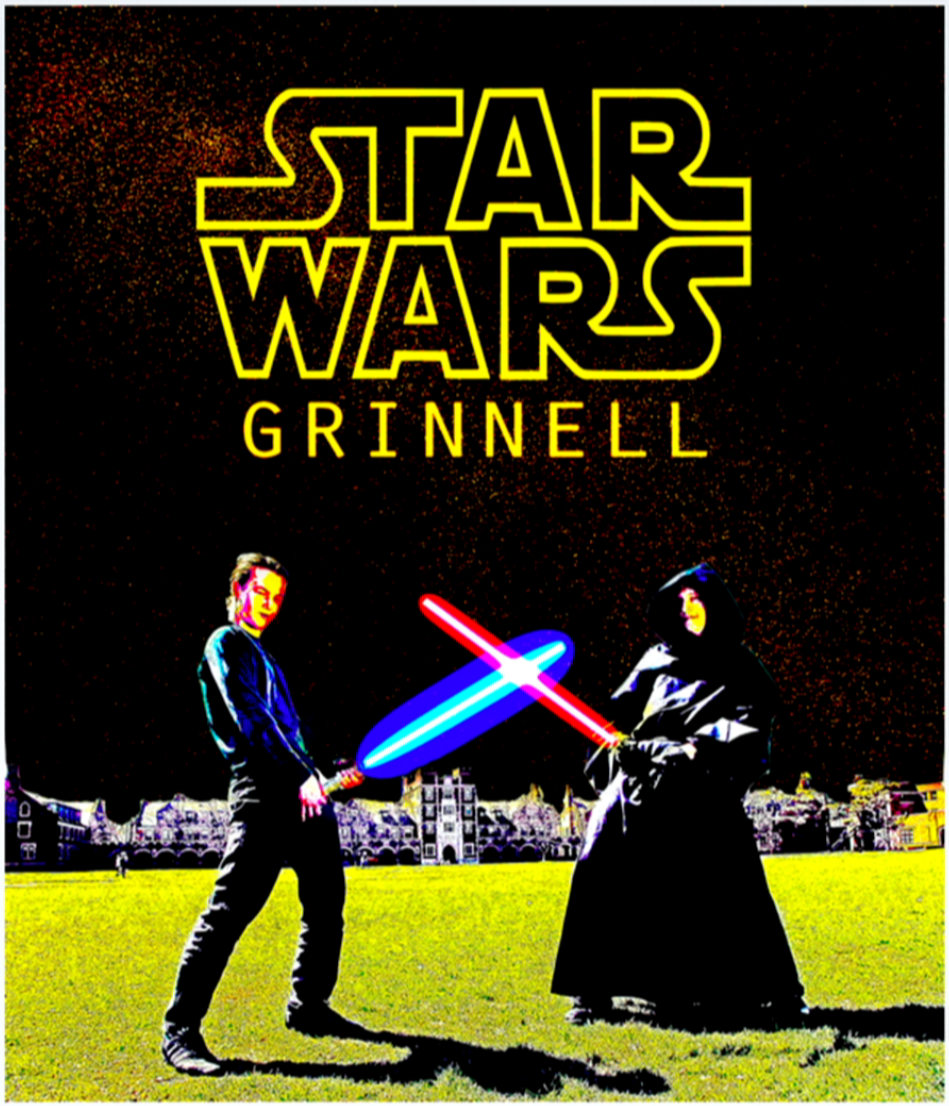
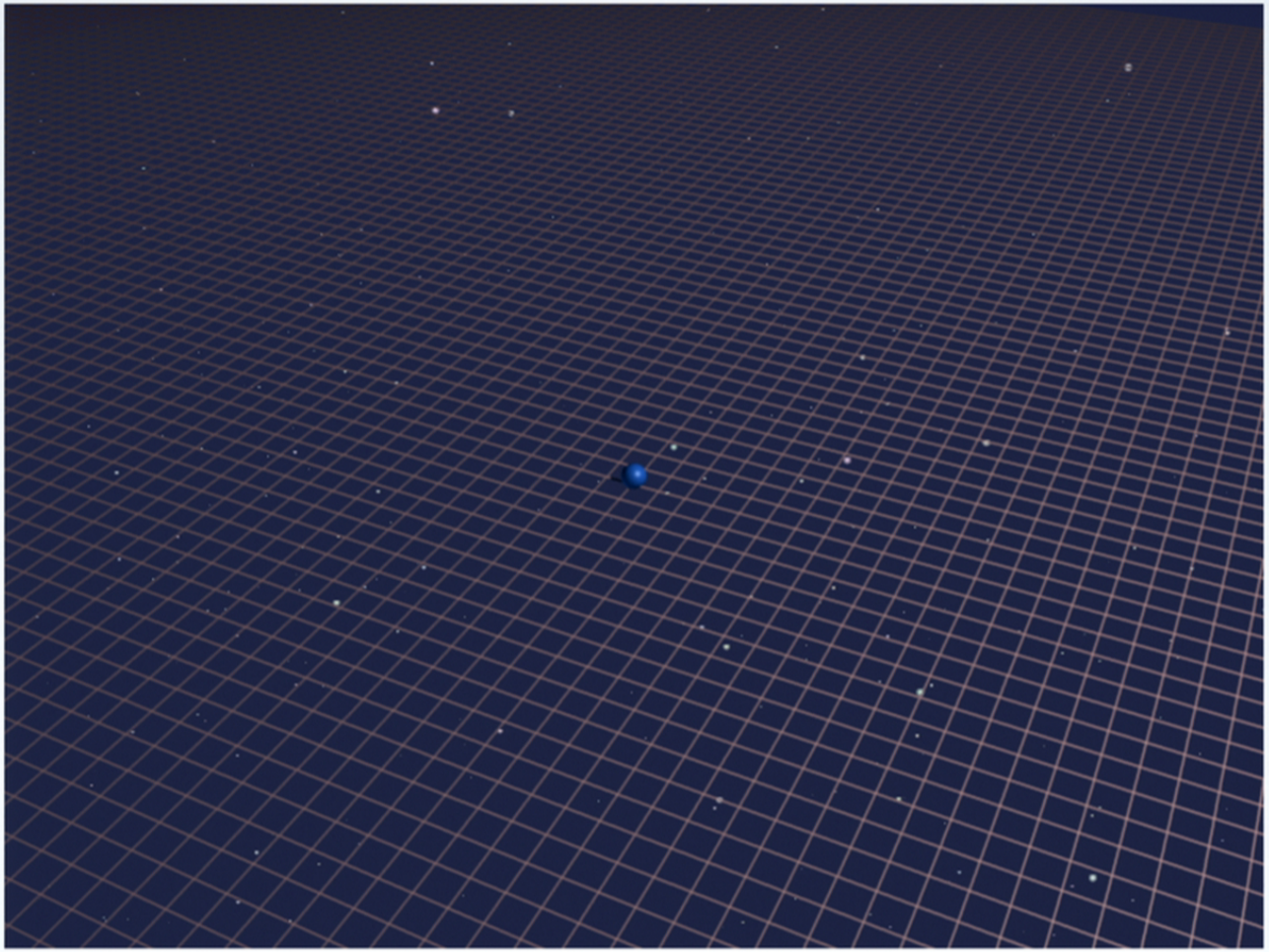
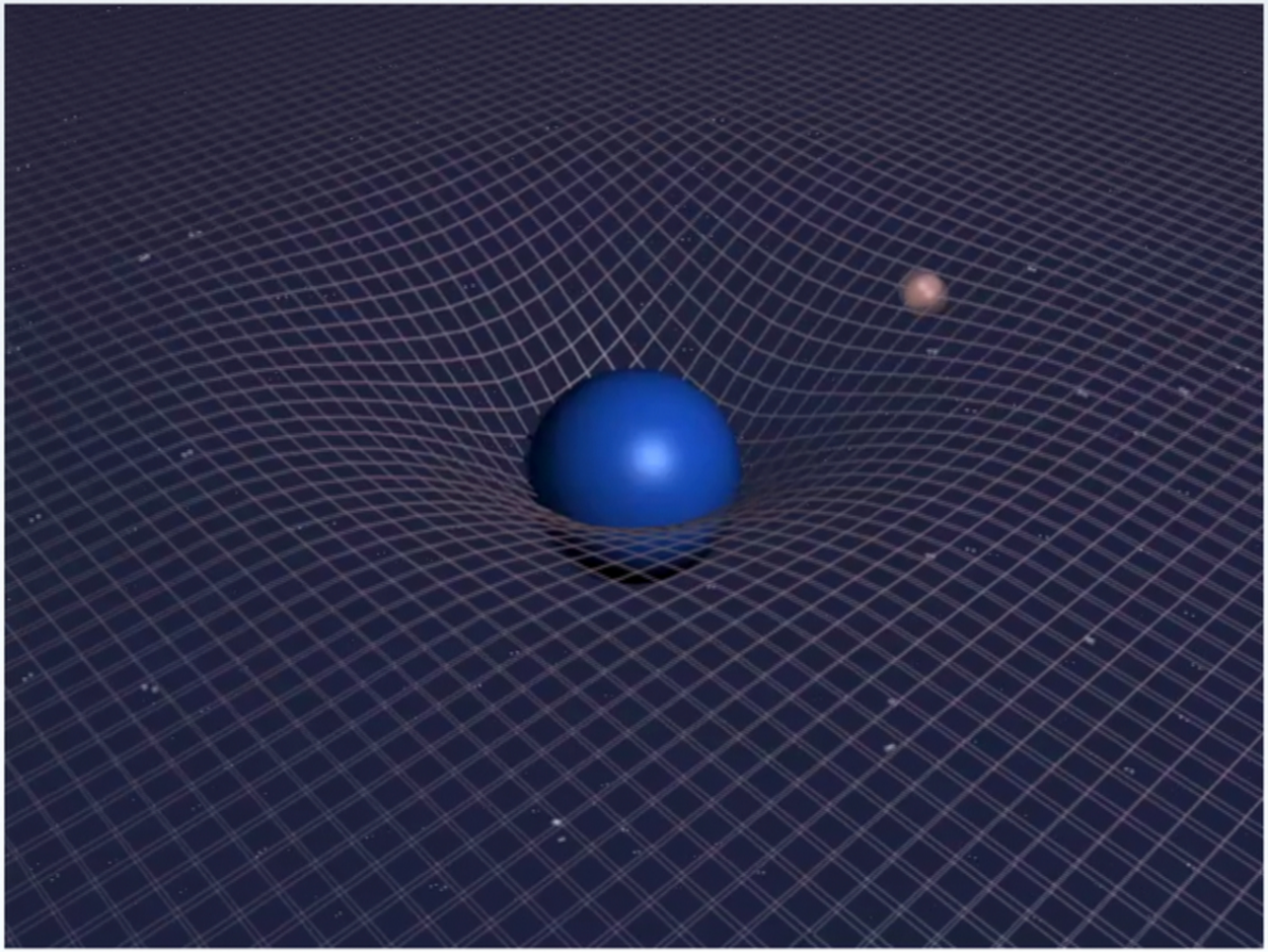
Schrödinger's Cat
Like
THE CHEVROLET VOLT.
IT'S MORE CAR THAN ELECTRIC.
« Back to Playlists
MinutePhysics
Cool physics and other sweet science - all in a minute!
More Info
Glass
minutephy... - 208,567 views
1:42
There is no pink light
minutephy... - 1,047,155 views
1:04
2011 Nobel Prize: Dark Energy feat. Sean
minutephy... - 495,711 views
1:39
Schrödinger's Cat
minutephy... - 1,372,890 views
1:48


STAR
WARS
GRINNELL

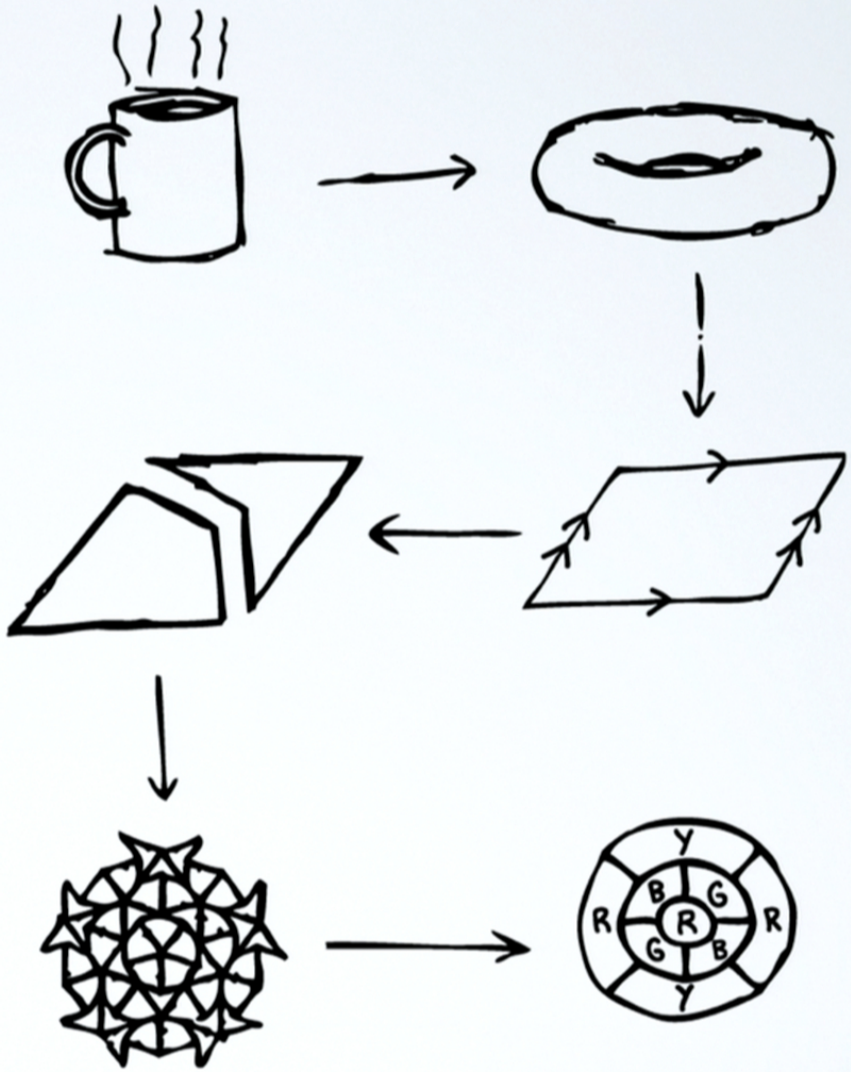
perimeter scholars
international

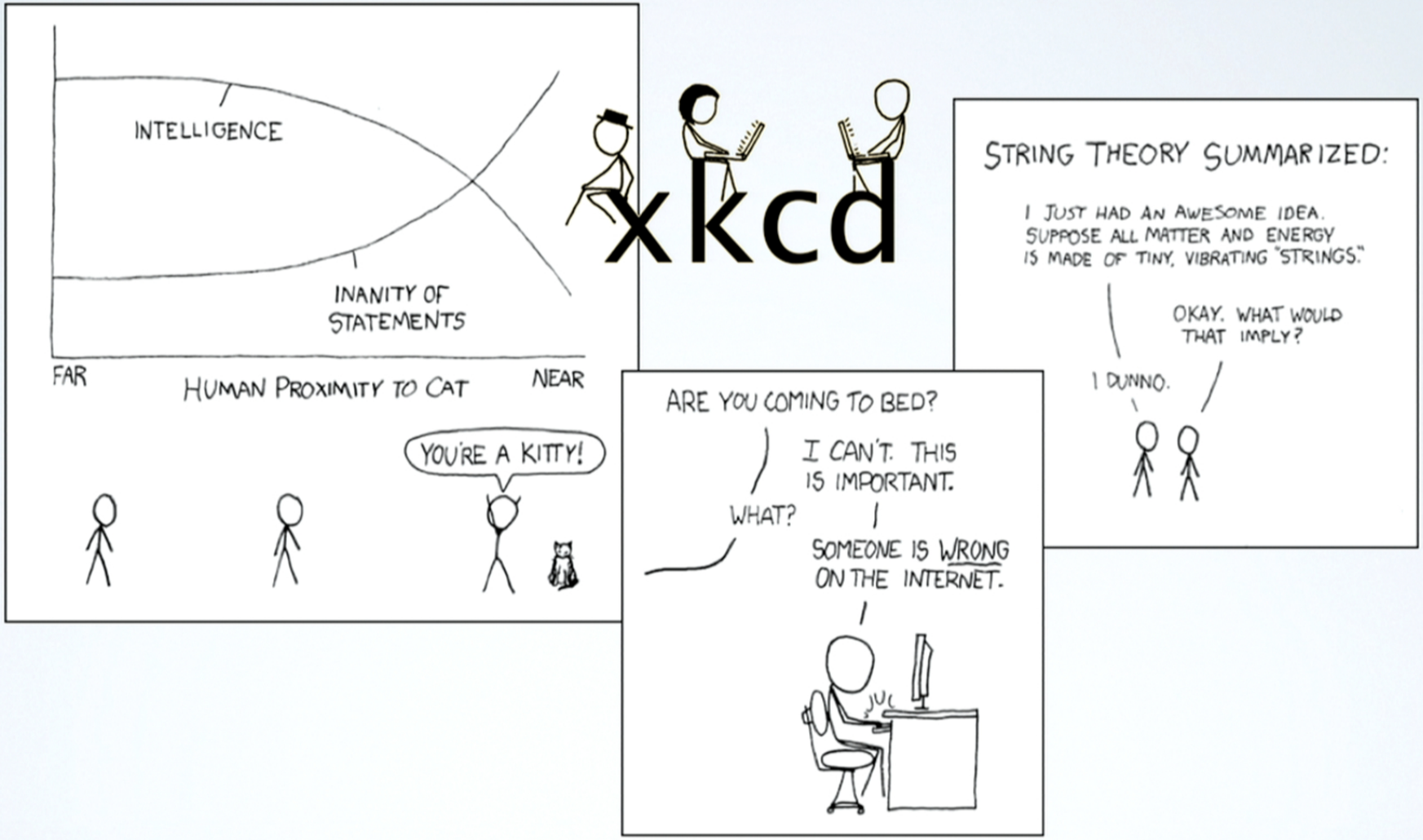


perimeter scholars
international



GRINNELL COLLEGE




INTELLIGENCE
INANITY OF STATEMENTS
FAR
HUMAN PROXIMITY TO CAT
NEAR
YOU'RE A KITTY!
xkcd
STRING THEORY SUMMARIZED:
I JUST HAD AN AWESOME IDEA. SUPPOSE ALL MATTER AND ENERGY IS MADE OF TINY, VIBRATING "STRINGS."
OKAY. WHAT WOULD THAT IMPLY?
I DUNNO.
ARE YOU COMING TO BED?
I CAN'T. THIS IS IMPORTANT.
WHAT?
SOMEONE IS WRONG ON THE INTERNET.

KHAN

ACADEMY

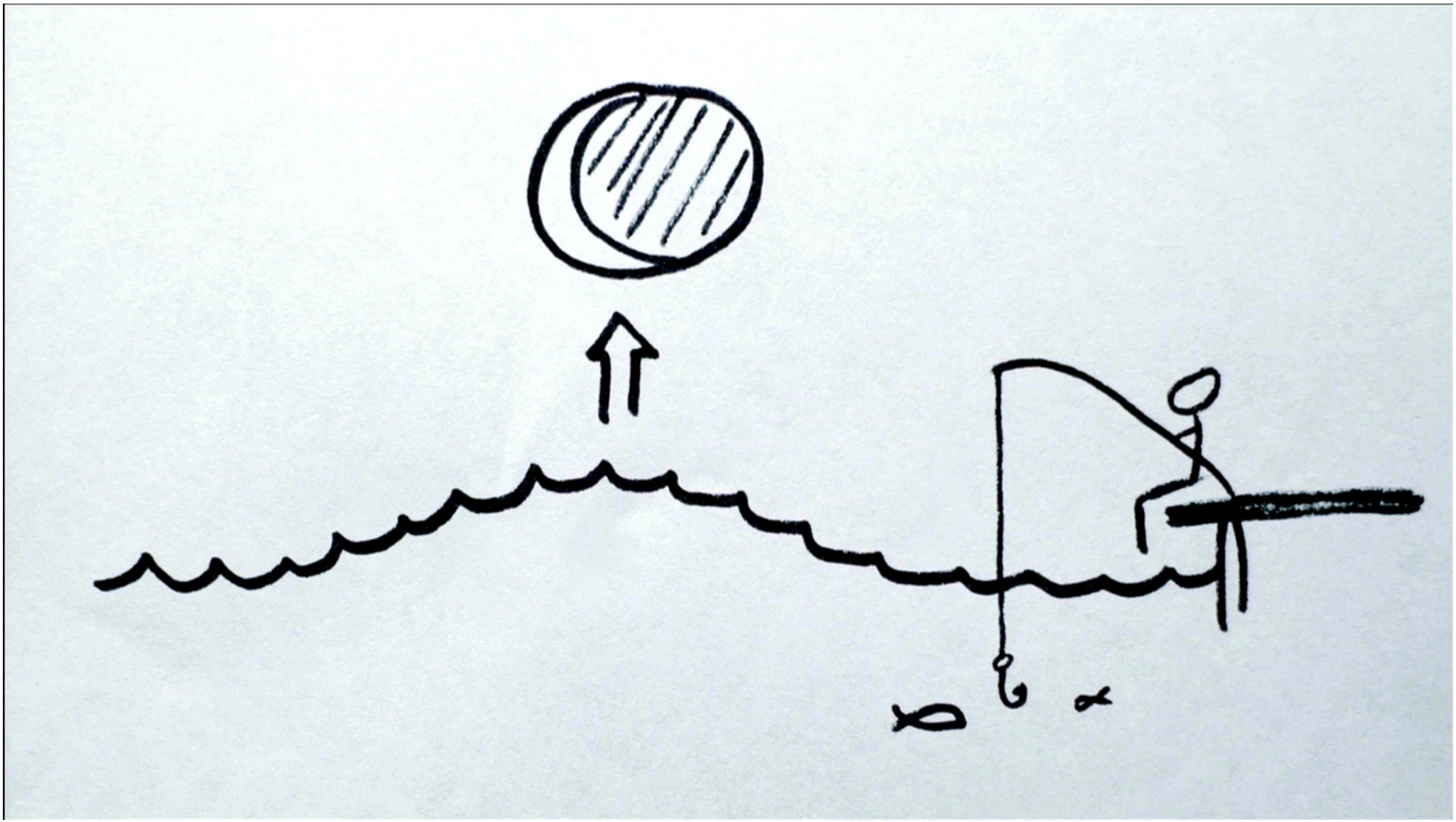
KHAN ACADEMY

RSA

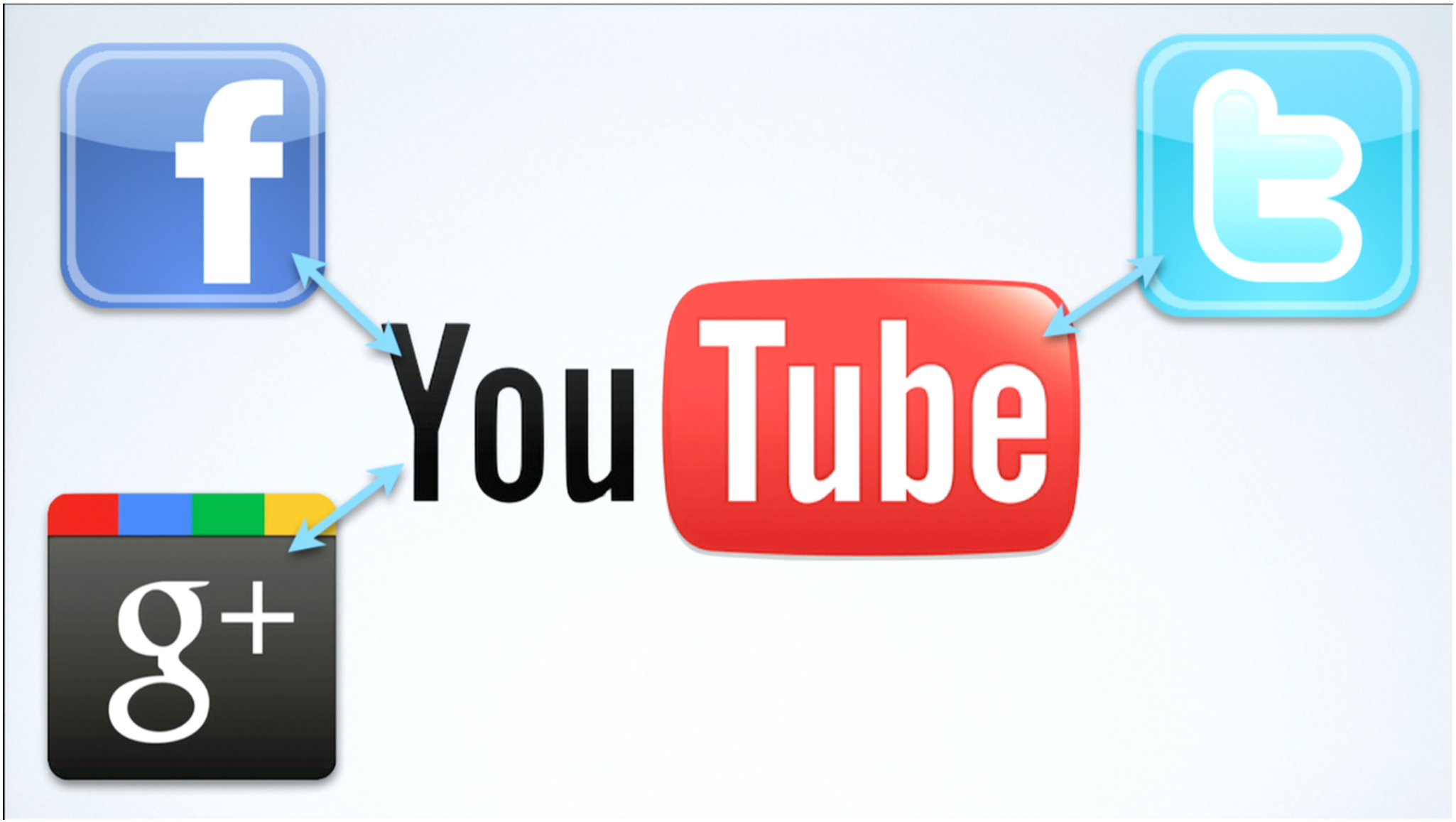
RSA

KHAN ACADEMY

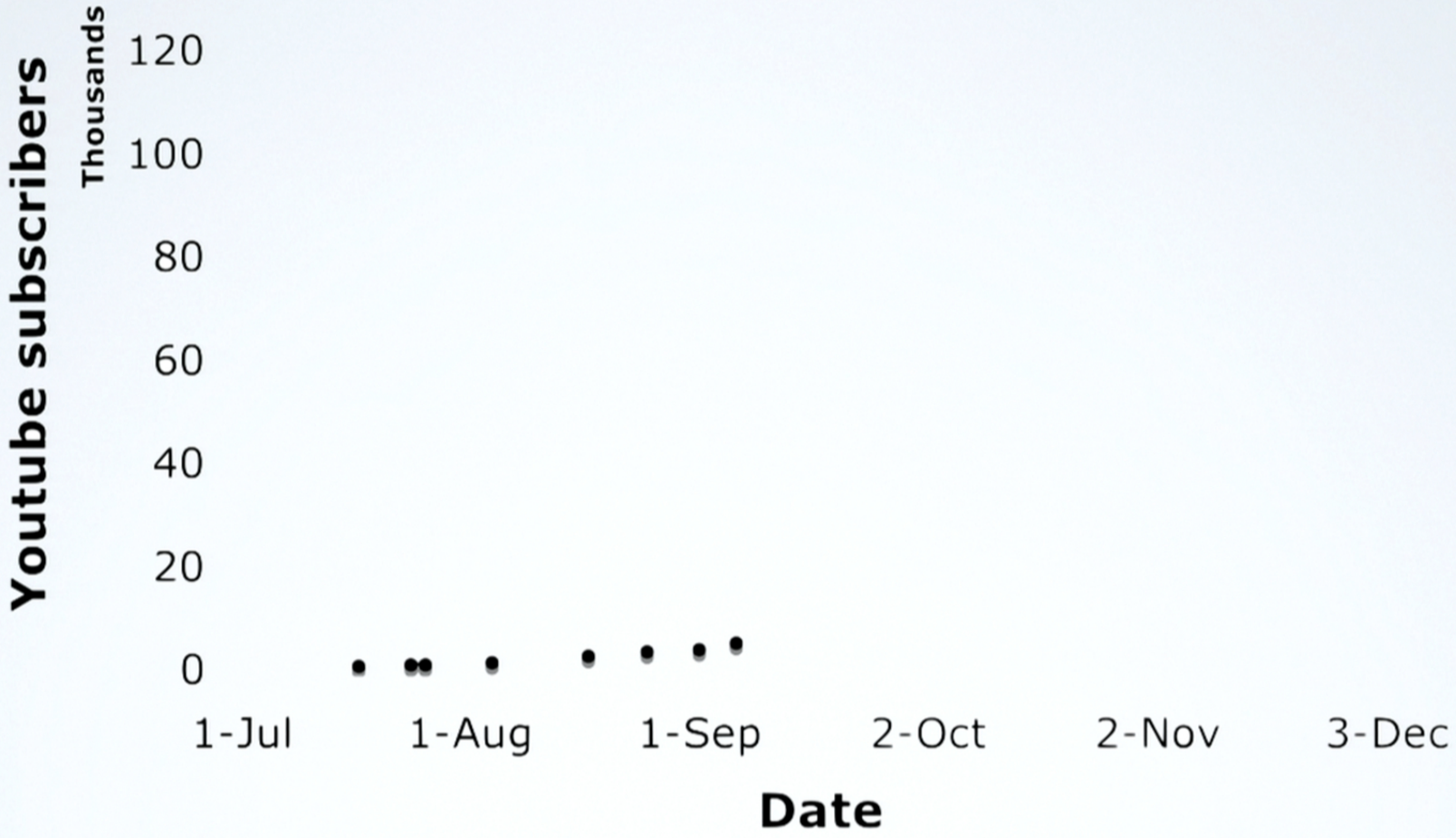
RADIOLAB

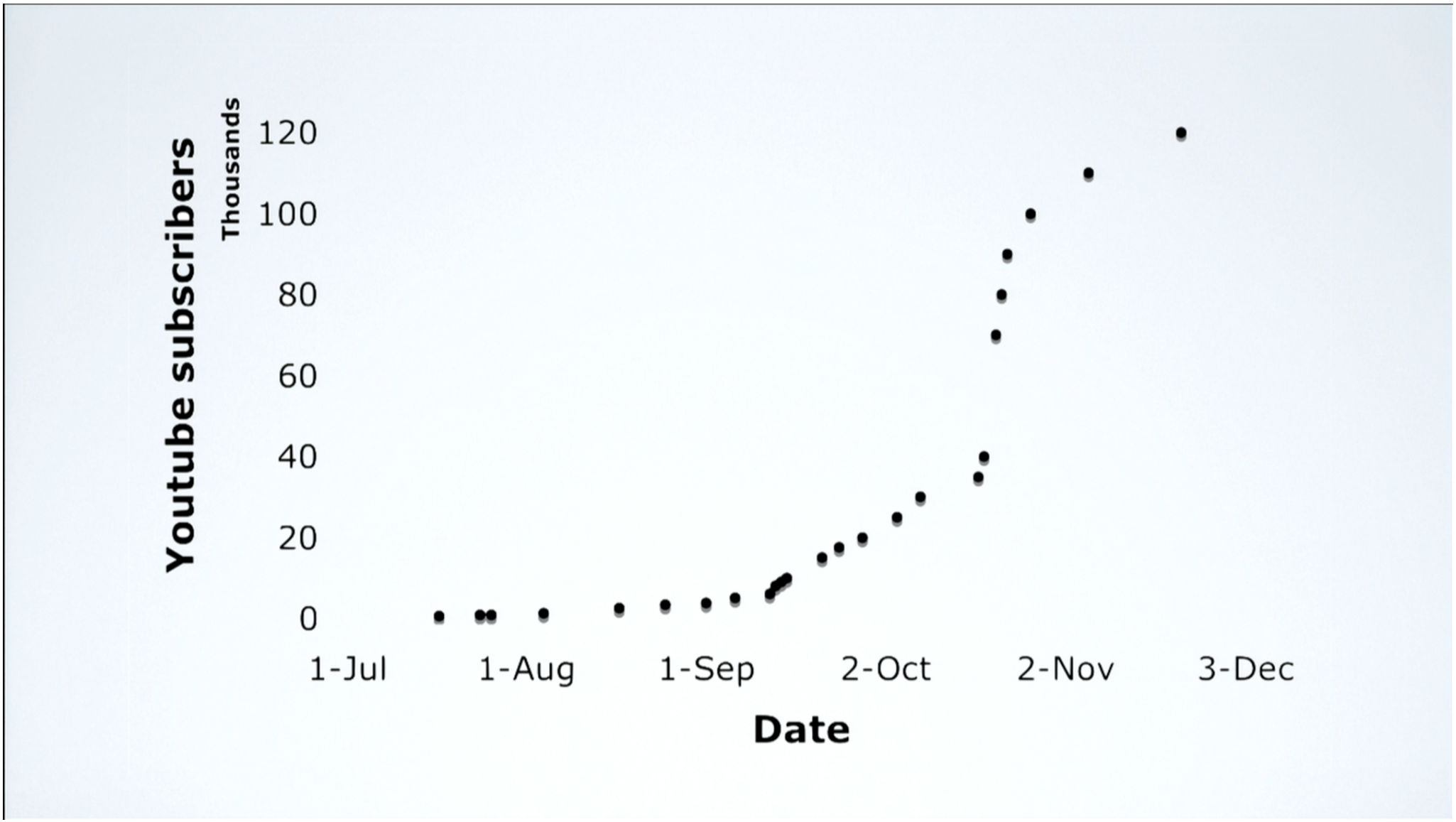


YouTube


f
You Tube
g+


f
You Tube
g+
MINUTE
PHYSICS


Youtube subscribers
Thousands
120
100
80
60
40
20
0
1-Jul
1-Aug
1-Sep
2-Oct
2-Nov
3-Dec
Date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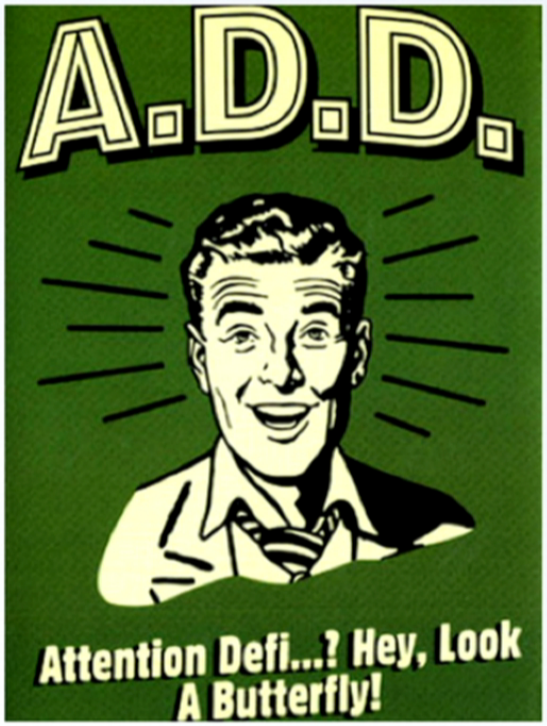
20
0
1-Jul
1-Aug
1-Sep
2-Oct
2-Nov
3-Dec
Date

Video Producer	Rank	Subscribers	Videos	Channel Views
Junkyard129	987	116,182	819	1,752,001
JckSparrow	988	116,147	58	2,167,085
italktosnakes	989	115,579	154	2,272,146
ThatsHeart	990	115,568	94	3,180,637
hickok45	991	115,556	519	5,178,772
jefferydallas	992	115,518	5	161,682
PROSTOtv	993	115,426	527	3,711,127
GoldGloveTV	994	115,383	701	1,867,925
mattrach	995	115,324	95	6,141,151
chachi0123	996	115,320	11	1,085,697
CiaraTV	997	115,295	31	3,774,546
universalmusicjapan	998	115,282	1,321	5,414,561
AkonVEVO	999	115,067	32	2,500,845
minutephysics	1000	115,045	21	366,890
Video Producer	Rank	Subscribers	Videos	Channel Views

COMMUNICATION ON THE INTERNET

- Has our attention span shortened?



COMMUNICATION ON THE INTERNET

- Has our attention span shortened?
- Captive vs. free audience

COMMUNICATION ON THE INTERNET

- Has our attention span shortened?
- Captive vs. free audience

COMMUNICATION ON THE INTERNET

- Has our attention span shortened?
- Captive vs. free audience
- Appropriate amount of content


STAR WARS
EPISODE III
REVENGE OF THE SITH


STAR WARS
EPISODE III
REVENGE OF THE SITH
RedLetterMedia

TOUR DE SCIENCE VIDEOS

TOUR DE SCIENCE VIDEOS

- Khan Academy

TOUR DE SCIENCE VIDEOS

- Khan Academy
- RSAnimate


DON'T WORRY MRS SMYTH
IT'S ALL THE RAGE. TRUST ME. I'M A DOCTOR.
ON WHAT?
iPHONES
ADVERTISING HOARDINGS
BUY THIS
100s OF TELEVISION CHANNELS
Ritalin 10mg
TAKE YOUR PILLS AND FOCUS!
TODAY'S LESSON
BORING STUFF
BLAH BLAH BLAH BLAH BLAH BLAH BLAH BLAH
STANDARDISED TESTING
ADHD
ON FACTORY LINES
SEPARATE SUBJECTS
SCIENCE
MATHS
LANGUAGES
SPORT
SEPAR FACILIT
WE STILL EDUCATE CHILDREN BY BATCHES
WHY DO WE DO THAT?
IF YOU ARE INTERESTED IN THE MODEL OF EDUCATION
YOU DON'T START FROM PRODUCTION LINE MENTALITY
I BELIEVE WE NEED TO GO...
CONFORMITY
BLAS MY SENSES
I KNEW THEM WELL
ANAESTHETIC
SHUT YOUR SENSES OFF
DEADEN YOURSELF TO WHAT IS HAPPENING
WE ARE GETTING OUR CHILDREN THROUGH EDUCATION BY ANAESTHETISING THEM
WE SHOULD BE WAKING THEM UP TO WHAT IS INSIDE OF THEMSELVES!
CHANGING THE PARADIGM
DON'T LOOK! DON'T COPY THAT'S CHEATING
OUTSIDE SCHOOL THAT'S CALLED COLLABORATION
IN THE EXACT OPPOSITE DIRECTION
STANDARDISATION
WE ALL HAVE THIS CAPACITY
WHAT % SCORED
TEST
GENIUS
98%
LONGITUDINAL TEST
IT MOSTLY DETERIORATES
MOST PEOPLE 10-15
PEOPLE WHO ARE GOOD AT THIS 200
IT'S A PAPER CLIP JAM... BUT NOT AS WE KNOW IT
PAPER BOARS?
GENE POOL
WE HAVE TO THINK DIFFERENTLY ABOUT HUMAN CAPACITY
ACADEMIC
ABSTRACT
NON-ACADEMIC
THEORETICAL
YOU ARE A MYTH!
GREAT LEARNING HAPPENS IN GROUPS
COLLABORATION IS THE STUFF OF GROWTH
LOTS OF WAYS TO INTERPRET A QUESTION
MULTIPLE ANSWERS NOT ONE!
SEE LOTS OF POSSIBLE ANSWERS TO A QUESTION
DIVERGENT
ONE EXAMPLE
HOW MANY USES CAN YOU THINK OF FOR A PAPER CLIP?
ERM... FISH HOOK, BACK SCRATCHER, BARBIE COAT HANGER...
COULD IT BE 200 FT TALL AND MADE OF FOAM RUBBER?

EXAMPLE SCIENCE VIDEOS

You don’t want to read directly off of your slides.

Sorry.


AUDIO-VISUAL
AUDIO-VISUAL
AUDIO-VISUAL
AUDIO-VISUAL

Weak nuclear force

$$n \rightarrow p + e^- + \bar{\nu}_e$$

Weak nuclear force

$$n \rightarrow p + e^- + \bar{\nu}_e$$

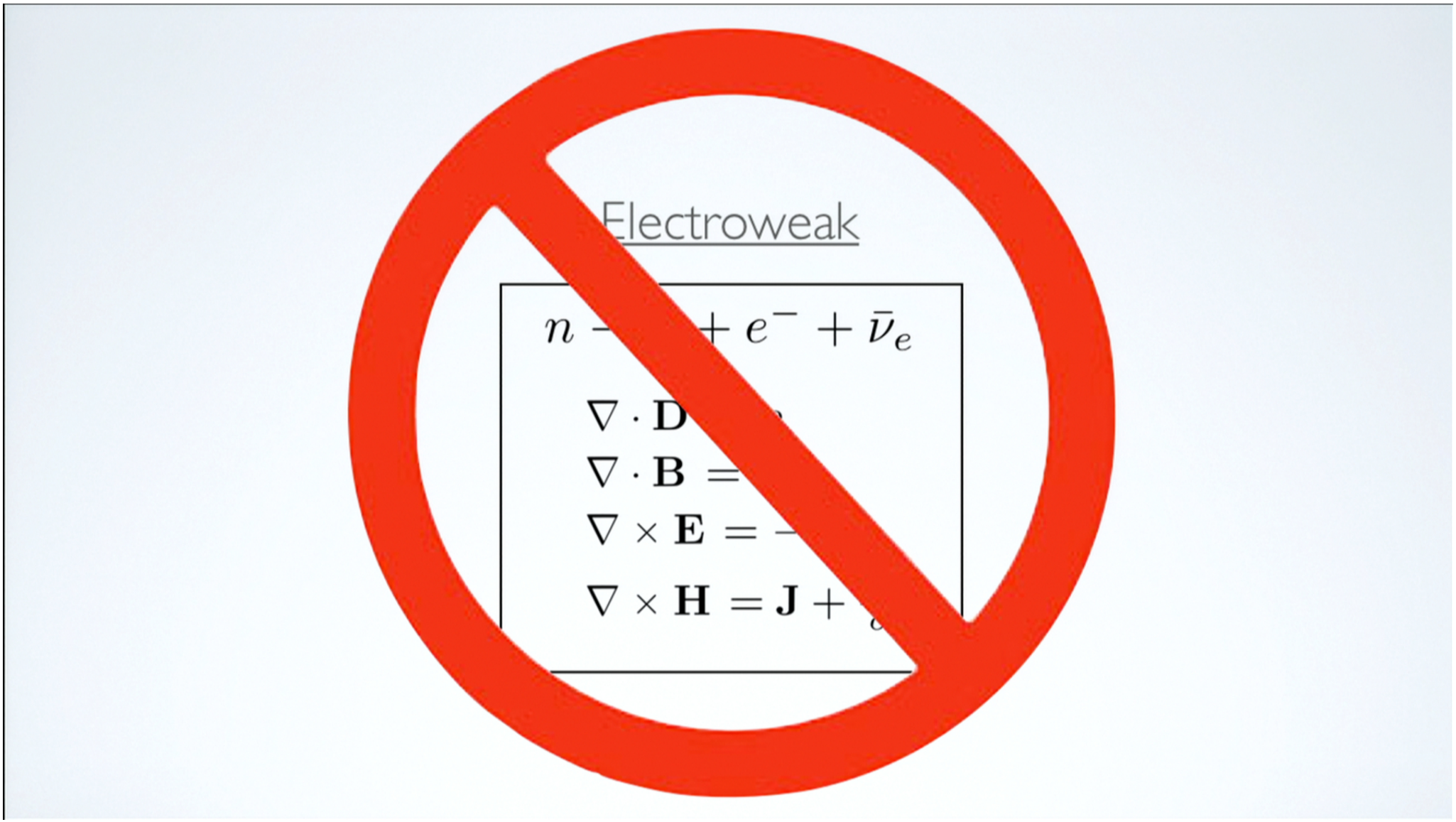
E&M

$$\nabla \cdot \mathbf{D} = \rho$$
$$\nabla \cdot \mathbf{B} = 0$$
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

Electroweak

$$n \rightarrow p + e^- + \bar{\nu}_e$$

$$\nabla \cdot \mathbf{D} = \rho$$
$$\nabla \cdot \mathbf{B} = 0$$
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$


Electroweak
n $+ e^- + \bar{\nu}_e$
$\nabla \cdot \mathbf{D}$
$\nabla \cdot \mathbf{B} =$
$\nabla \times \mathbf{E} =$
$\nabla \times \mathbf{H} = \mathbf{J} +$

TOUR DE SCIENCE VIDEOS

- Khan Academy
- RSAnimate
- Stanford's AI course


STANFORD
ENGINEERING
Oct. 10 ~ DEC. 16, 2011
INTRODUCTION TO
Artificial
Intelligence
In partnership with the Stanford University School of Engineering.
You can join this online worldwide class this fall.

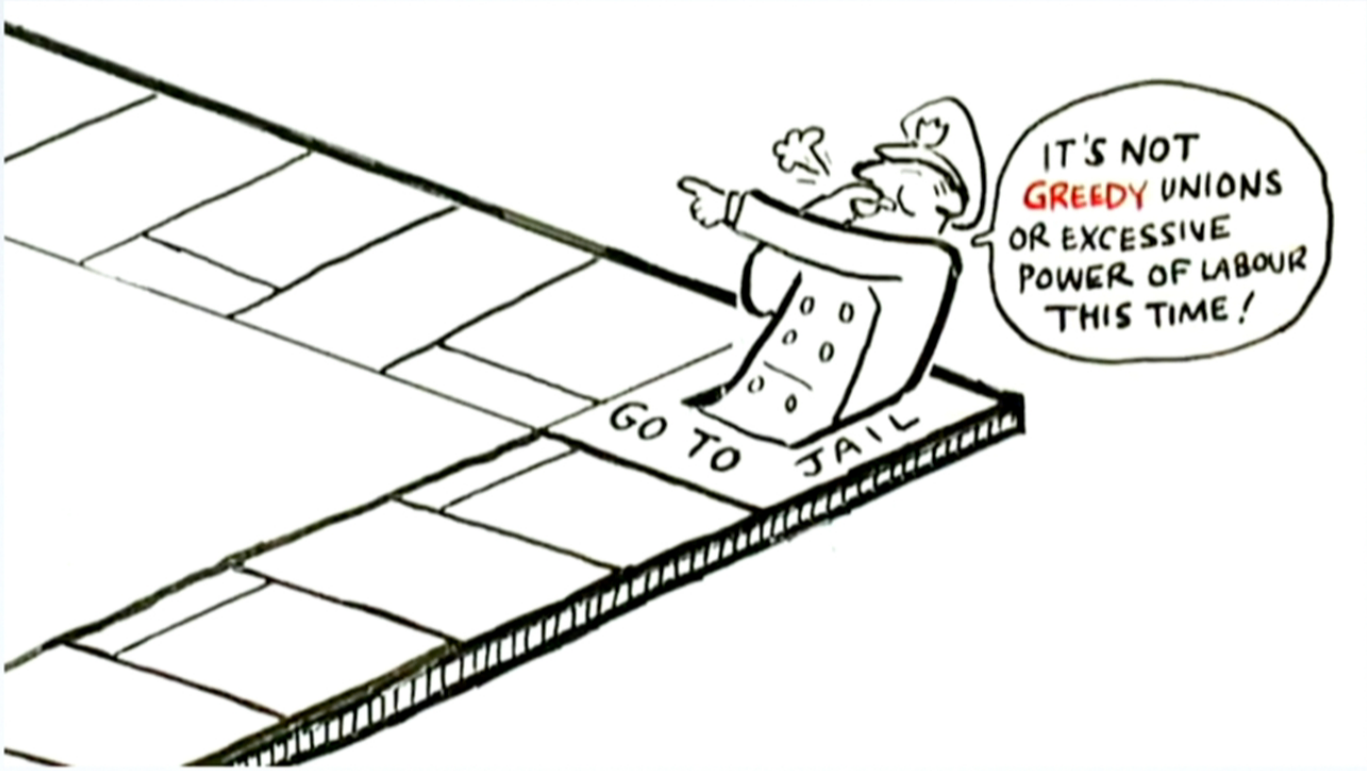
TOUR DE SCIENCE VIDEOS

- Khan Academy
- RSAnimate
- Stanford's AI course

TOUR DE SCIENCE VIDEOS

- Khan Academy
- RSAnimate
- Stanford's AI course
- Alice & Bob

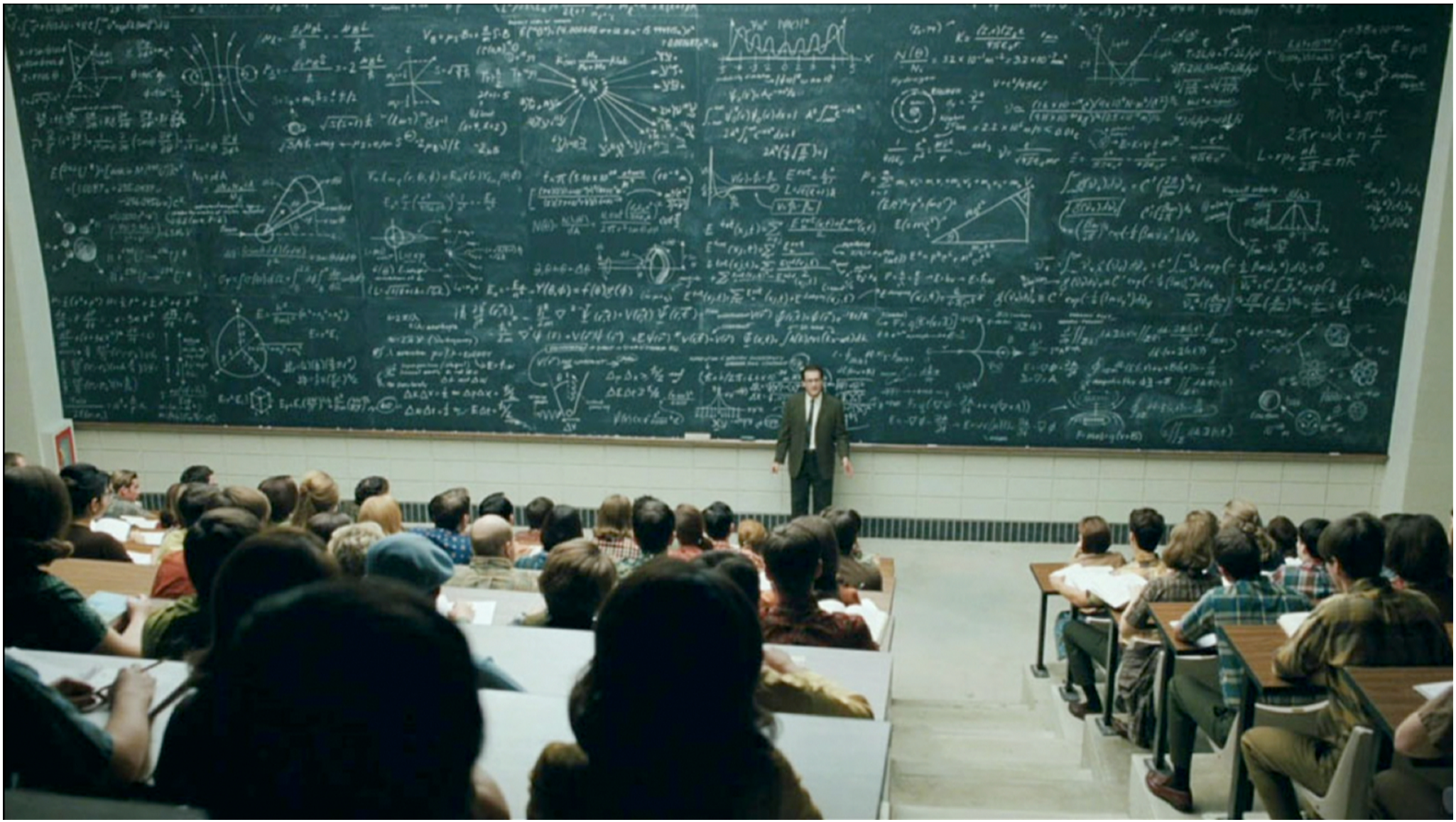
TOUR DE SCIENCE VIDEOS

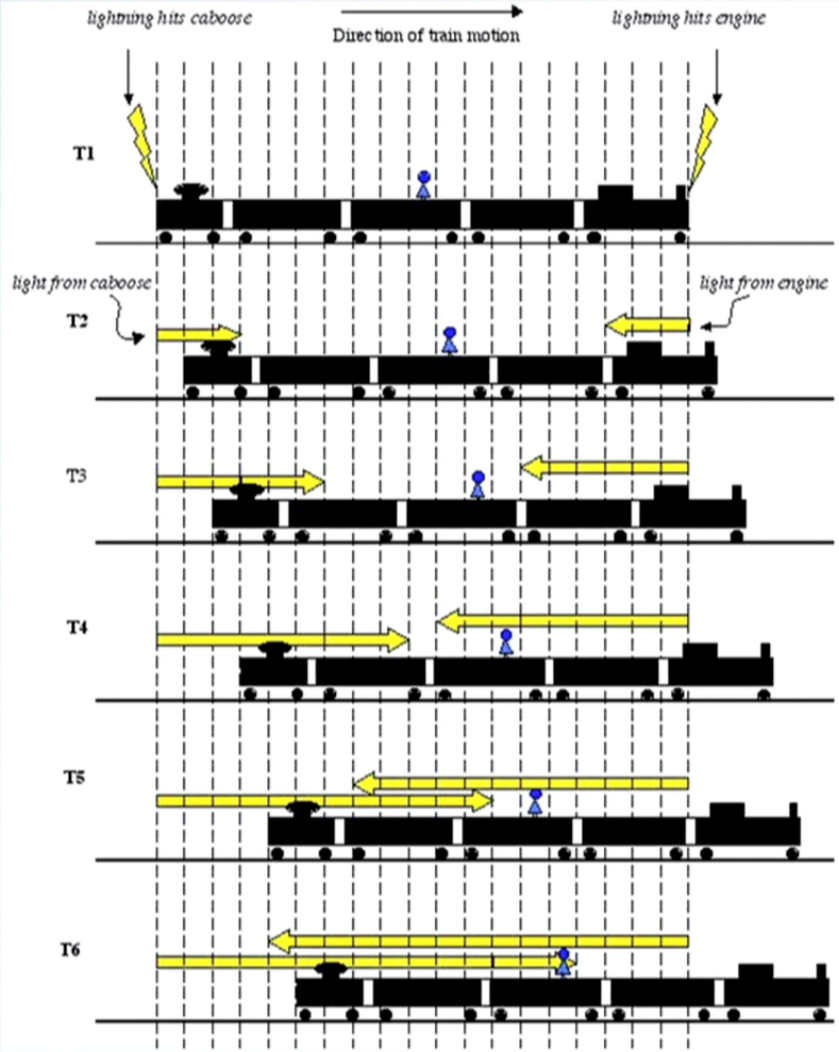


GOOD PRODUCTION VALUE: PBS & BRIAN GREENE


McCann
LEVI'S
NYC TAXI

SHOCK AND AWE





Relativity:

$$\omega = \frac{\omega_0 + k_0 v}{\sqrt{1 - v^2/c^2}} \qquad \omega' = \frac{\omega + kv}{\sqrt{1 - v^2/c^2}}$$

$$x' = \frac{x + vt}{\sqrt{1 - v^2/c^2}}, \qquad x = \frac{x' - vt'}{\sqrt{1 - v^2/c^2}}$$

$$t' = \frac{t + vx/c^2}{\sqrt{1 -}} \qquad t' - vx'/c^2$$

Two people are measuring each others time

cos (ωt -

Person who is watching another person move by, measures

Person who is moving with the clock, measures

$$\Delta t = \frac{\Delta t_p}{\sqrt{1 - \frac{v^2}{c^2}}} = \gamma \Delta t_p$$

Proper Time

Gamma $\gamma > 1$

W

p

A mov

Special Relativity

$$\beta = \frac{v}{c} \qquad \gamma = \frac{1}{\sqrt{1 - \beta^2}}$$

At v = 0.42c, γ = 1.10, which means the effects of Relativity become noticeable.

$$\Delta x = \gamma(\Delta x' + v\Delta t')$$
$$\Delta t = \gamma(\Delta t' + v\Delta x'/c^2)$$
$$\Delta y = \Delta y'$$
$$\Delta z = \Delta z'$$

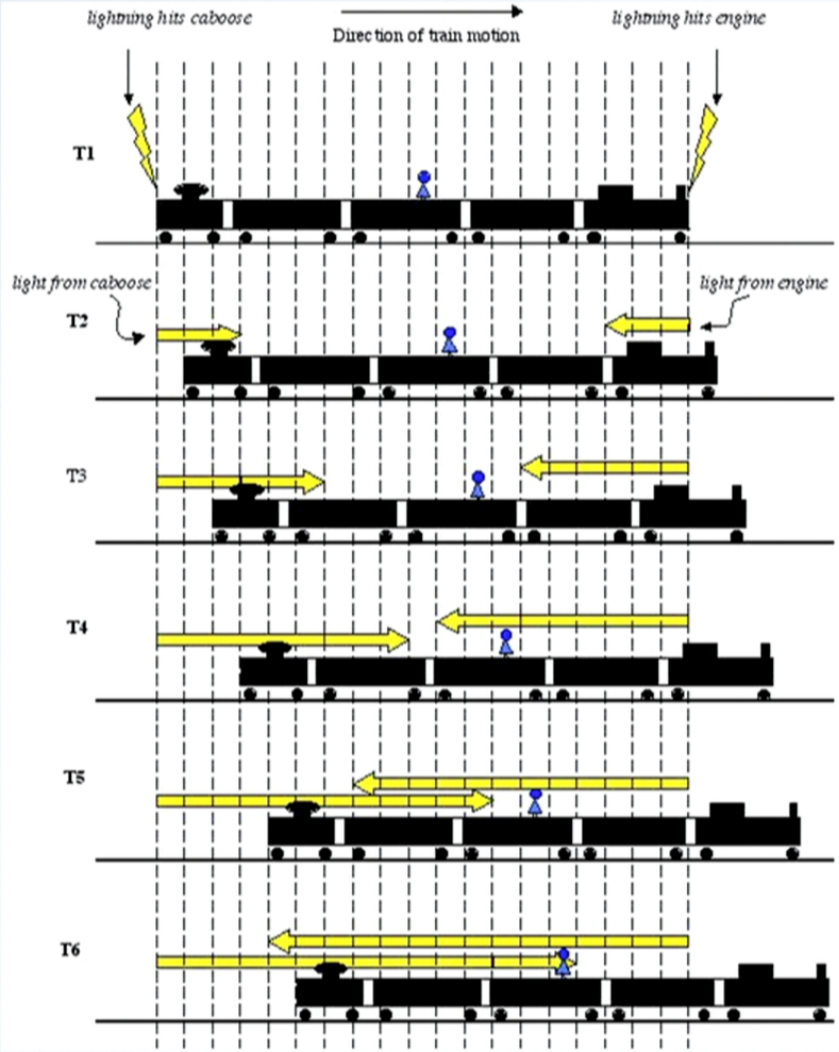
The Lorentz Tran

Length contraction

$$L' = \frac{L_0}{\gamma}$$

Time dilation

$$t' = \gamma t$$



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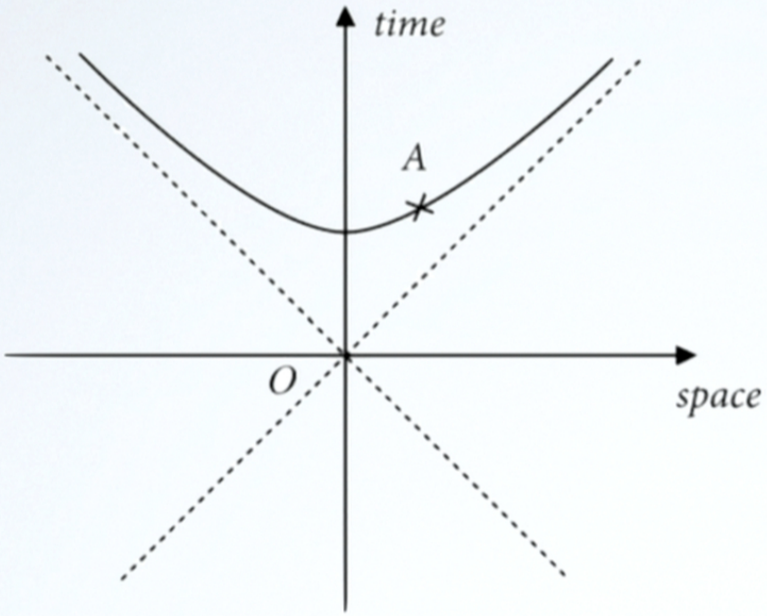
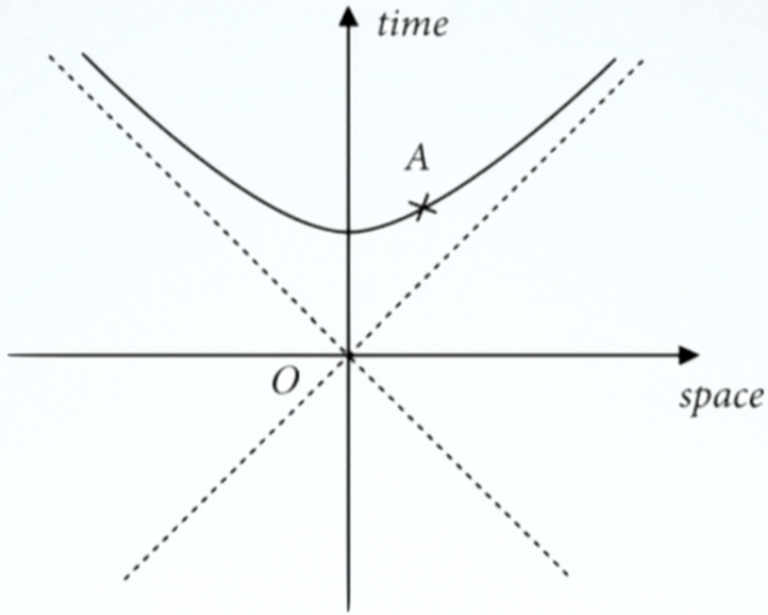
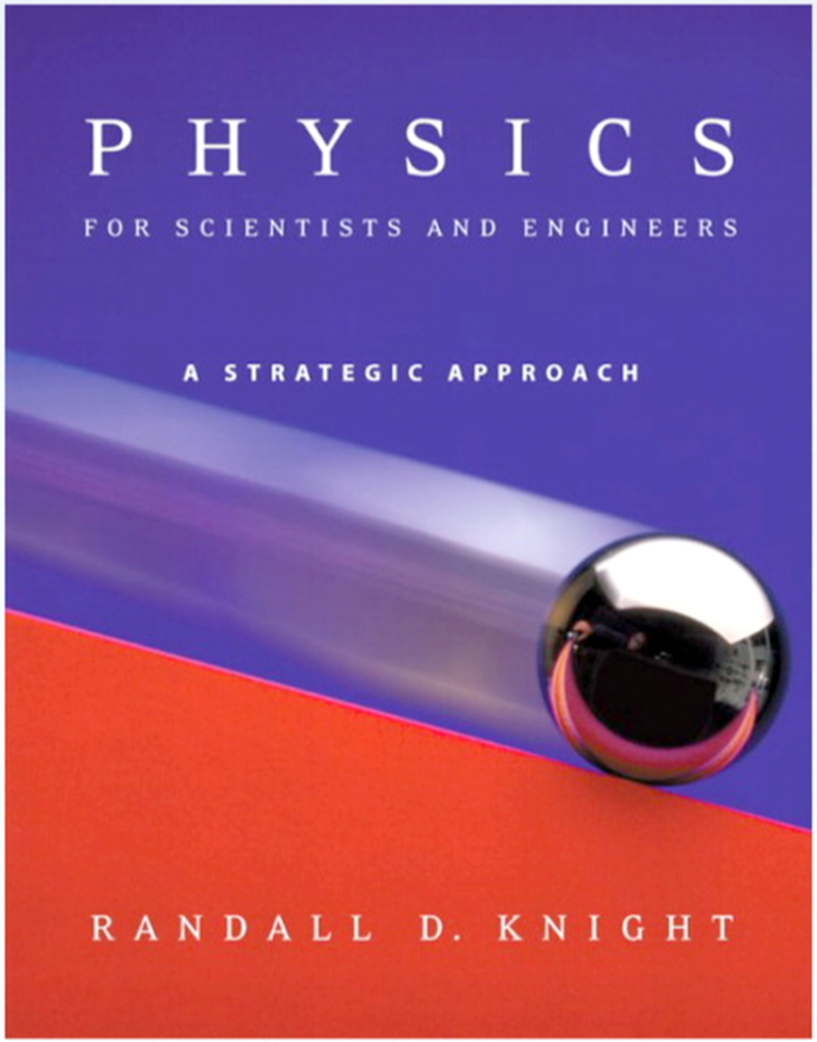


$$s^2 = -c^2(\Delta t)^2 + (\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2$$

$$ds^2 = \eta_{\mu\nu} dx^\mu dx^\nu$$
$$\eta_{\mu\nu} = \eta_{\rho\sigma} \Lambda^\rho_\mu \Lambda^\sigma_\nu$$

$$SO(1,3)$$


time
A
O
space


PHYSICS
FOR SCIENTISTS AND ENGINEERS
A STRATEGIC APPROACH
RANDALL D. KNIGHT


PHYSICS


PHYSICS

ANALOGIES IN PHYSICS

- Math is better, but what about the public?
- If there aren't perfect analogies, why use any?
- Understanding via relativism is human nature

ANALOGIES IN PHYSICS

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- Better to promote 'less wrong' analogies than allow 'swrong' analogies to flourish

ANALOGIES IN PHYSICS

- Math is better, but what about the public?
- If there aren't perfect analogies, why use any?
- Understanding via relativism is human nature
- Better to promote 'less wrong' analogies than allow 'swrong' analogies to flourish
- Be clear that an analogy is NOT exact science

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All Categories

All submissions (2368)

Physics

High Energy Particle Physics (168) - particle theory, phenomenology and experiment that ignores gravity
Quantum Gravity and String Theory (225) - and any other unified theories or "TOEs" that include gravity
Relativity and Cosmology (473) - classical physics of special and general relativity including cosmology and application in astrophysics
Astrophysics (110) - astronomical physics covering planetary, stellar and galactic systems.
Quantum Physics (191) - other aspects of quantum physics including quantum information theory
Nuclear and Atomic Physics (38)
Condensed Matter (39)
Classical Physics (143) - and other general physics topics outside relativity and quantum theory
Geophysics (5)
Climate Research (8)
Mathematical Physics (71) - mathematical research related to physics
History and Philosophy of Physics (41) - including sociology of science

Mathematics

Set Theory and Logic (33)
Number Theory (311)
Combinatorics and Graph Theory (13)
Algebra (67)
Geometry (93)
Topology (3)
Functions and Analysis (14)
Statistics (34)
General Mathematics (13) - covering multiple areas

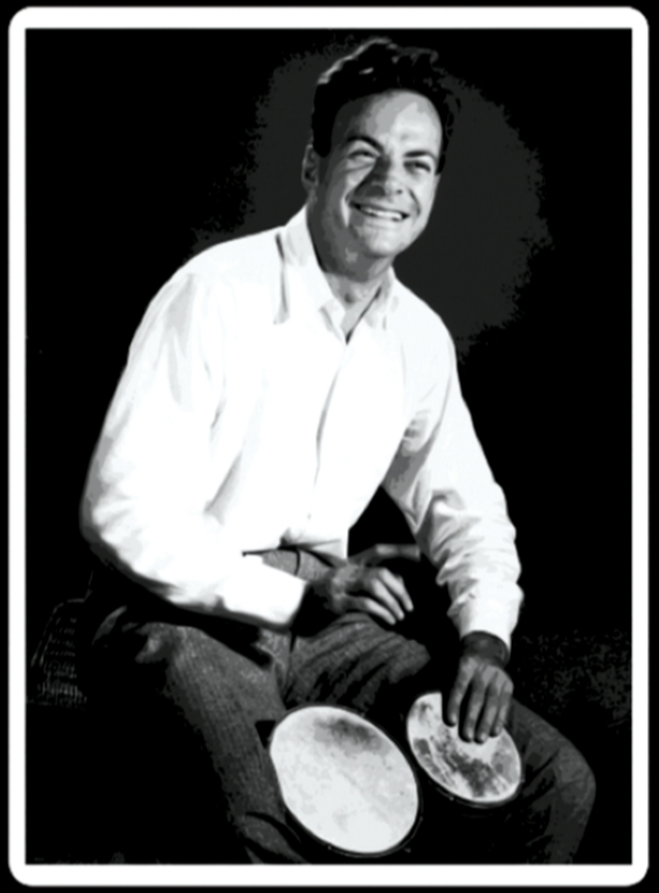
Metanalogy

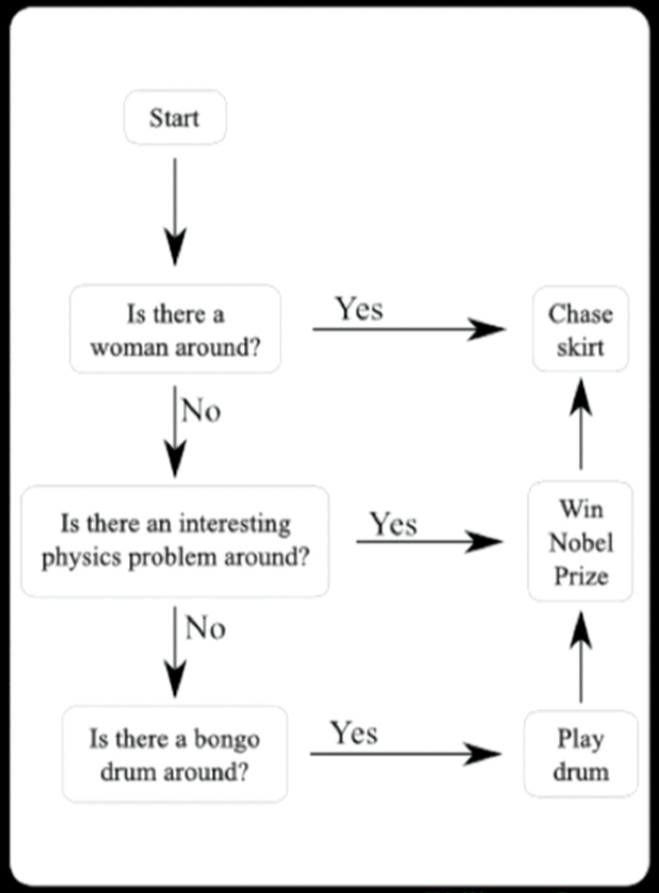
Metanalogy

Metanalogy

WE NEED NEW ANALOGIES

W.W.R.F.D?

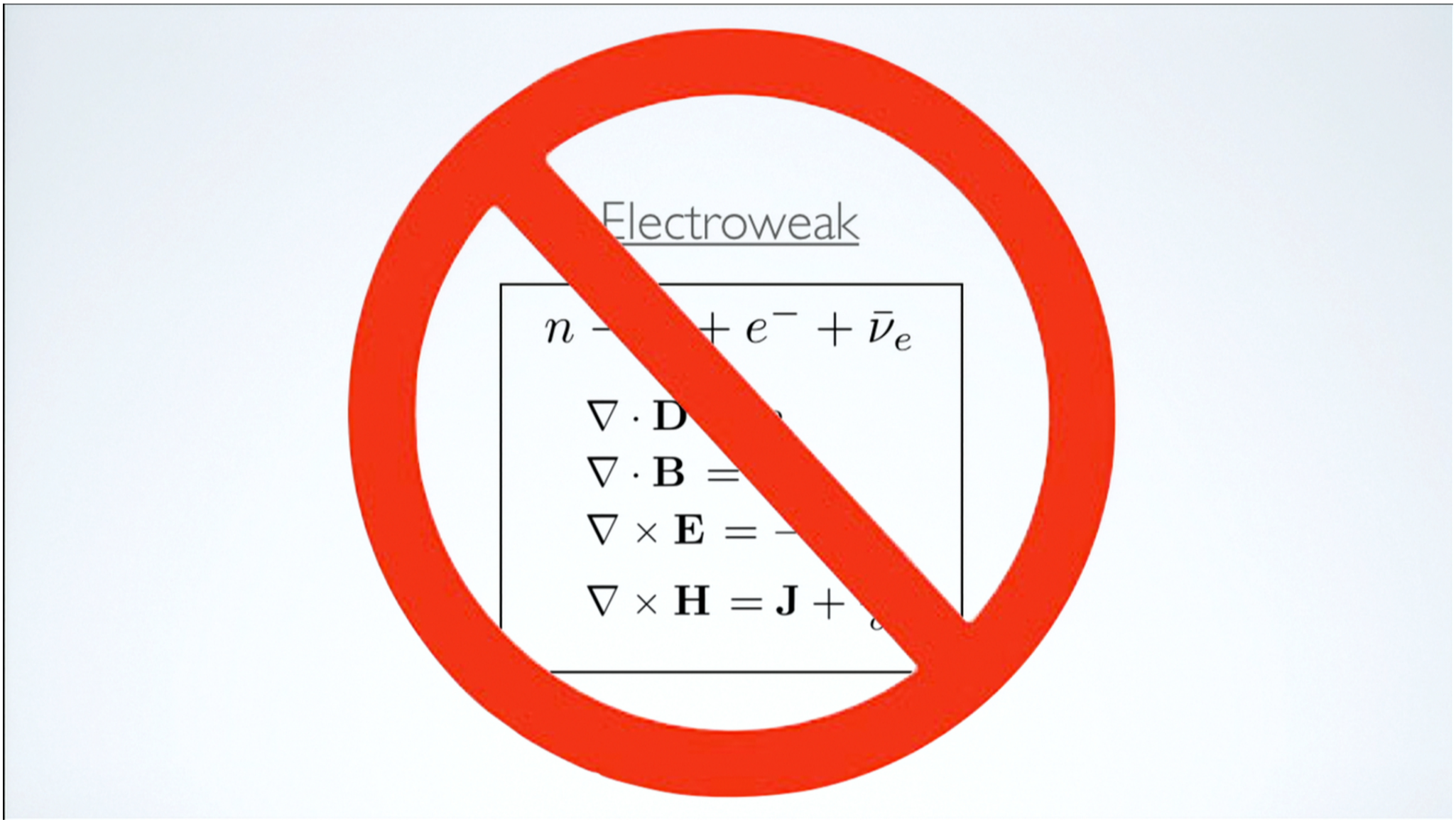




WellingtonGrey.net

GRAND UNIFIED THEORY

- Know & respect your audience
- Choose valid content
- Length appropriate for content
- Use your medium to its full potential


Electroweak
n $+ e^- + \bar{\nu}_e$
$\nabla \cdot \mathbf{D}$
$\nabla \cdot \mathbf{B} =$
$\nabla \times \mathbf{E} =$
$\nabla \times \mathbf{H} = \mathbf{J} +$

Electroweak

$$SU(2) \times U(1)$$

GRAND UNIFIED THEORY

- Know & respect your audience
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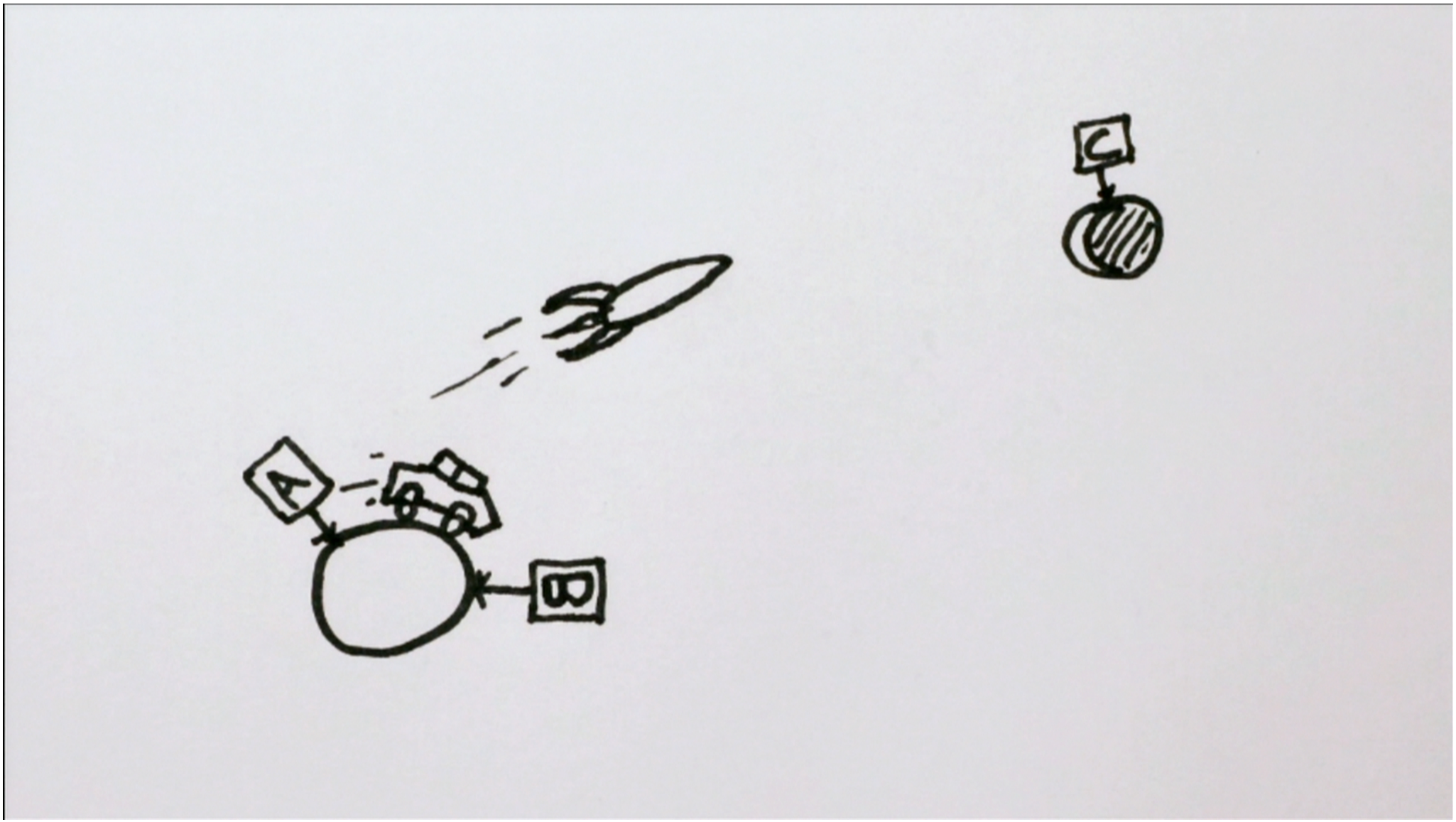
- Length appropriate for content
- Use your medium to its full potential
- Quality execution

GRAND UNIFIED THEORY

- Know & respect your audience
- Choose valid content
- Length appropriate for content
- Use your medium to its full potential
- Quality execution
- Be your own Feynman

My favorite Minutephysics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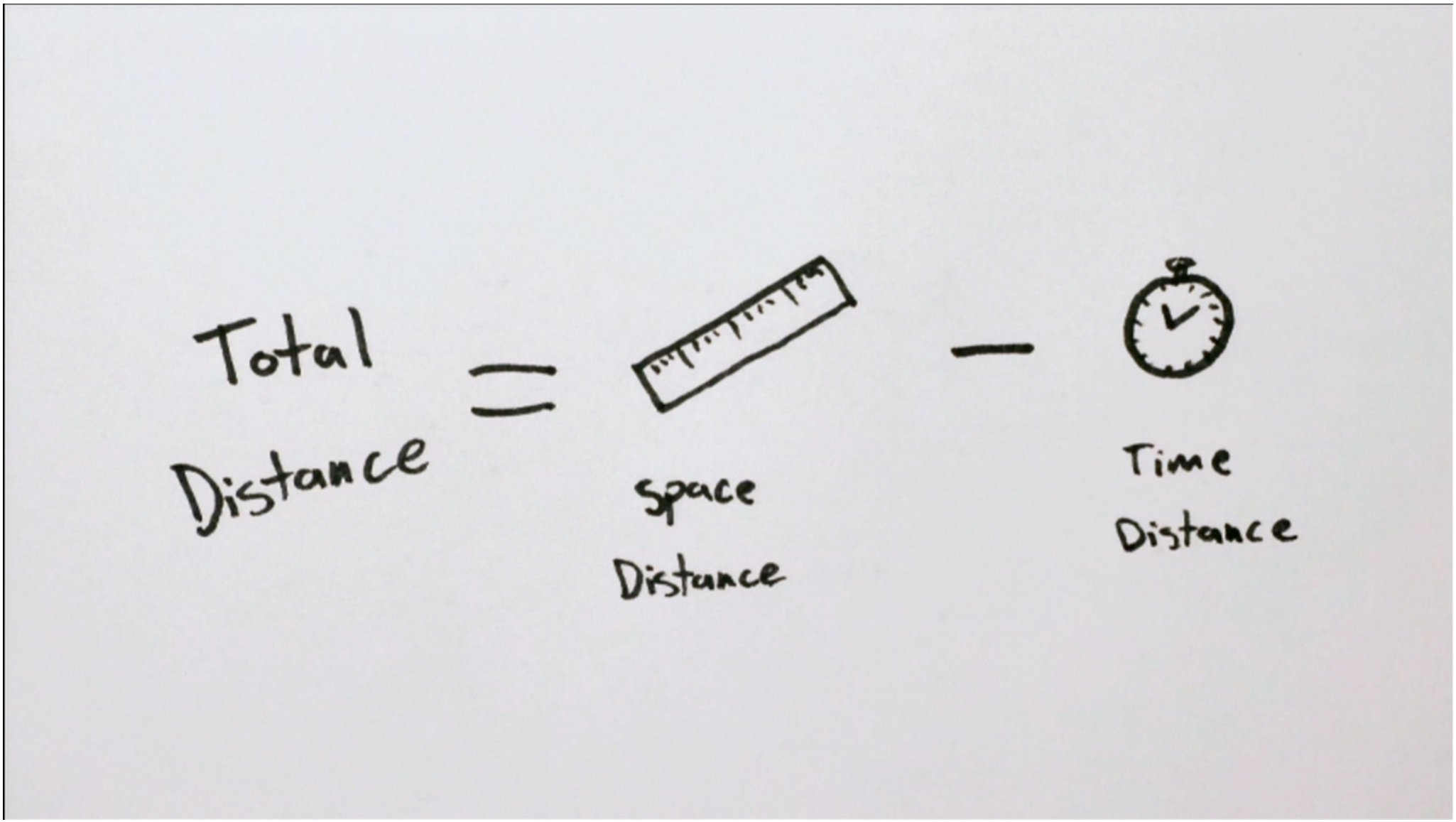
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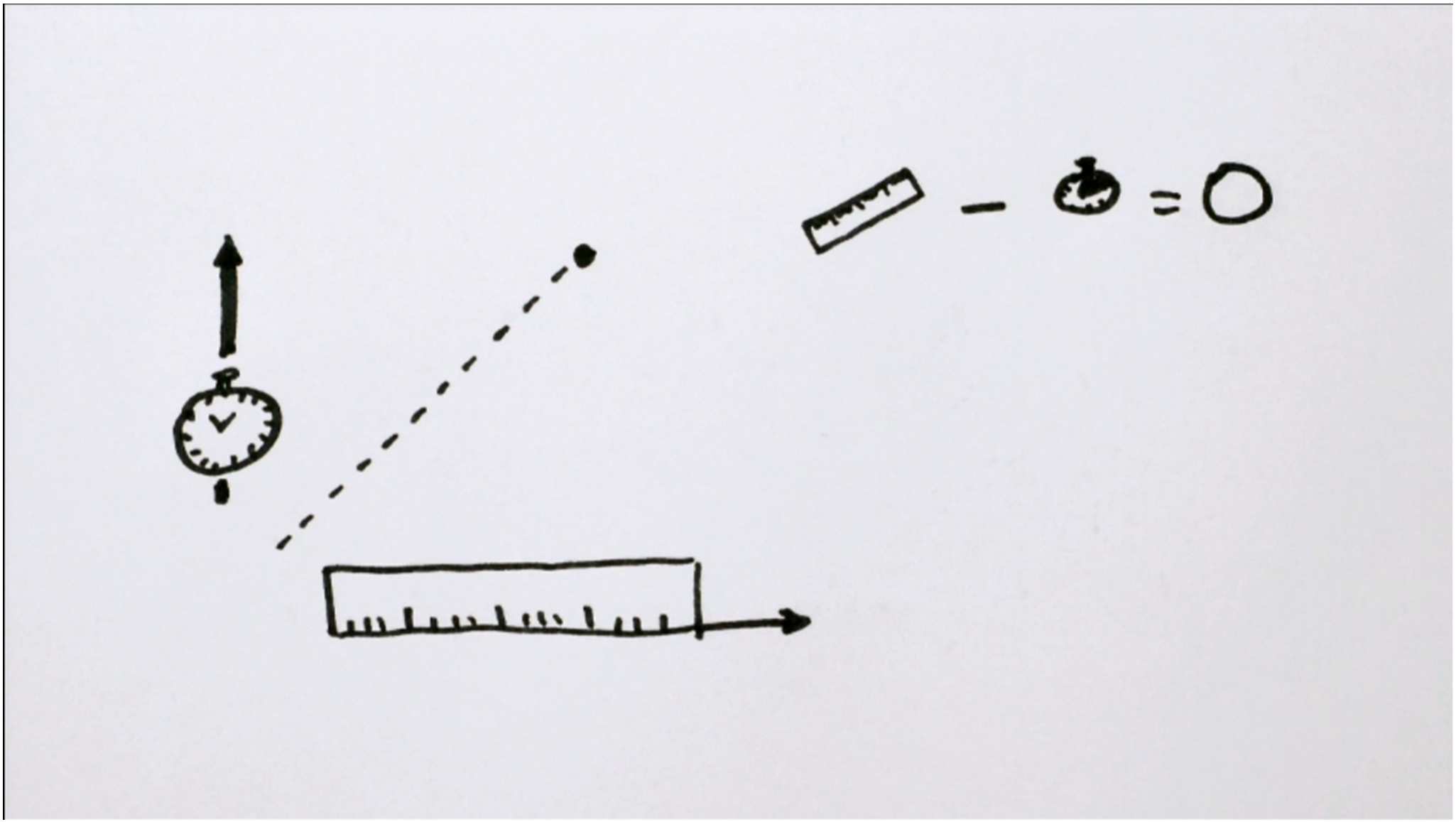

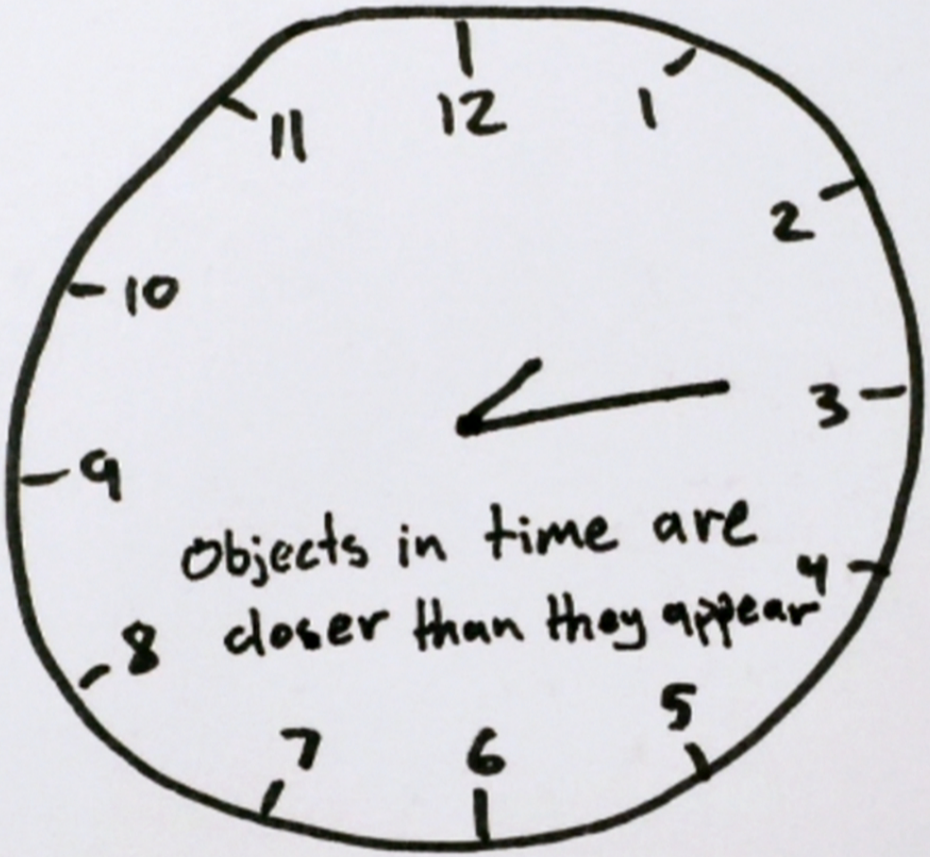
12
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Objects in time are
closer than they appear