Education & Outreach

Sarah Demers
Horace D. Taft Associate Professor of Physics
Yale University
August 4, 2017
2017 DPF Meeting, FNAL

(Public) Education & Outreach

Sarah Demers
Horace D. Taft Associate Professor of Physics
Yale University
August 4, 2017
2017 DPF Meeting, FNAL

Outline

- Why?
- How?

Caveats

I'm missing entire categories of outreach

I'm focusing on work that you, a practicing physicist, could be doing, not the incredible work by communication & education offices

I apologize if I'm missing YOUR contribution, or your favorites

Caveats

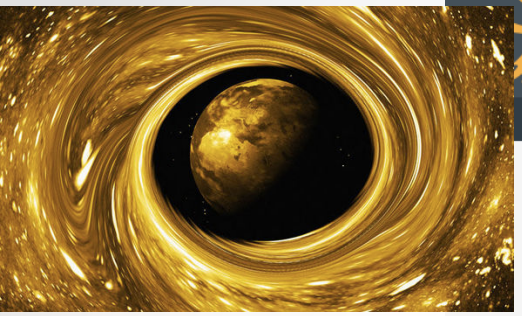
Outreach for Science requires that there be SCIENCE

Unless you are in a professional communications role,

- prioritize your research
- understand how your outreach activities can affect your career

WHY?

…



livescience

TECH HEALTH PLANET EARTH SPACE STRAN

TRENDING: Wearable Tech // Archaeology // Military & Spy Tech // Zika virus // OurAmazingPlanet

Will the Large Hadron Collider Destroy Earth?

by Clara Moskowitz | October 26, 2012 06:11pm ET

Large Hadron Collider turned BACK ON but could 'create GIANT black hole and DESTROY earth'

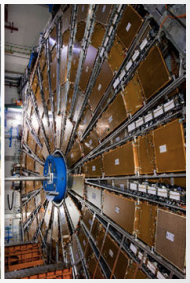
THE entire universe could be swallowed up at ANY second after a brain-warpingly complex machine that can make black holes was switched BACK on at DOUBLE its previous power.

Scientists at Large Hadron Collider hope to make contact with PARALLEL UNIVERSE in days

SCIENTISTS conducting a mindbending experiment week hope to connect with a PARALLEL UNIVERSE

By PAUL BALDWIN

PUBLISHED: 00:49, Thu, Oct 22, 2015 | UPDATED: 09:21, Thu,



Collider magnetic field could pull asteroids towards Earth

HONEY

THURSDAY, JUL 5, 2012 01:29 PM EDT

CERN's expensive science

Can debt-swamped Europe afford expensive science, like pursuing the God particle?

BARRY NEILD, GLOBALPOST

Pocket SKIP TO COMMENTS

TOPICS: ACADEMIA, EUROPE, GLOBALPOST, PHYSICS, SCIENCE, POLITICS NEWS

ILLINOIS REVIEW

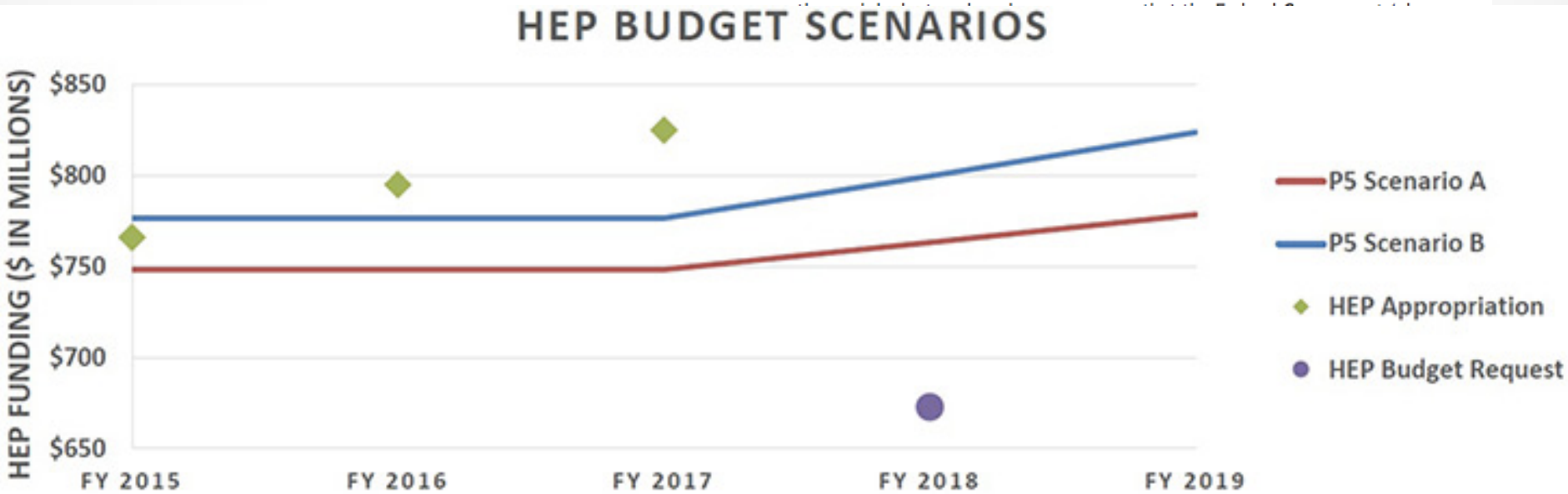
Unopened and Unread »

TUESDAY, MARCH 29, 2011

TIME TO CLOSE FERMILAB

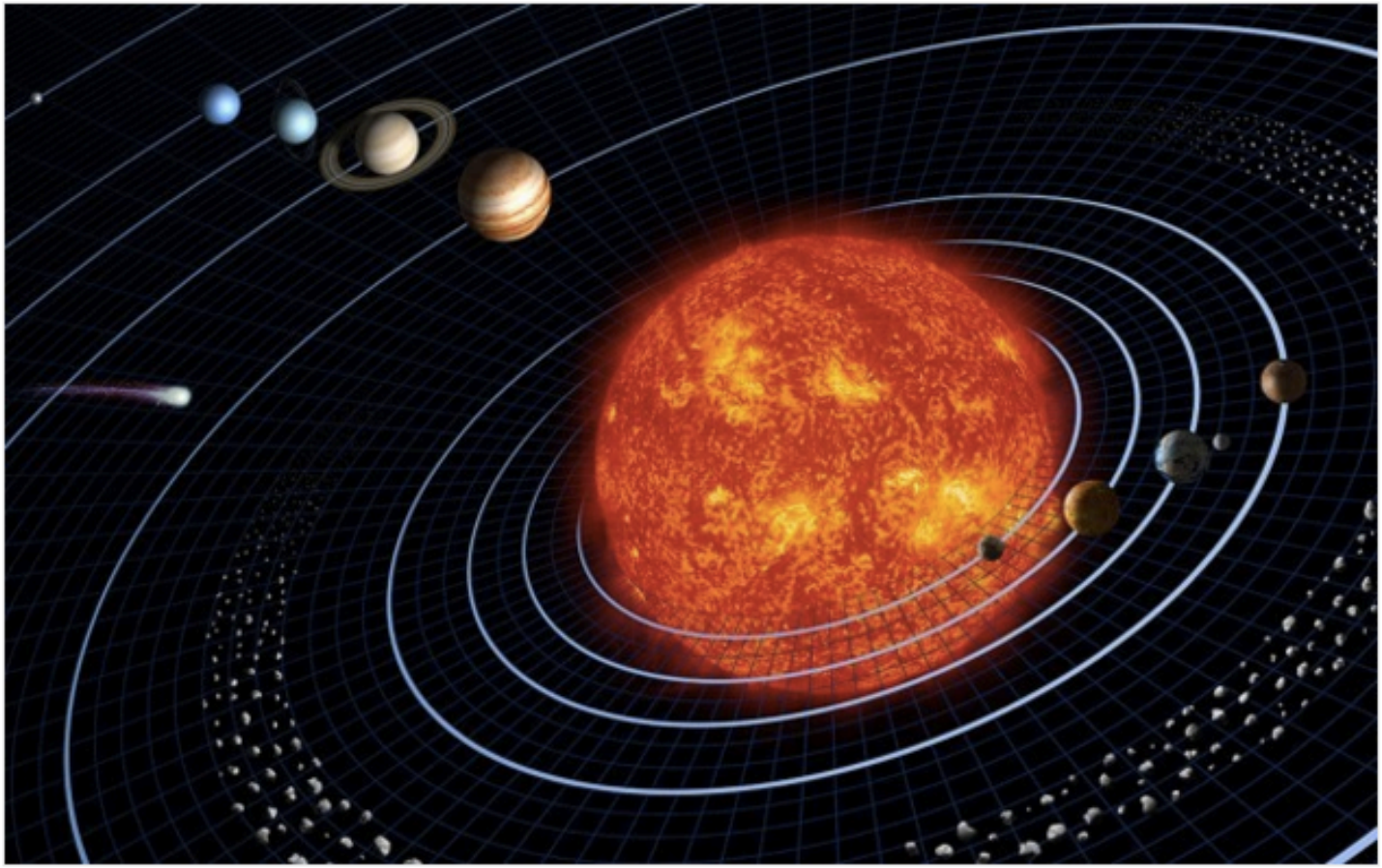
by Ghost of John Brown

I know, I know, another article that could get me in trouble. I've said before that our budget problems are national, and we need to be willing to make cuts even in our own backyard. We need a



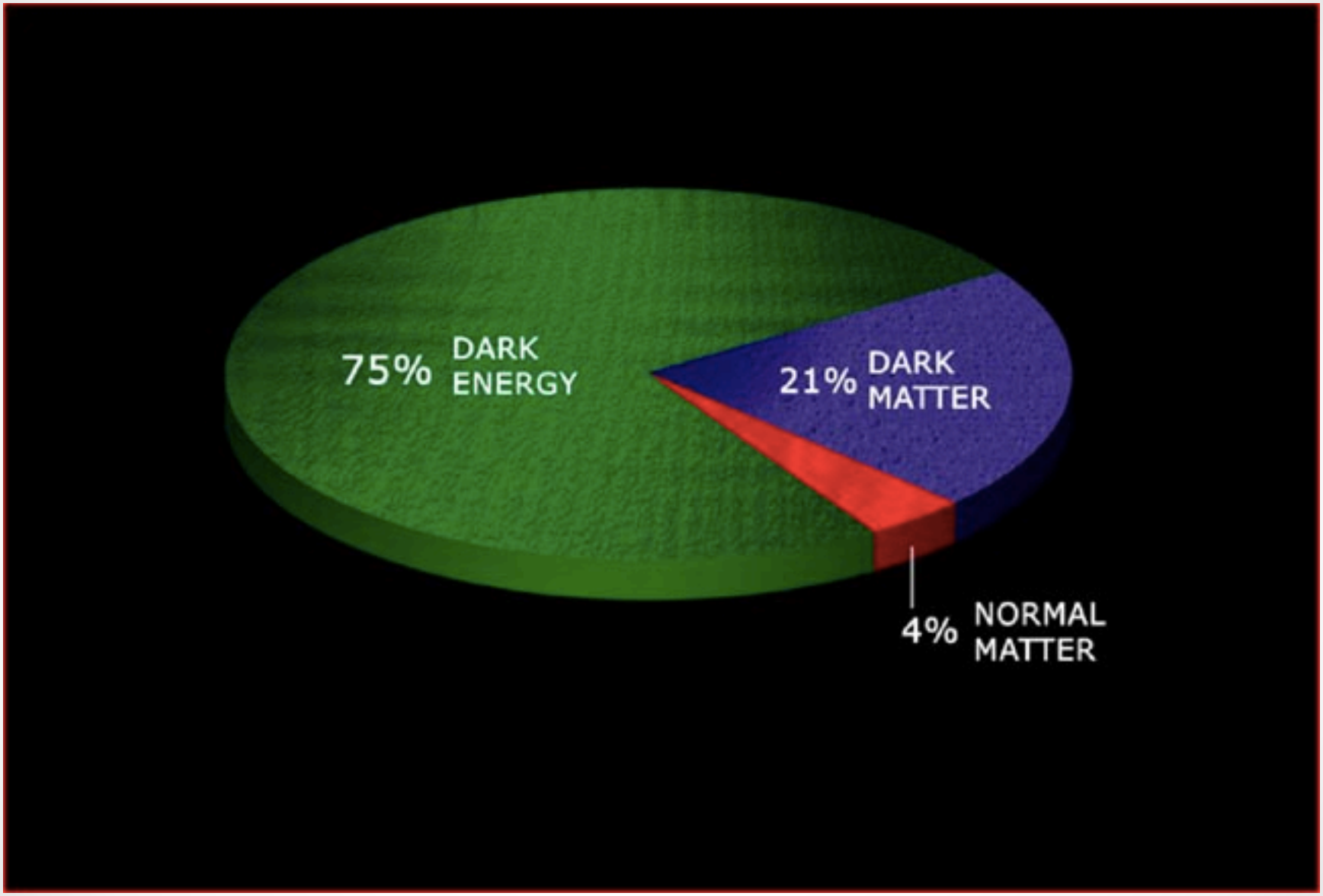
What Americans Don't Know About Science

On a recent survey, just 74 percent of Americans said that the Earth revolves around the sun.

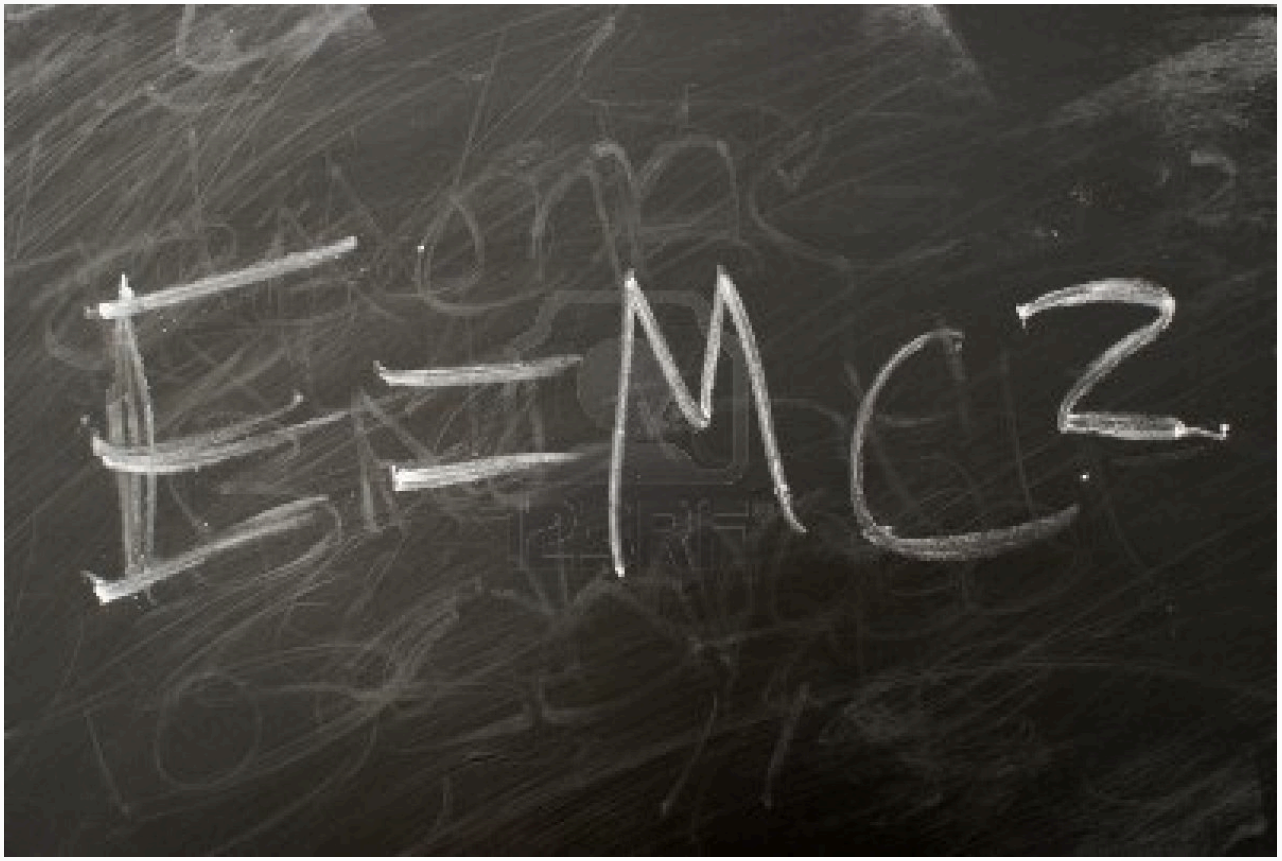


A rendering of the solar system. Note the sun in the center and the planets revolving around it. (NASA)

https://www.theatlantic.com/education/archive/2014/02/what-americans-dont-know-about-science/283864/


75% DARK ENERGY
21% DARK MATTER
4% NORMAL MATTER

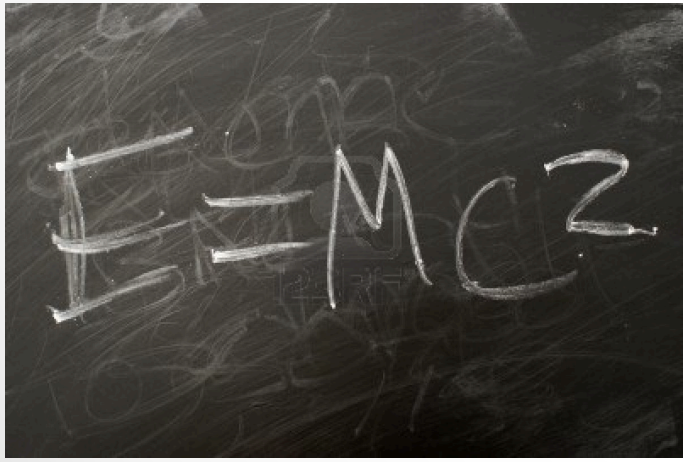
Time and Energy

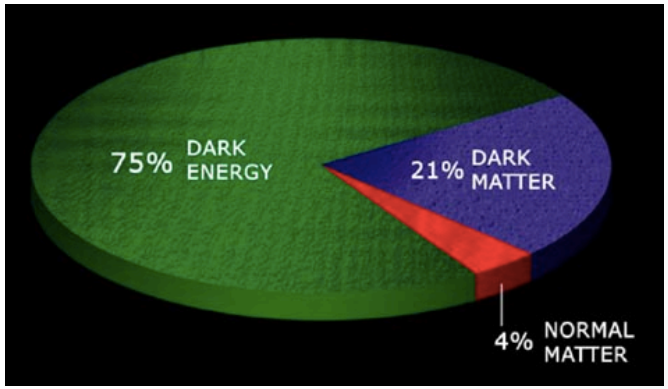


"Science Communication … reconnected me to my motivation."

WHY?

…





How?

• • •

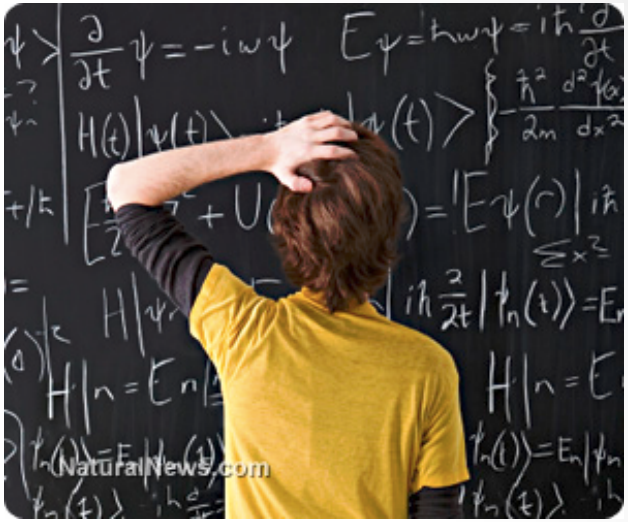
We'll focus first on **what makes sense for you**

and then

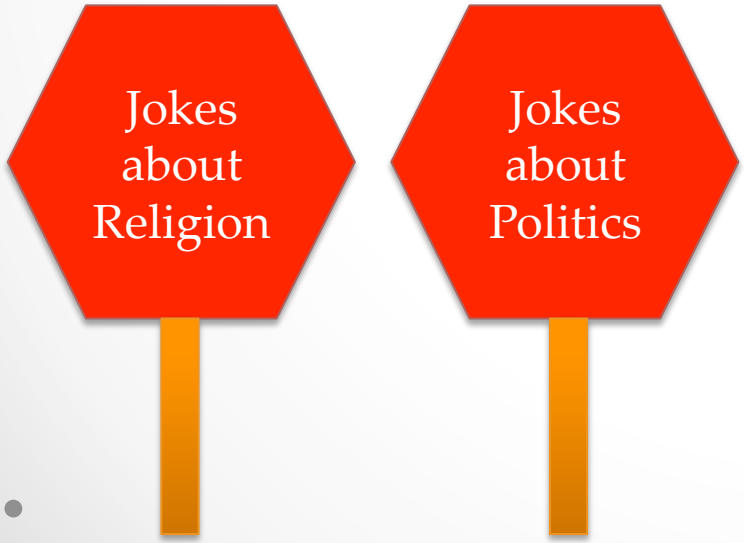
what audiences we want to remember

As your enthusiastic self

With a message that meets your audience where they are



With true respect for your audience (consider a "first do no harm" plan)



Consider teaming up with a collaborator

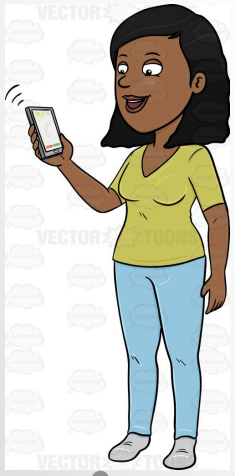
What are your strengths?

Do you write well?

A book for the public
A textbook
An opinion piece
A blog

Are you a story teller?

TED(x) talk
Story Collider
Physics Slam
PechaKucha
Podcasts

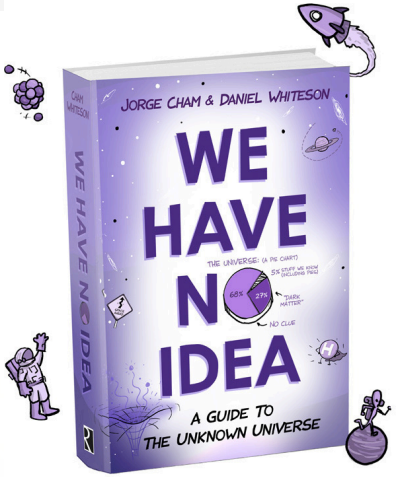


Are you a social media whiz?

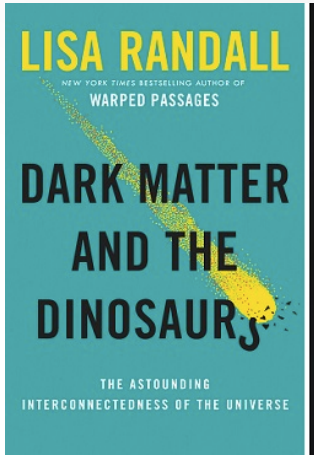
A science twitter feed
Instagram
Facebook

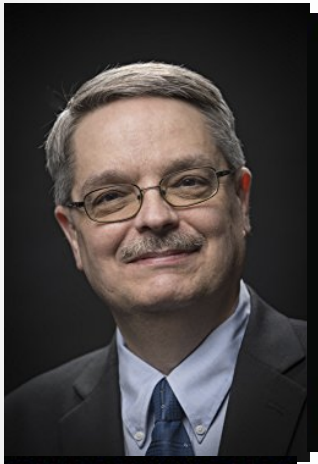
Productively Uncomfortable

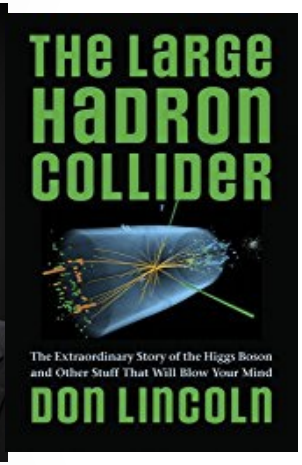
The power of training your brain in a new way…

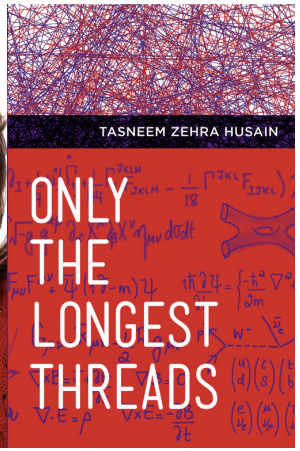

JORGE CHAM & DANIEL WHITESON
WE HAVE NO IDEA
A GUIDE TO THE UNKNOWN UNIVERSE

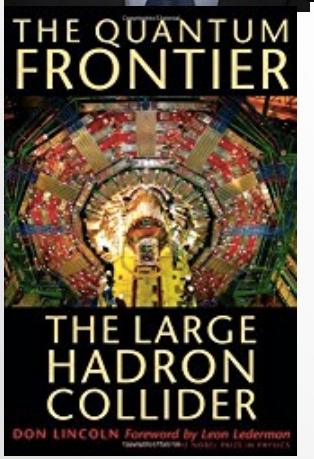
Write a book !

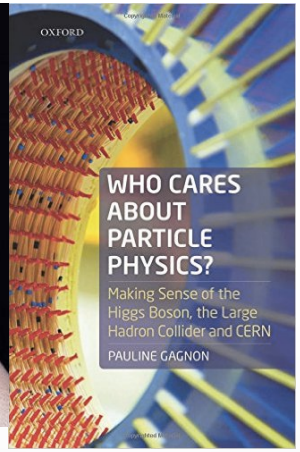

LISA RANDALL
NEW YORK TIMES BESTSELLING AUTHOR OF
WARPED PASSAGES
DARK MATTER AND THE DINOSAURS
THE ASTOUNDING INTERCONNECTEDNESS OF THE UNIVERSE

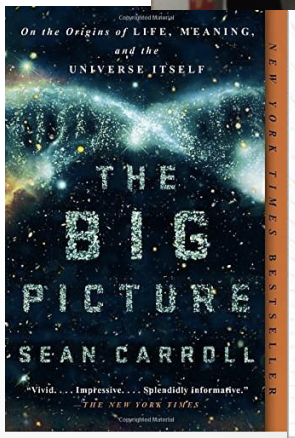


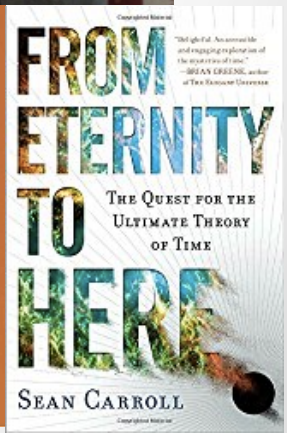

THE LARGE HADRON COLLIDER
The Extraordinary Story of the Higgs Boson and Other Stuff That Will Blow Your Mind
DON LINCOLN


TASNEEM ZEHRA HUSAIN
ONLY THE LONGEST THREADS


THE QUANTUM FRONTIER
THE LARGE HADRON COLLIDER
DON LINCOLN Foreword by Leon Lederman


OXFORD
WHO CARES ABOUT PARTICLE PHYSICS?
Making Sense of the Higgs Boson, the Large Hadron Collider and CERN
PAULINE GAGNON


On the Origins of LIFE, MEANING, and the UNIVERSE ITSELF
THE BIG PICTURE
SEAN CARROLL
"Vivid. . . . Impressive. . . . Splendidly informative."
THE NEW YORK TIMES


FROM ETERNITY TO HERE
THE QUEST FOR THE ULTIMATE THEORY OF TIME
SEAN CARROLL

Write an opinion piece, host or contribute to a blog

http://articles.latimes.com/2012/jul/09/opinion/la-oe-tipton-higgs-boson-20120709

Op-Ed

Finding Higgs boson: A triumph of human curiosity

It seems fitting that nature's secrets are unwrapped by all of us, that we own and enjoy the discovery corporately.

July 09, 2012 | By Paul Tipton

https://medium.com/@Yangyang_Cheng

Yangyang Cheng Follow

Postdoc. Particle detector builder & dark matter hunter. Political junkie. Windy City expat.

Apr 2 · 7 min read

Let Science Be Science Again

Also in Bulletin of Atomic Science and Teen Vogue

https://profmattstrassler.com/

Of Particular Significance

Conversations About Science with Theoretical Physicist Matt Strassler

HOME ABOUT ARTICLES MOVIE CLIPS NEW? START HERE TECHNICAL ZONE XOTICA

My Op Ed Experience

Started with a humor piece. (Will the Huffington Post Print Anything? Maybe…)

New Year's Resolutions From a New Particle: An Imagined Message From the Higgs Boson, Personified

By Sarah Demers

http://www.huffingtonpost.com/sarah-demers/new-years-resolutions-fro_2_b_2339973.html

TEDBlog

Sometimes you get rejected in useful ways: "We won't publish that piece about funding HEP, but we like your 'voice'. Could you write an article about women in science?"

Science

Op-Ed: The still-tolerated gender bias in science

Posted by: Sarah M. Demers March 29, 2013 at 11:00 am EDT

http://blog.ted.com/op-ed-the-still-tolerated-gender-bias-in-science/

My Op Ed Experience

Finally, victory!!!

though I had to remove my final paragraph and therefore change the focus of the piece to get it published…

The Atlantic

High-Energy Physics Is Still a Worthwhile Investment

SARAH DEMERS | MAR 5, 2013 | HEALTH

https://www.theatlantic.com/health/archive/2013/03/high-energy-physics-is-still-a-worthwhile-investment/273511/

Let Them Play the Game

INSIDE HIGHER ED

> Sarah Demers tried (and failed) to teach a new card game to her family. right approach.

By Sarah Demers // April 23, 2014

https://www.insidehighered.com/advice/2014/04/23/when-lectures-fall-short-teaching-tool-essay

Want to do some Public Writing, but don't know how to get started?

Resources

OP-ED WRITING: TIPS AND TRICKS

PITCHING

SUBMISSION INFORMATION

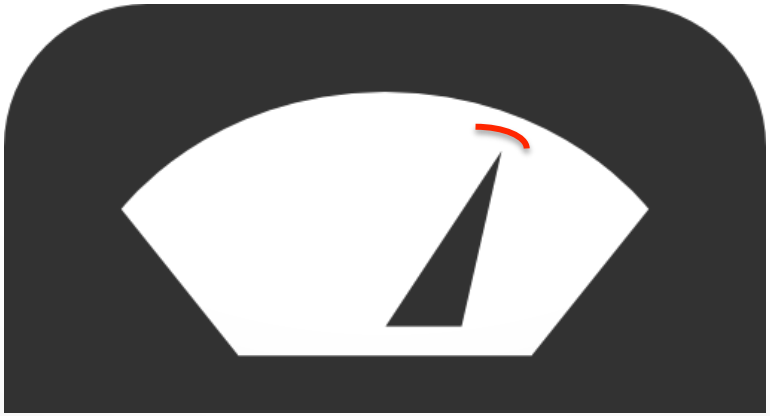
MENTOR-EDITOR NETWORK

Op-ed Writing: Tips and Tricks

The suggestions below are simply that -- suggestions. This is not a forumla, but a guide to help you as you formulate your ideas.

1. Getting Started: The Basics
2. Questions To Ask Yourself When Writing
3. Structure
4. Ledes and News Hooks: Catching Attention
5. FAQs

https://www.theopedproject.org/oped-basics/#gettingstarted



Tell a Story…

THE STORY COLLIDER
STORIES ABOUT SCIENCE

PITCH YOUR OWN STORY!

The Story Collider is always looking for new and exciting true, personal ten-minute stories about science in cities around the U.S. and the U.K. If you would like to tell a story at one of our shows, we would love to hear from you! **Send a two-paragraph summary of your story idea to stories@storycollider.org.** Please include your city of residence so we can match you with a show near you.

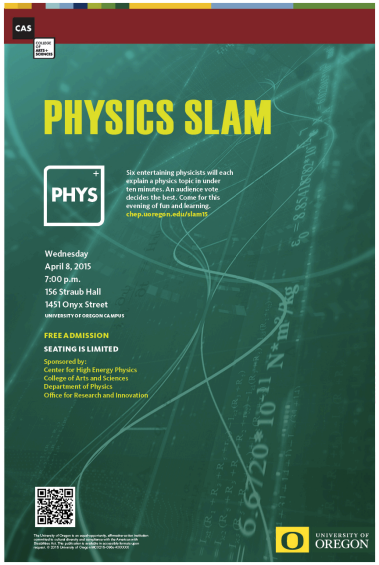
Started by Ben Lillie, from The Moth Story Hour, with a PhD in particle physics

https://www.storycollider.org/submissions/

Physics Slams

Contestants have ~10 minutes to educate and entertain,
Audience votes by clap-o-meter

Physics Slam V – Sold Out



https://www.youtube.com/watch?v=b1q46oeuG4Q

PechaKucha

20 slides for 20 seconds each – the slides advance automatically

http://www.pechakucha.org/

In over 900 cities, so there is one coming soon to a city near you! Like this one on August 17, at which FNAL's Spencer Paseros will present "A Grand Day at Fermilab"

Spencer Paseros
FNAL Education and Public Outreach

TED(x) Talks…

TED Ideas worth spreading WATCH

TED Speaker

James Beacham

Experimental particle physicist

atlas.cern @jbbeacham

https://www.ted.com/talks/james_beacham_how_we_explore_unanswered_questions_in_physics

James Beacham's TED talk

How we explore unanswered questions in physics

Posted Dec 2016

TEDxYale

x = independently organized TED event

How?

• • •

We'll focus first on what makes sense for you
and then
what audiences we want to remember

Which Constituencies Should We Target?

Politicians and Policy Makers (they control resources)

In-person Visits

- In DC
- In their home offices

Letters and emails

Public writing and social media

Taxpayers (our real bosses, the public)

Public lectures

Social media and online materials

Public writing

School kids (future colleagues, future taxpayers)

Talks in their schools/classrooms

Invite them to your lab/university

Contacting Congress

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS

Workshop on Advocacy in Science: Advocacy Initiatives

https://www.aaas.org/page/workshop-advocacy-science-advocacy-initiatives

APS physics

Advocacy Dashboard

APS serves the needs of its membership and the general public by providing information on how to take action and contact lawmakers on issues that affect both the physics community and the nation as a whole.

▸ Learn About the Issues & Take Action!

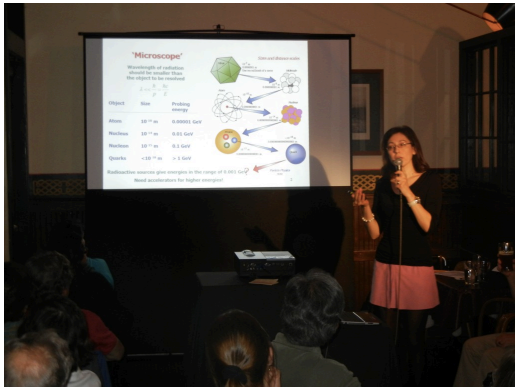
https://www.aps.org/policy/index.cfm

Where to find the Public? In Bars.

It's a particle! Higgs news draws giddy crowd to bar

BY SALLY JAMES on July 4, 2012 at 8:41 am

Anna Goussiou
and
Gordon Watts
in Seattle



https://www.geekwire.com/2012/generation-higgs-particle-draws-giddy/

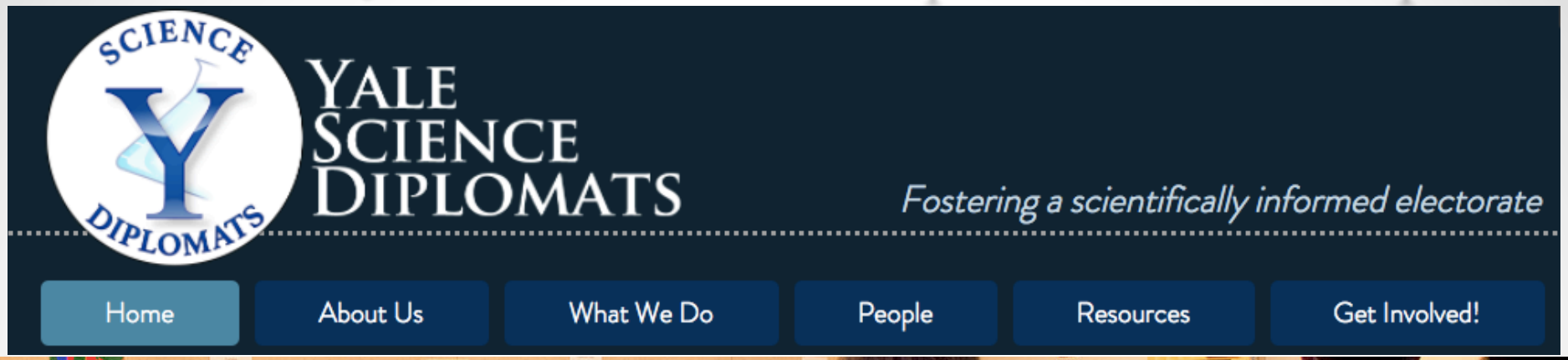
Join Us for Physics and Fun at BAR in New Haven on Thursday, October 16th

Admission is free 21+

$3 draft & bottled beers—$4 mixed drinks

http://star.physics.yale.edu/BAREVENT/

Start/Join a "Science Diplomats" Group



SCIENCE@ BAR • 2016

SCIENCE in the NEWS

SCIENCE SHORTS

http://yalesciencediplomats.wixsite.com/main

Go to the bars, AND go to the libraries…

QuarkNet

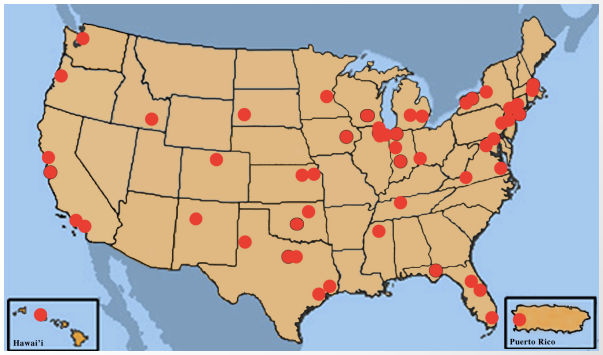
Helping Develop America's Technological Workforce

Home | Data Portfolio

https://quarknet.i2u2.org/

QuarkNet's Brilliance

HANDS ON for students
BIG IMPACT by training teachers
REAL PHYSICS experiments
EXPERIENCE: you can plug in



Open CERN data

Education

The CMS (Compact Muon Solenoid) experiment is one of two large general-purpose detectors built on the Large Hadron Collider (LHC). Its goal is to investigate a wide range of physics such as the characteristics of the Higgs boson, extra dimensions or dark matter.

Explore CMS >

ALICE (A Large Ion Collider Experiment) is a heavy-ion detector designed to study the physics of strongly interacting matter at extreme energy densities, where a phase of matter called quark-gluon plasma forms. More than 1000 scientists are part of the collaboration.

Explore ALICE >

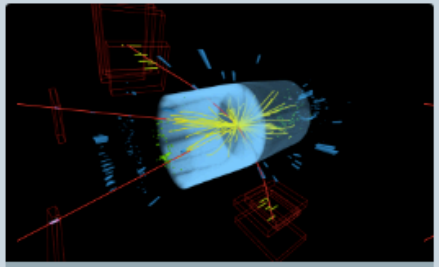
The ATLAS (A Toroidal LHC ApparatuS) experiment is a general-purpose detector exploring topics like the properties of the Higgs-like particle, extra dimensions of space, unification of fundamental forces and evidence for dark matter candidates in the Universe.

Explore ATLAS >

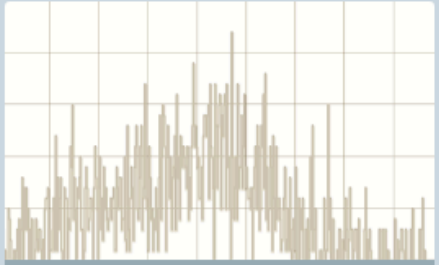
The LHCb (Large Hadron Collider beauty) experiment aims to record the decay of particles containing b and anti-b quarks, known as B mesons. The detector is designed to gather information about the identity, trajectory, momentum and energy of each particle.

Explore LHCb >

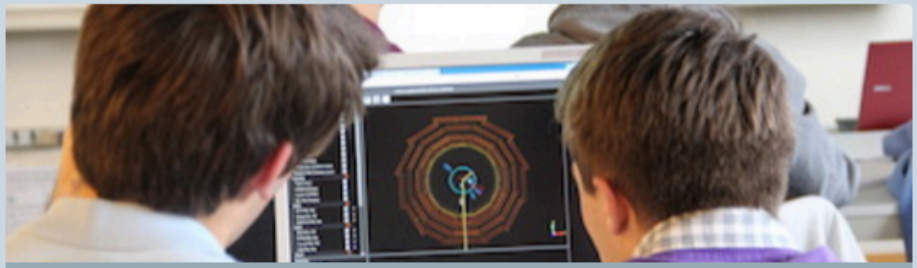
For education purposes, the complex primary data need to be processed into a format (examples below) that is good for simple applications. Get in touch if you wish to build your own applications similar to those shown here



Visualise events >



Visualise histograms >

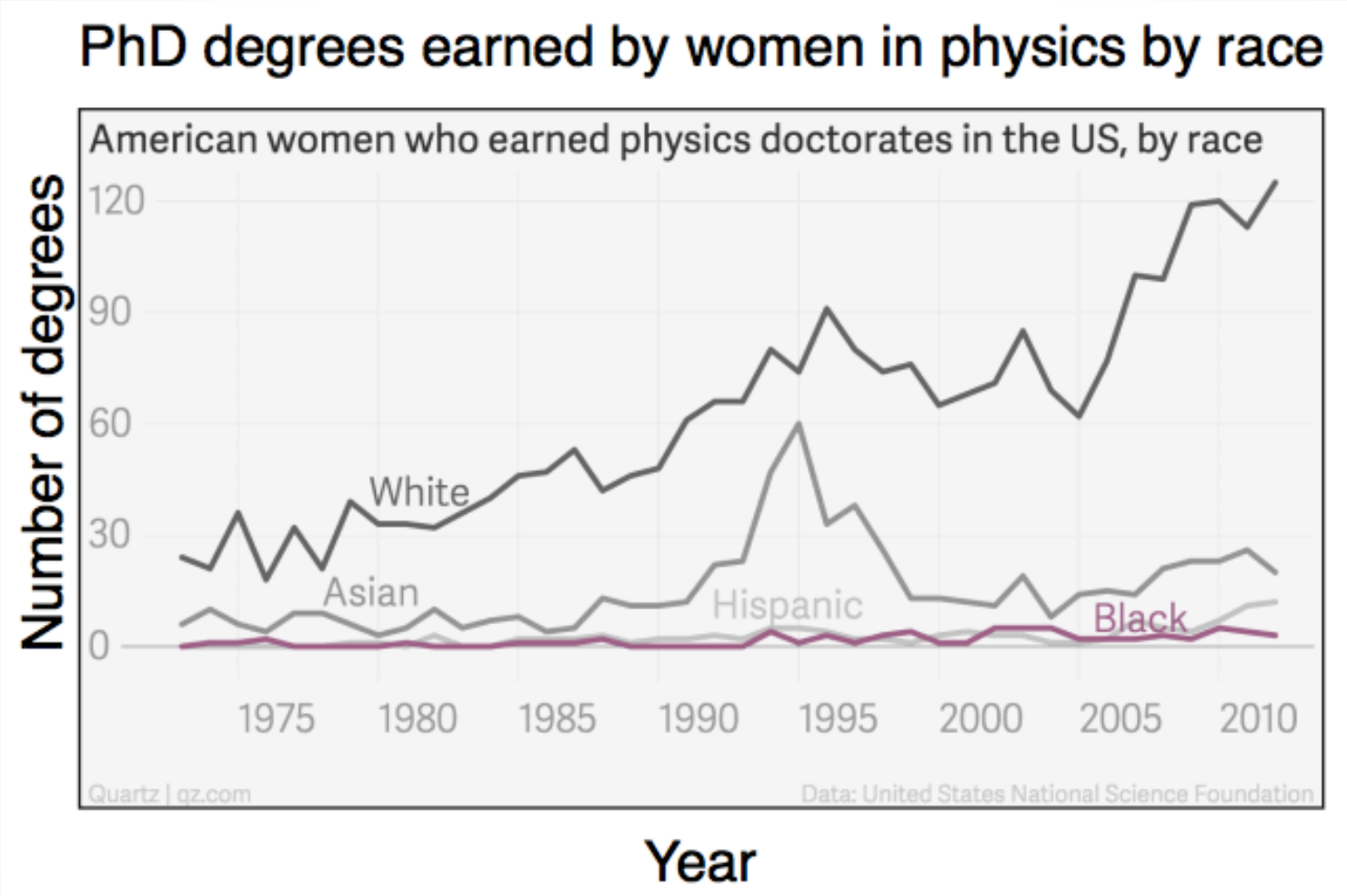


Learning Resources >

http://opendata.cern.ch/?ln=en

APS's Conference for Undergraduate Women in Physics (CUWiP)

http://www.aps.org/programs/women/workshops/cuwip.cfm



https://indico.fnal.gov/getFile.py/access?contribId=258&sessionId=20&resId=0&materialId=slides&confId=11999

From Brian Breckford's talk yesterday

http://gsi.yale.edu/

Some Final Thoughts

- Outreach can
  - educate the public
  - inspire the next generation
  - diversify participation
  - correct the record
- Within academia outreach is
  - only marginally valued in many disciplines
  - arguably part of our responsibility to the taxpayers and our communities
  - valuable to your career when it results in net energy and remains a manageable fraction of your time
- Opportunities exist everywhere
  - I suggest that you take them and make them!

Thanks for your attention!