

Title: Talking to My Dog about Science: Weblogs and Public Outreach

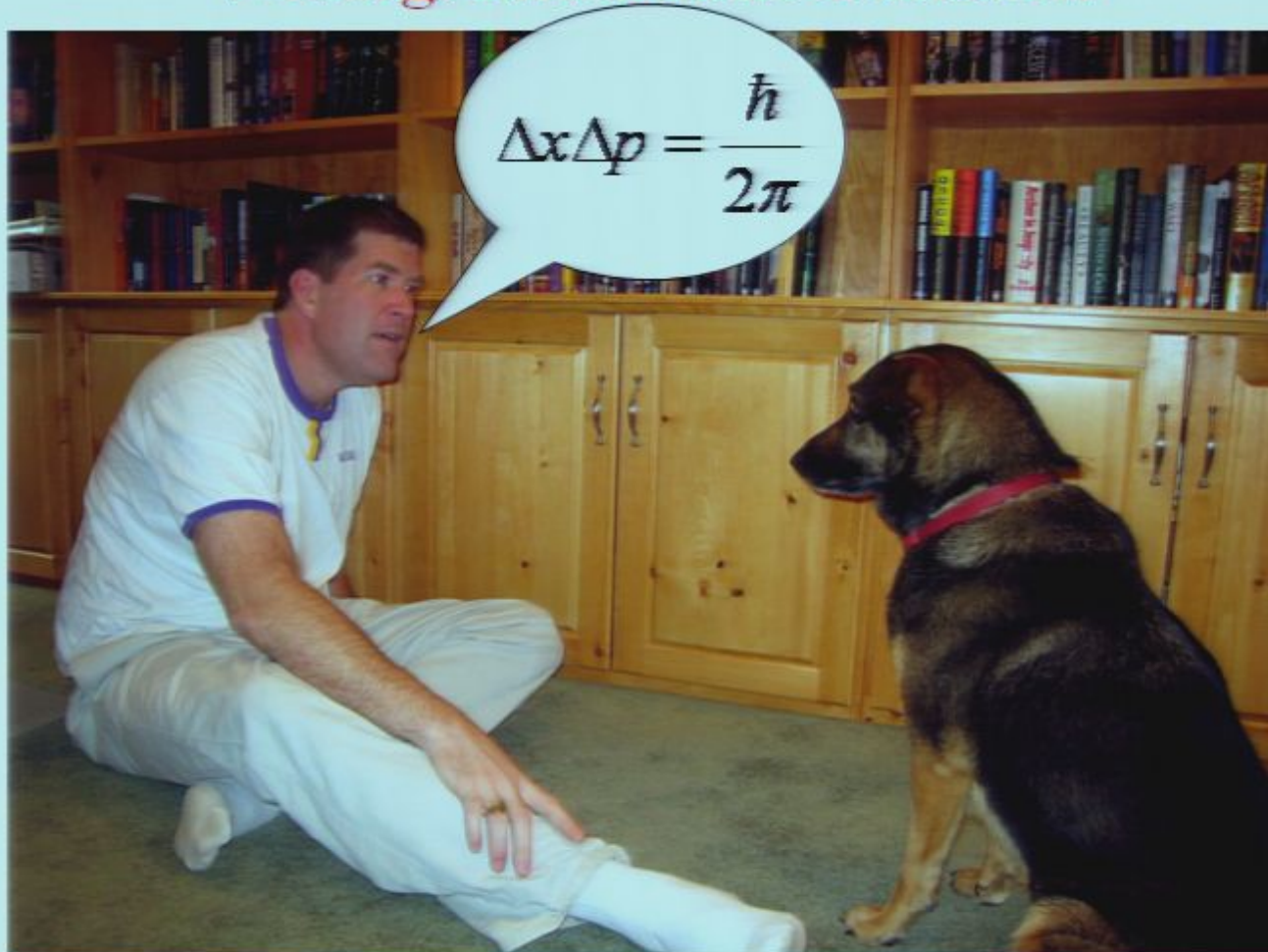
Date: Sep 08, 2008 11:00 AM

URL: <http://pirsa.org/08090026>

Abstract: At a time when the great challenges facing our civilization are scientific in nature (climate change, sustainable energy, pandemic disease), improving the voting public's understanding and appreciation of science is more important than ever. I will argue that the Internet in general and weblogs specifically provide an opportunity to address this problem, both through bringing science outreach directly to the public, but also by humanizing scientists to the public. I will illustrate with examples from my own experience blogging about physics for a popular audience, including explaining quantum mechanics to my dog.

Talking to My Dog About Science

Weblogs and Public Outreach



Chad Orzel

<http://scienceblogs.com/principles/>

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Uncertain Principles

$$\Delta x \Delta p \geq \frac{\hbar}{2}$$

Uncertain Principles

Physics, Politics, Pop Culture

$$\Delta E \Delta t \geq \frac{\hbar}{2}$$

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SEPTEMBER 2, 2008

"Quantum Mechanics Is Magic": The Making of "Spin polarization and quantum statistical effects in ultracold ionizing collisions"

Category: Academia • Lab Stories • MXP • My Lab • Physics • Science

This was the last of the experiments that I did for my thesis (it's not the last xenon paper I'm an author on, but the work for that one was done while I was writing up), so my memories of it are bound up with the thesis-writing process.

My favorite story about this stuff was when I gave a talk about this work at NIST-- I don't recall if it was before or after my defense-- and somebody asked the obvious question about how the quantum statistical rules are enforced. That is, how is it that you never get two identical fermions colliding in an s-wave state? Since an s-wave collision is just a head-on collision, shouldn't there be some fermions somewhere in the sample that are headed straight at one another?

I shrugged, and said, "Quantum mechanics is magic." Then I went on to give the more serious explanation, namely that it's a mistake to think of the atoms as having definite positions and momenta within the sample, which is what you're doing when you imagine head-on collisions. Instead, you've got fuzzy probability clouds moving around, and you never find two fuzzy fermionic probability clouds in the s-wave configuration.

Then I turned to Bill Phillips, who had won a Nobel Prize by that point, and said "Anyway, that's how I think about it. How would you explain it."

Profile



"Prof. Orzel gives the impression of an everyday guy who just happens to have a vast but hidden knowledge of physics." (anonymous student evaluation comment)

The miscellaneous ramblings of a physicist at a small liberal arts college. Physics, politics, pop culture, and occasional conversations with his dog.



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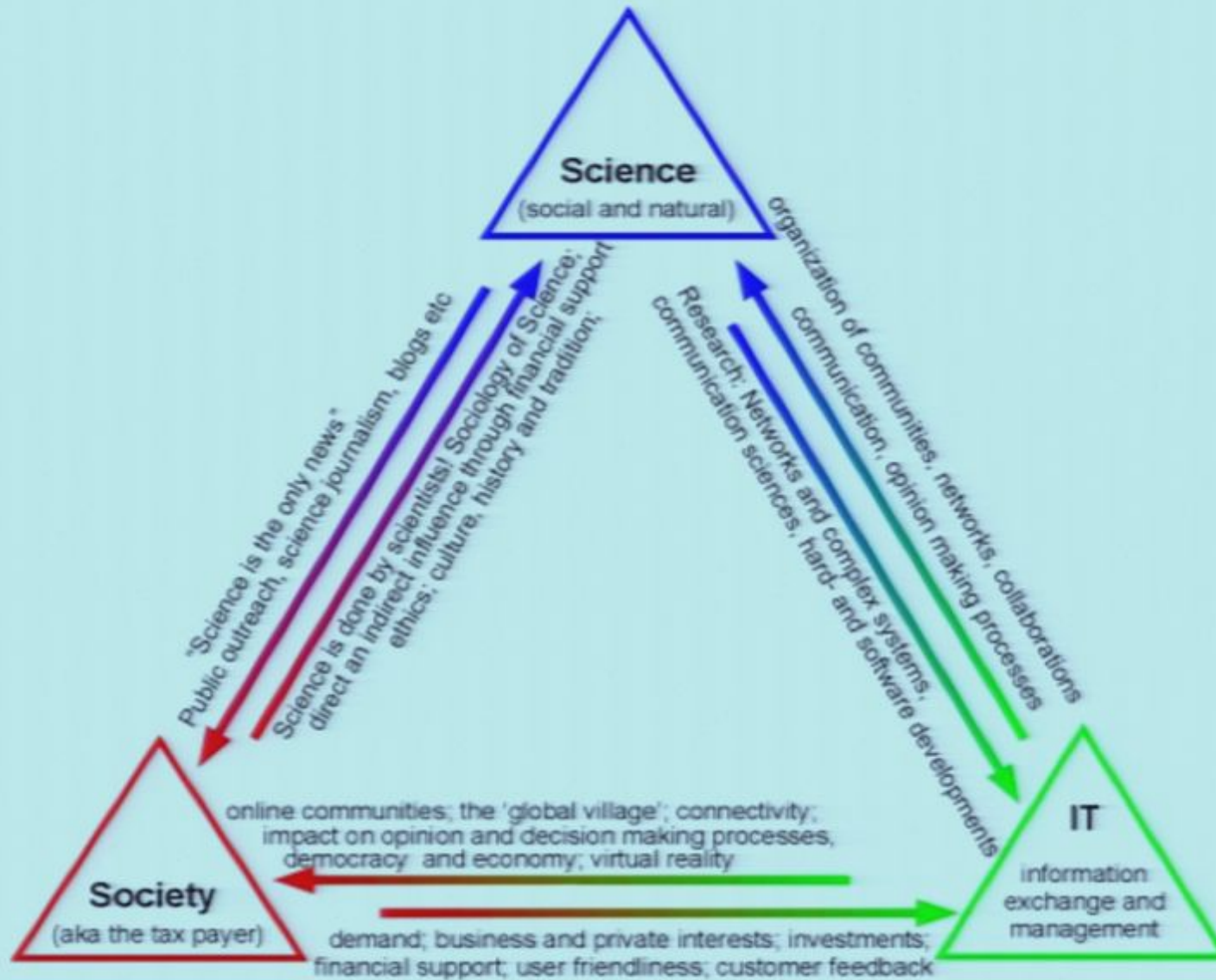
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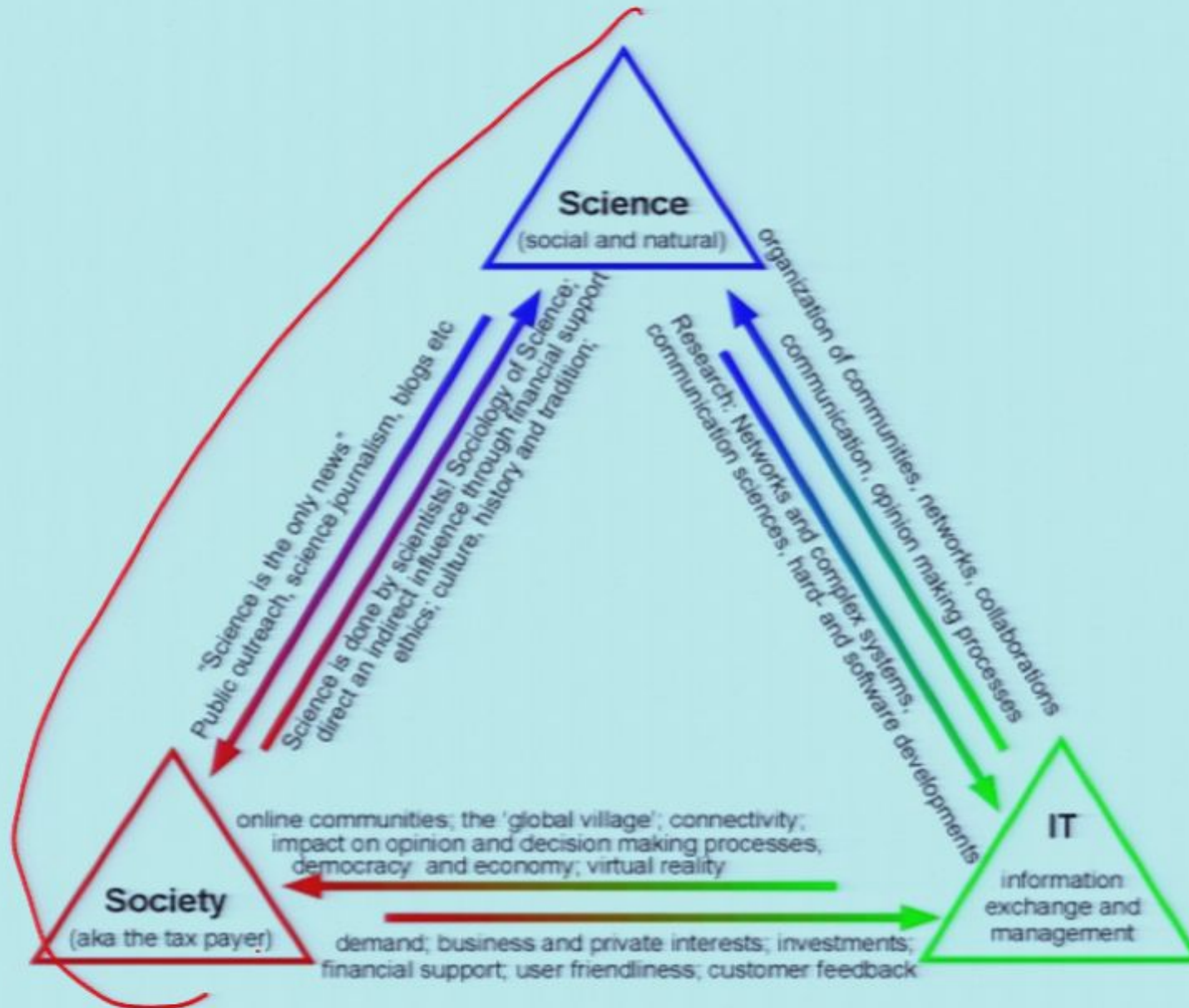
TOP FIVE / MOST GERMAN

1. [Singende Astronomen: Hotel Mauna](#)

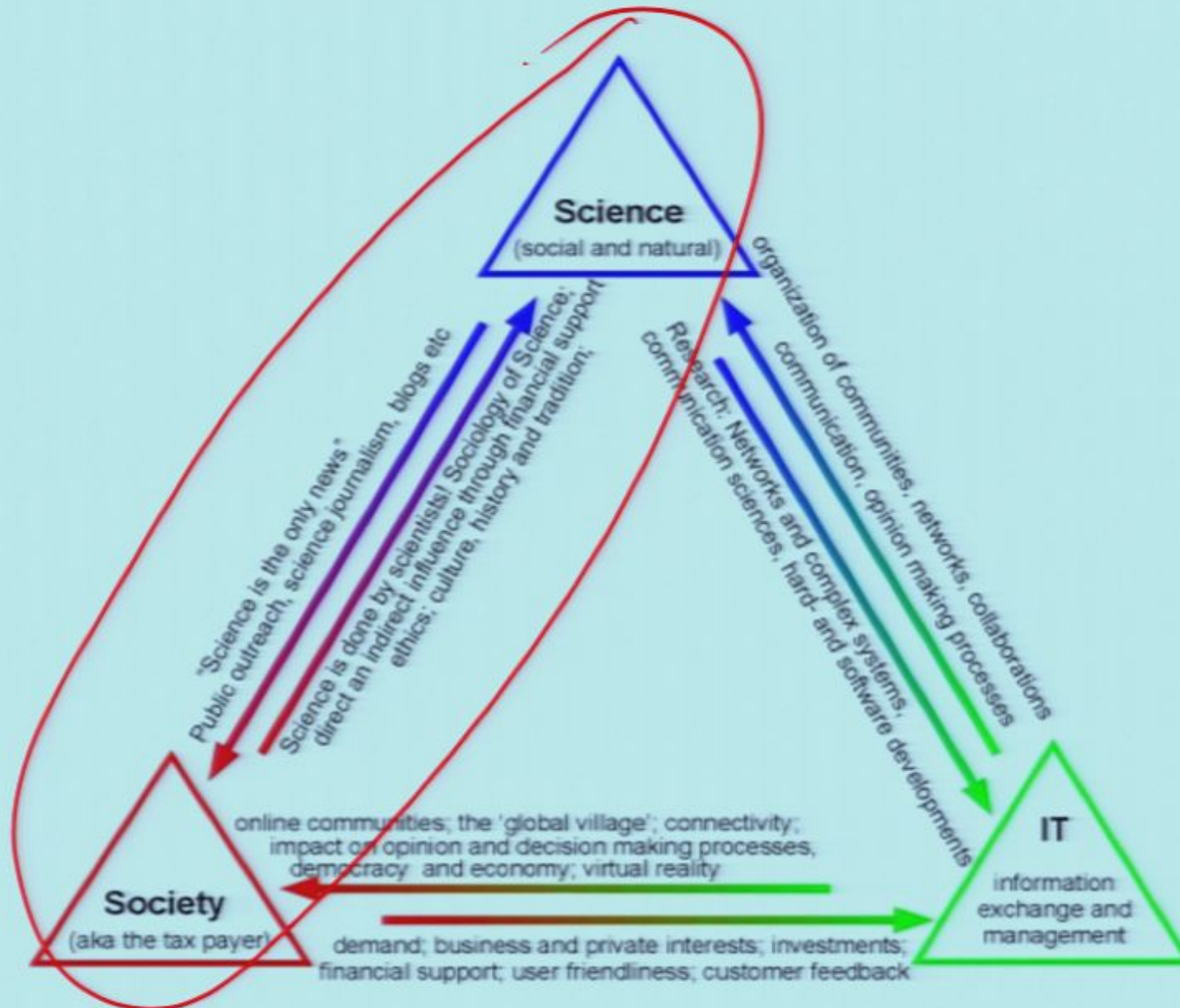
The Triangle



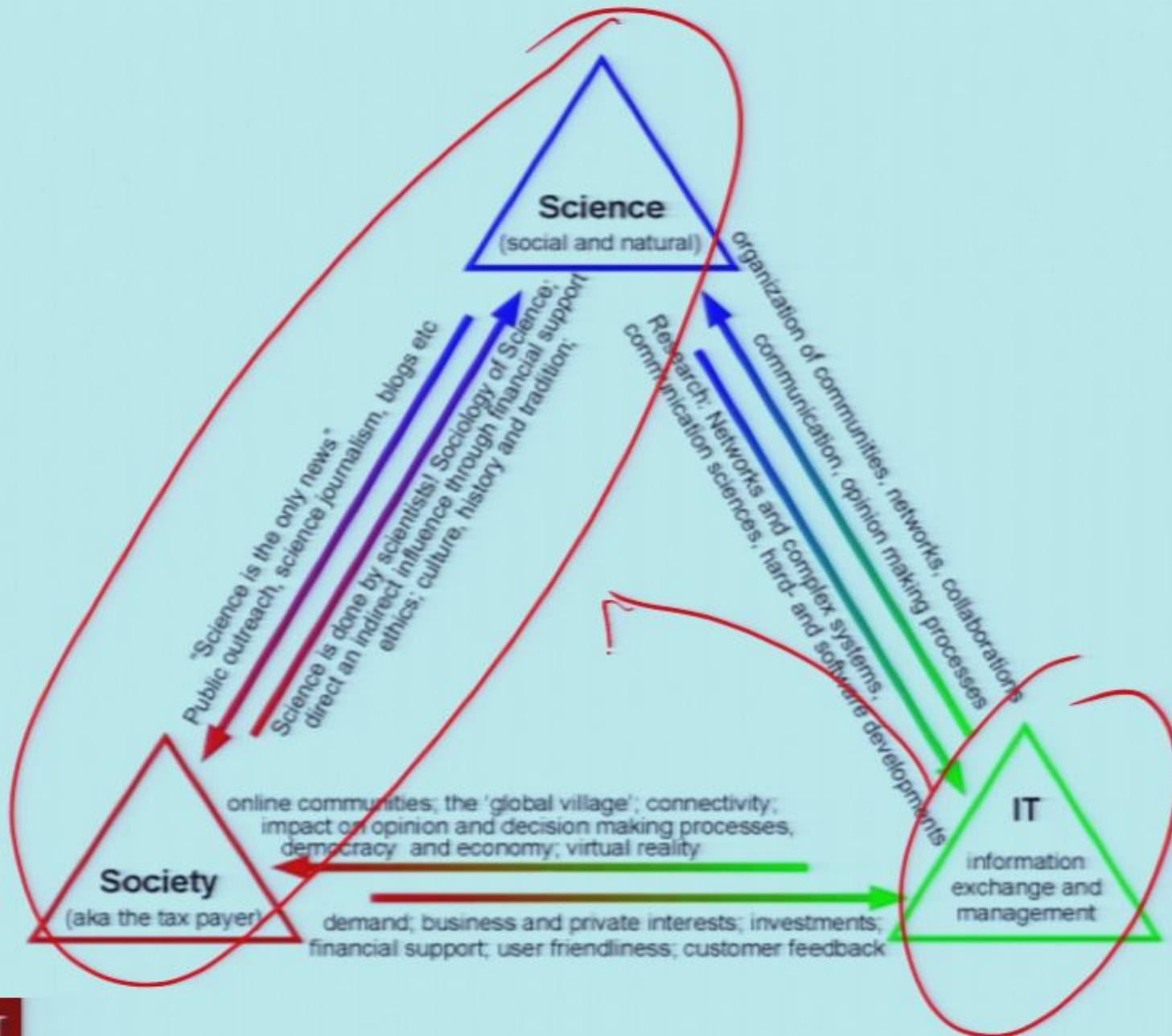
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The Problem

Funding problems for science:

US FY08 Omnibus Budget Bill:

Fermilab funding cut to \$320 million (expected \$372M)

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Similar deep cuts in UK physics funding

Assigning Blame

Whose fault is it that funding was cut?

George Bush?

Iraq, Afghanistan, tax cuts used
up all the money



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Democrats in Congress?

Grandstanding, message-sending

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My Claim:

We have failed at our job as scientists

What Is Science?

Science is a process for learning about the world:

1) Look at the world

Find some interesting phenomenon to explain

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Publication, dissemination, replication

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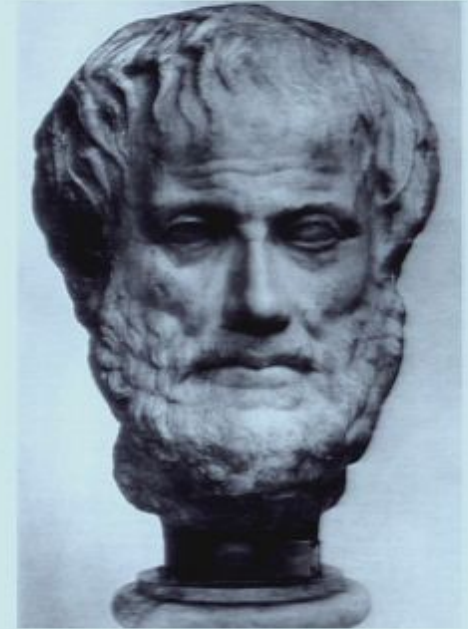
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History

- 1) Look at the world
- 2) Make up a theory
- 3) Test your theory
- 4) Tell everyone about it

First two steps go back to antiquity



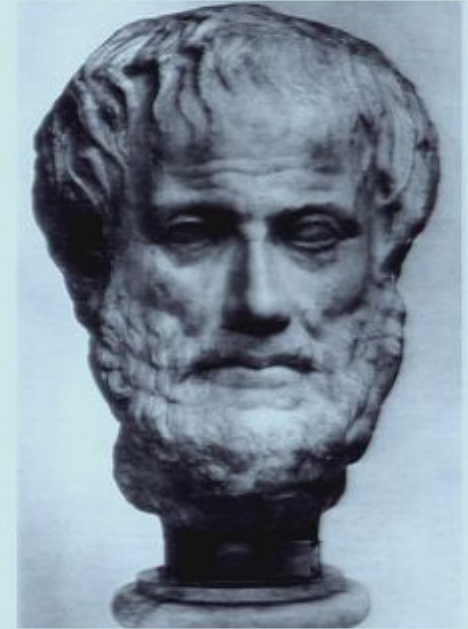
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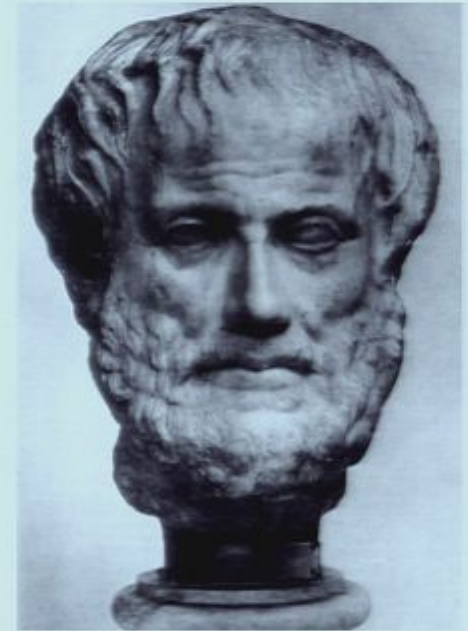
Aristotle, Pythagoreans, etc.

Lots of nifty ideas, many totally wrong



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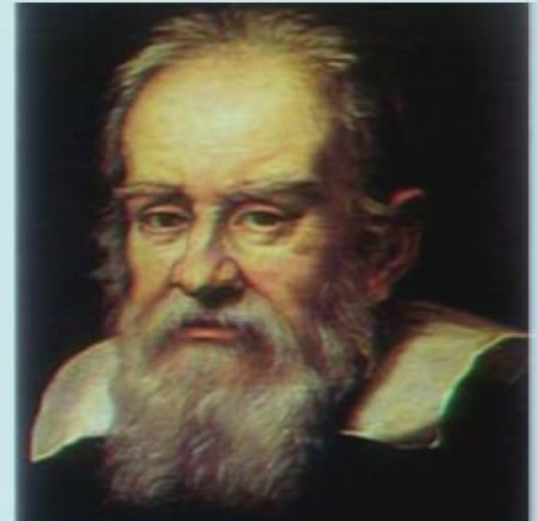
Aristotle, Pythagoreans, etc.

Lots of nifty ideas, many totally wrong

No systematic culture of experiment

History

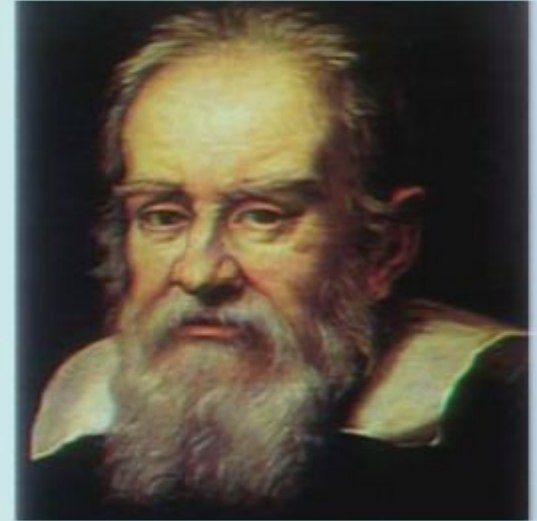
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Step 3 becomes established in 1600's

History

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Step 3 becomes established in 1600's

Galileo Galilei (1564-1642)

Experiments allow you to distinguish between theories

Systematic study of mechanics, astronomy

(roughly contemporary developments in medicine, etc.)

History

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R. Hooke

Step 4: Surprisingly late catching on

Robert Hooke, 1676: “ceiininossstuv”

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Step 4 separates science from alchemy

Stand on “shoulders of giants”

Models of Publication

Two models of approaching scientific communication:

(hat-tip: Robert Krulwich, WNYC Radiolab)

Models of Publication

Two models of approaching scientific communication:



Sir Isaac Newton
(1642-1727)

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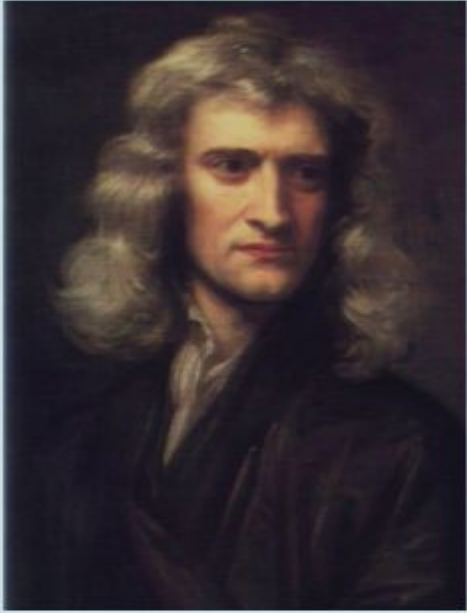


Galileo Galilei
(1564-1642)

(hat-tip: Robert Krulwich, WNYC Radiolab)

Newtonian Publication

Most famous work:



Newtonian Publication



Most famous work:

*Philosophiae Naturalis
Principia Mathematica*

(published 1687)

PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA

Autore JS. NEWTON, Trin. Coll. Cantab. Soc. Mathes.
Professore Lucasiano, & Societatis Regalis Sodali.

IMPRIMATUR
S. PEPYS, Reg. Soc. PRÆSES.
Julii 5. 1686.

LONDINI,

Jussu Societatis Regiæ ac Typis Josephi Streater. Prostat ap
plures Bibliopolas. Anno MDCLXXXVII.

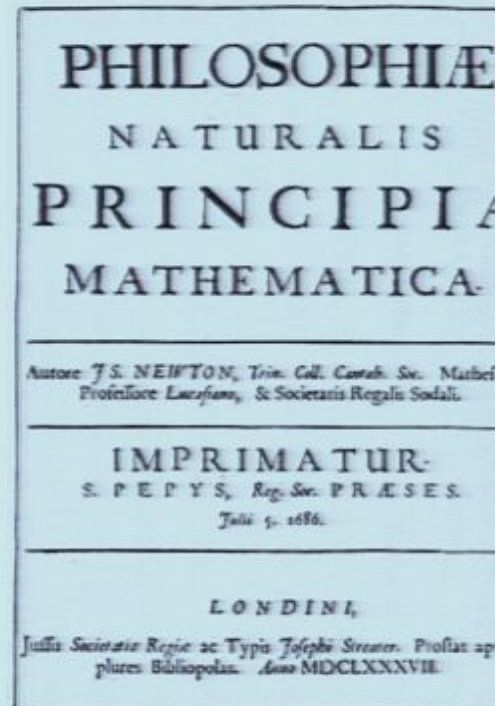
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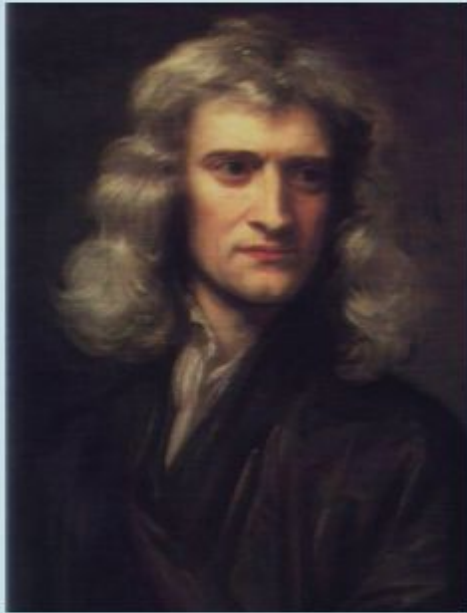
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Written in Latin, highly technical, highly mathematical

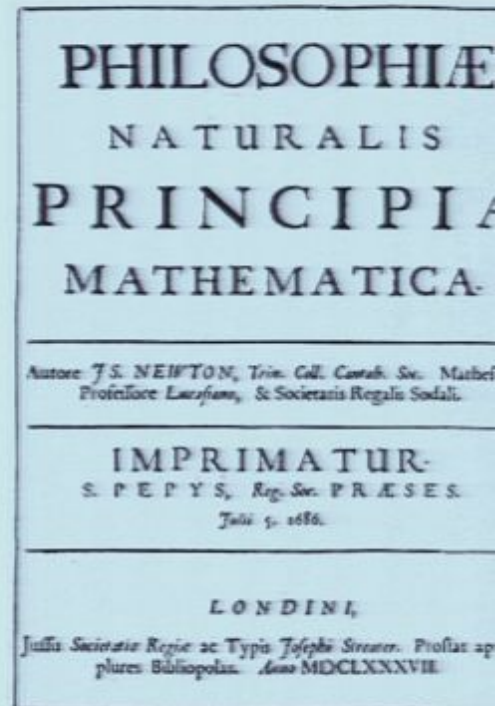
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Deliberately difficult, “to avoid being baited by little smatterers
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Galileian Publication

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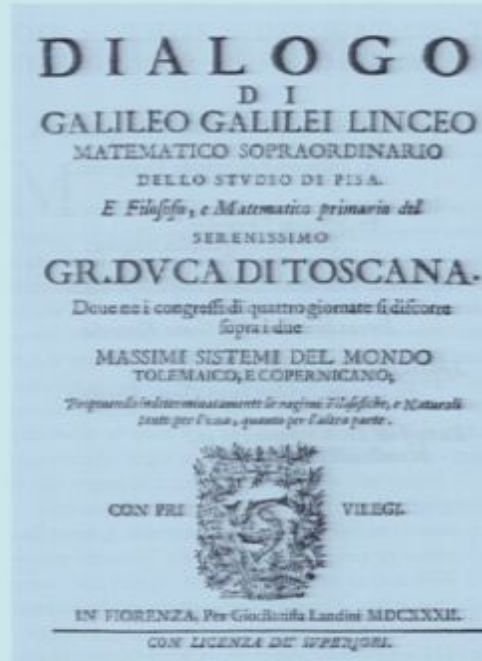


Galileian Publication

Most famous work:

*Dialogue Concerning the
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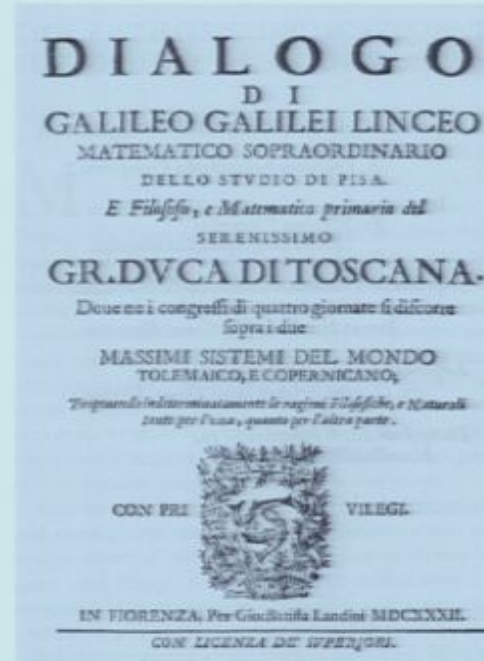
Galileian Publication



Most famous work:

*Dialogue Concerning the
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Written in vernacular, dialogue between three characters

Witty, accessible, highly readable, and persuasive

Banned, but widely read and influential

Results

Outcomes of different publication models:

Newton



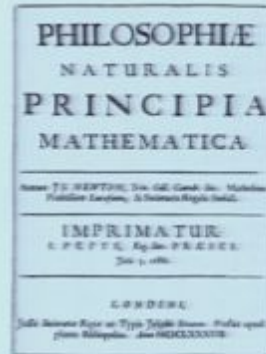
Galileo:



Results

Outcomes of different publication models:

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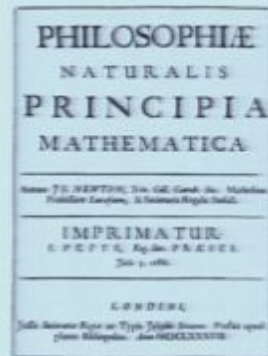
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Results

Outcomes of different publication models:

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Master of the Mint

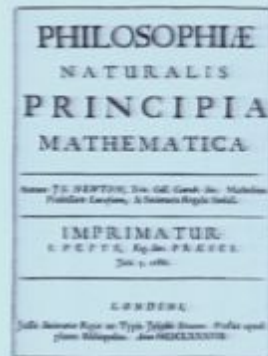
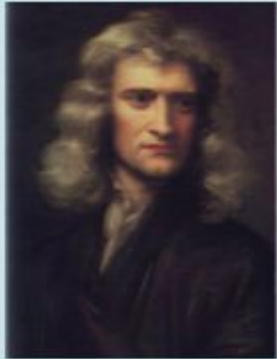
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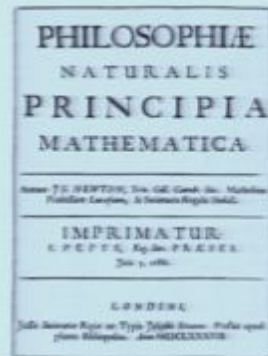
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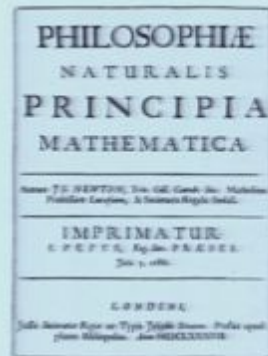


The Inquisition

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Master of the Mint

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The Inquisition

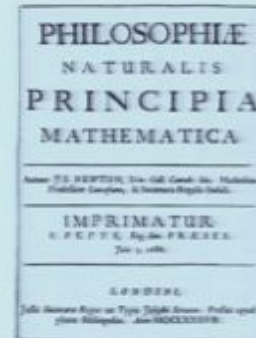
Lesson of History:

Newtonian Publication Is Better For Your Career

Newton Lives

Same pattern still holds today

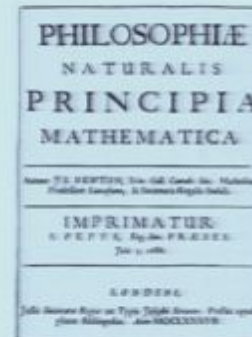
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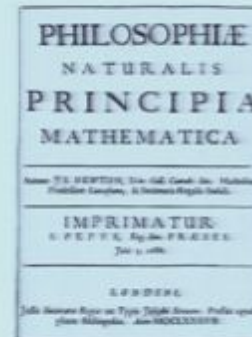
Hiring, promotion, prestige depend on technical publications
aimed at a narrow audience of other scientists

Science, not Scientific American

Newton Lives

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Newtonian publication preferred



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Galileian publication discounted or ignored

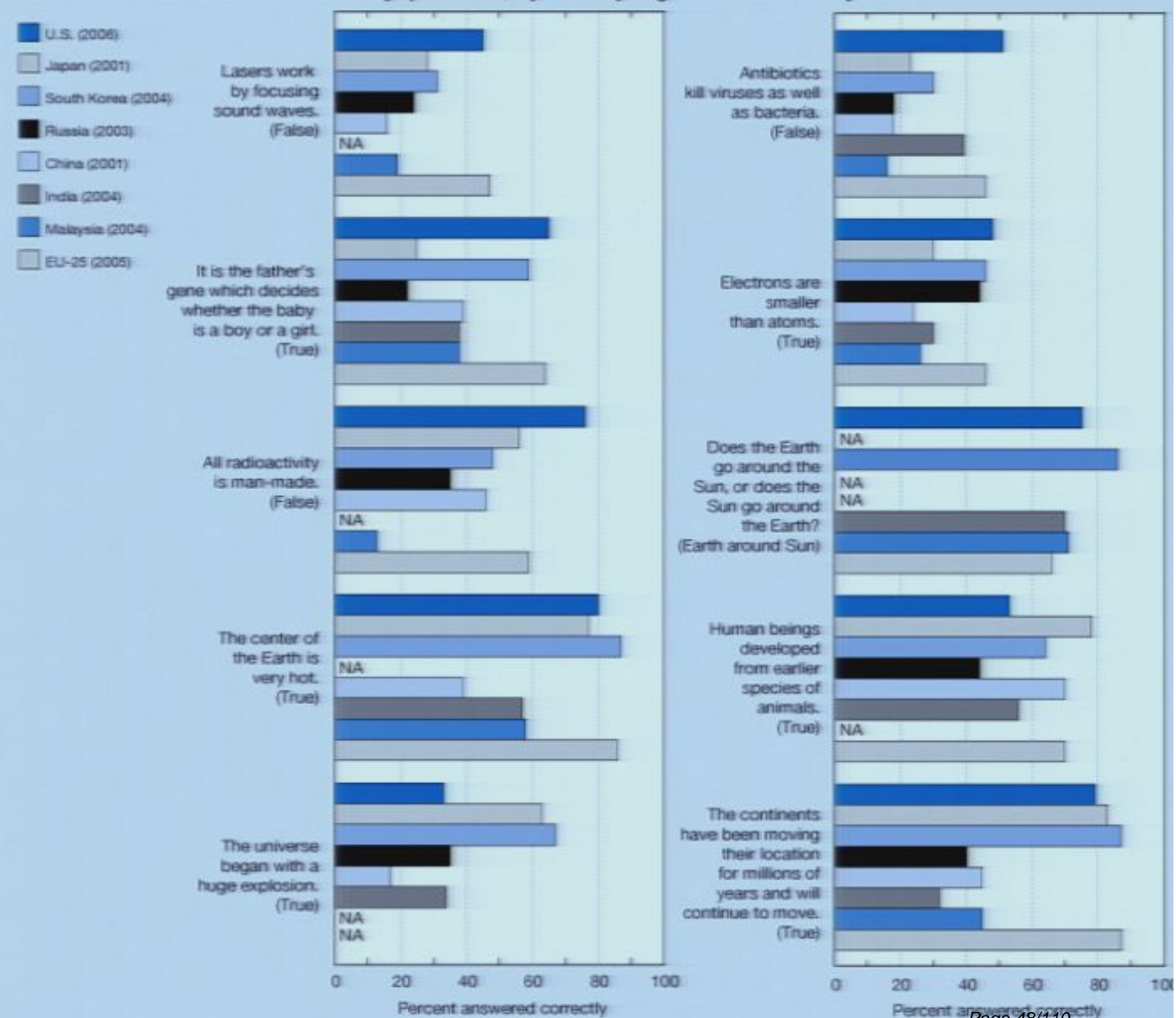
Even pedagogical research doesn't fully "count"

Public Knowledge

What's the problem?

Science literacy
among public is
depressingly bad

Figure 7-8
Correct answers to scientific literacy questions, by country/region: Most recent year

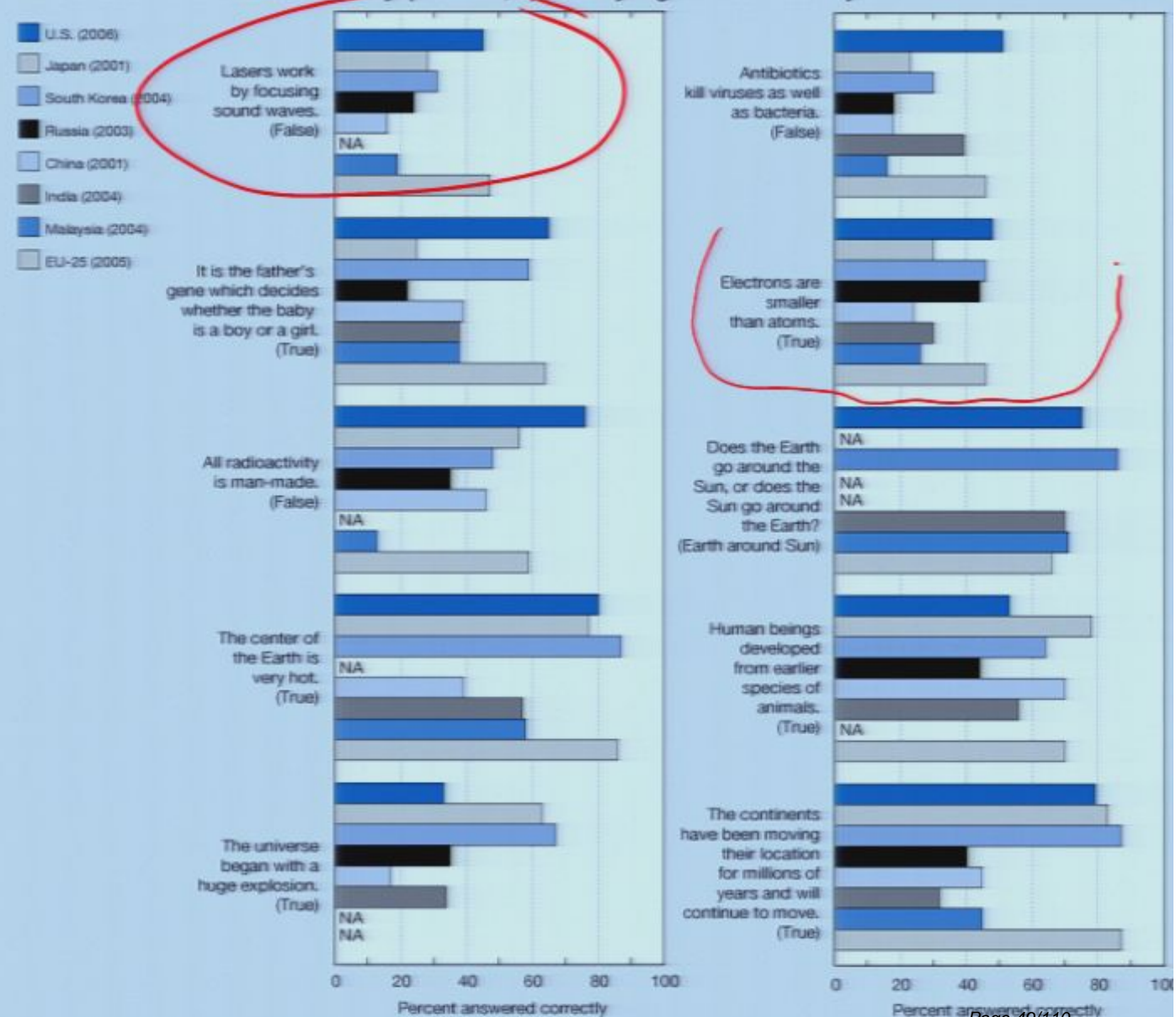


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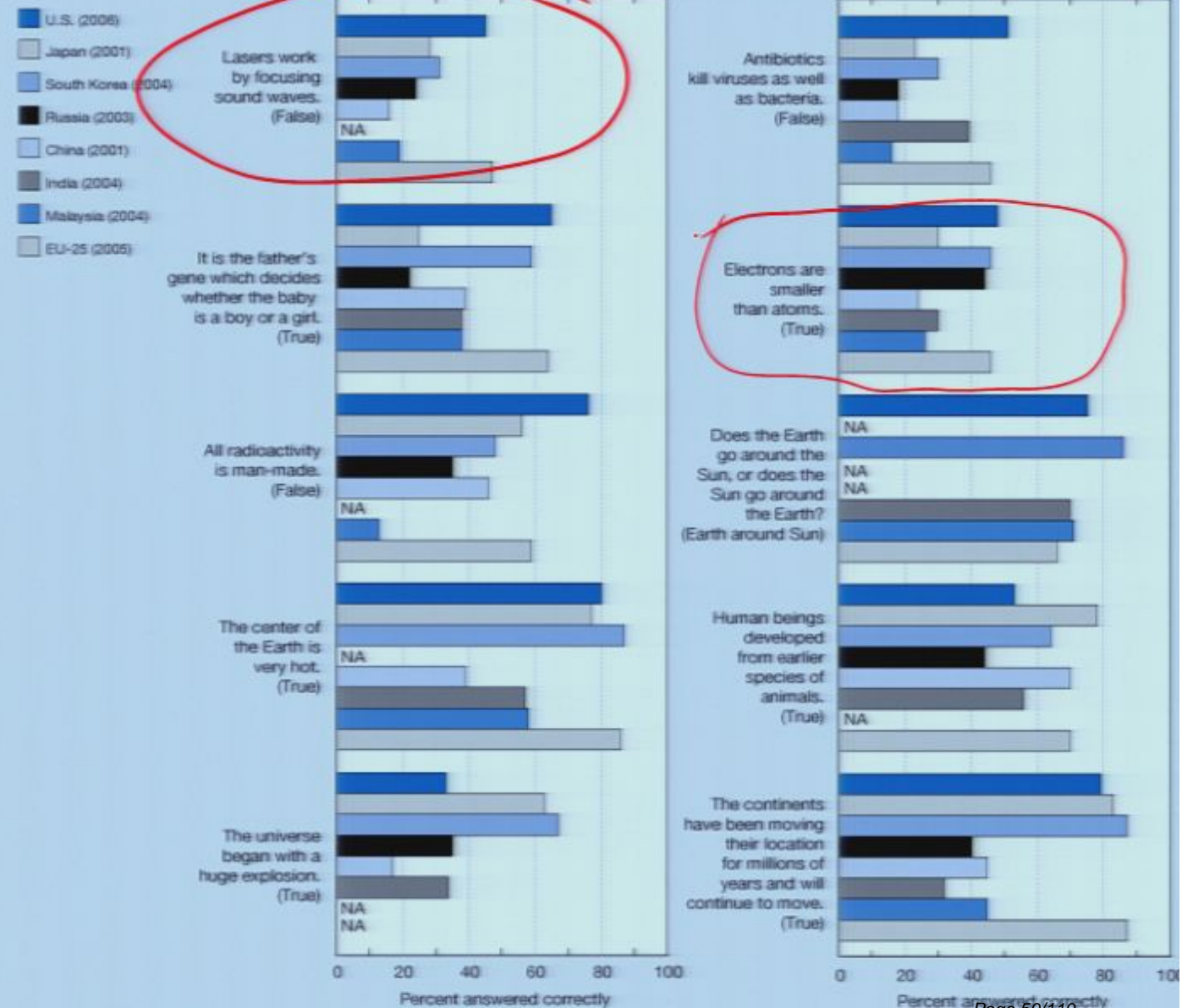
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(Note: Not just a US
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Correct answers to scientific literacy questions, by country/region: Most recent year



Public Attitudes

The general public likes science...

87% support Federal funding

41% favor spending more

(ahead of defense, space, foreign aid)

87% interested in new discoveries

47% “a lot” of interest

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47% “a lot” of interest

... when they notice it.

only 15% follow science news “very closely”

10th place— sports gets 23%, religion 16%

(NSF Science & Engineering indicators 2008)

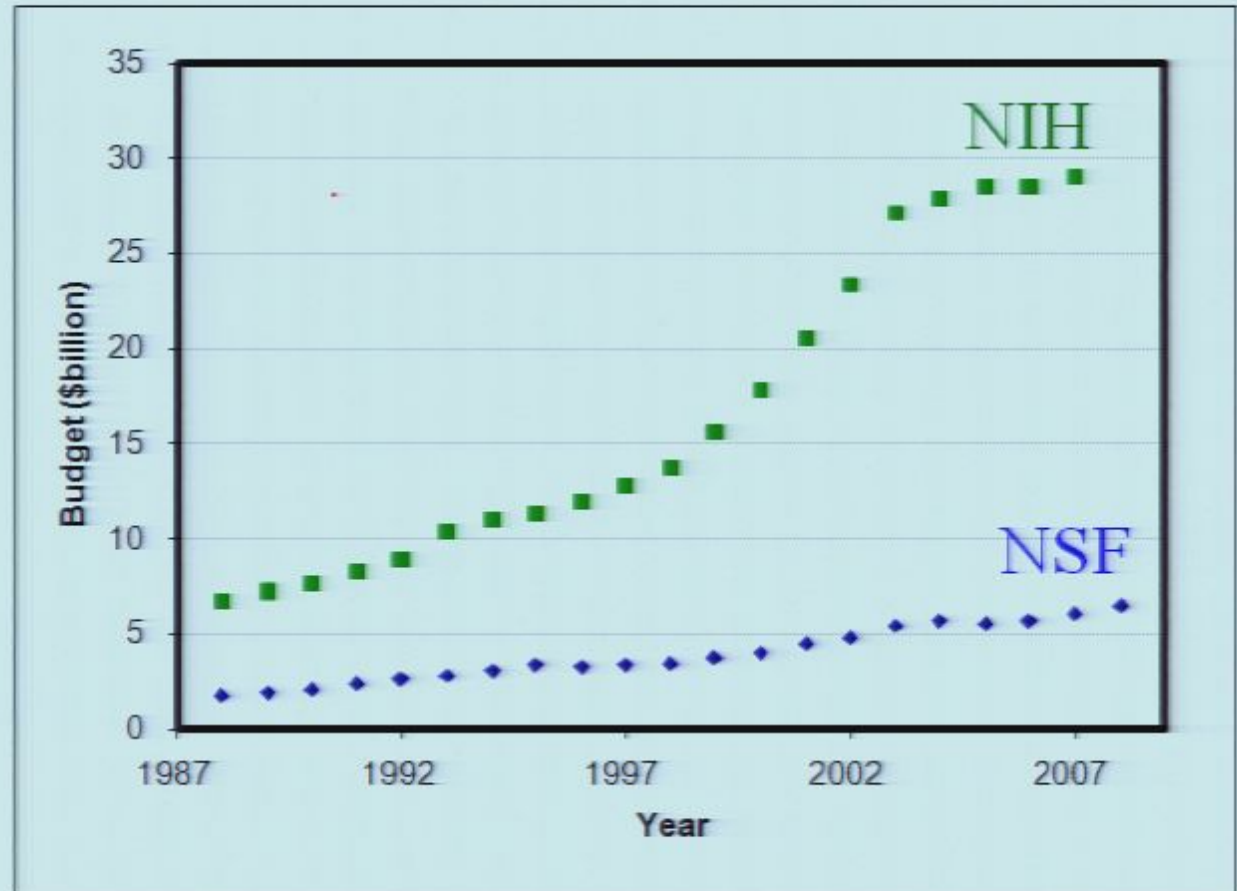
Funding Consequences

Public favors funding,
but not a priority

→ Instability

Feast or Famine

Lots of money for
“crises,” then lose
interest



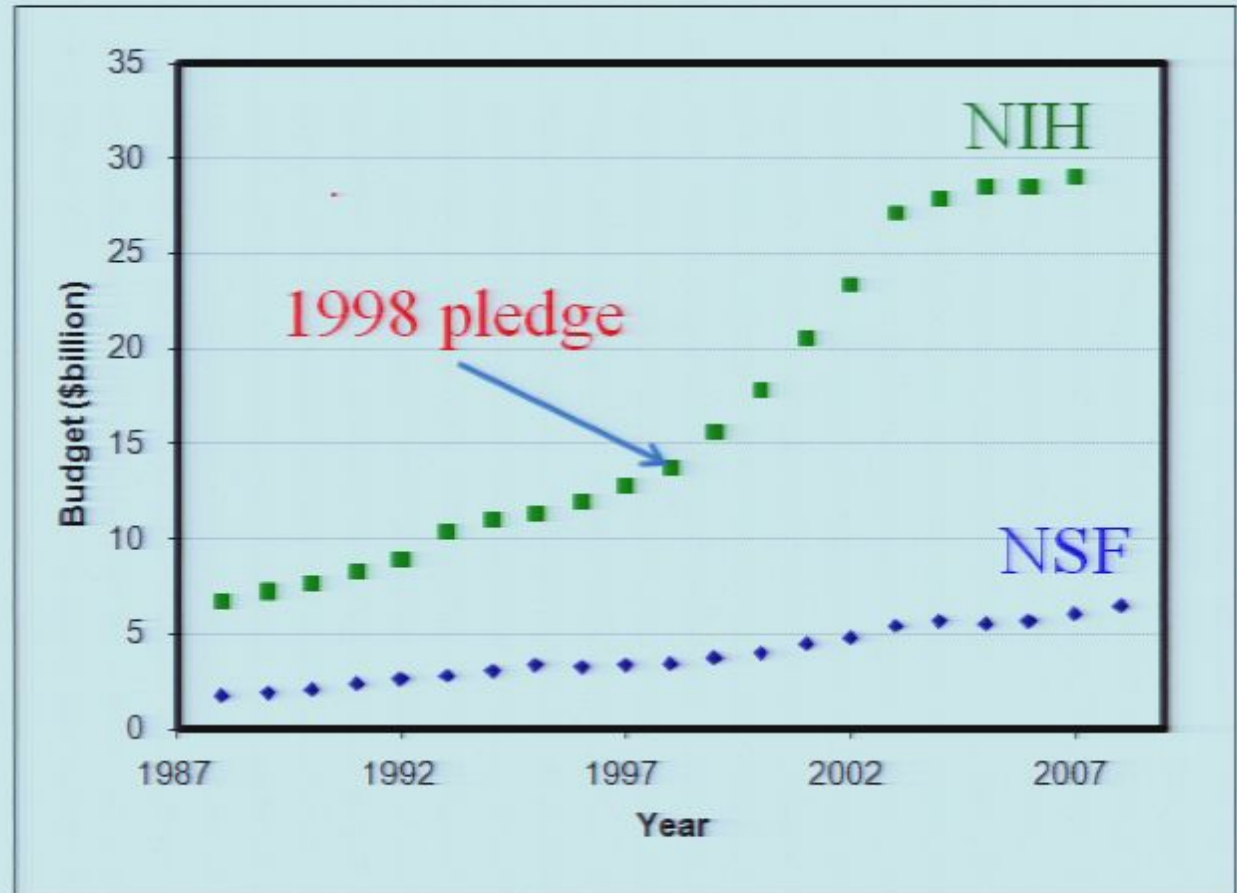
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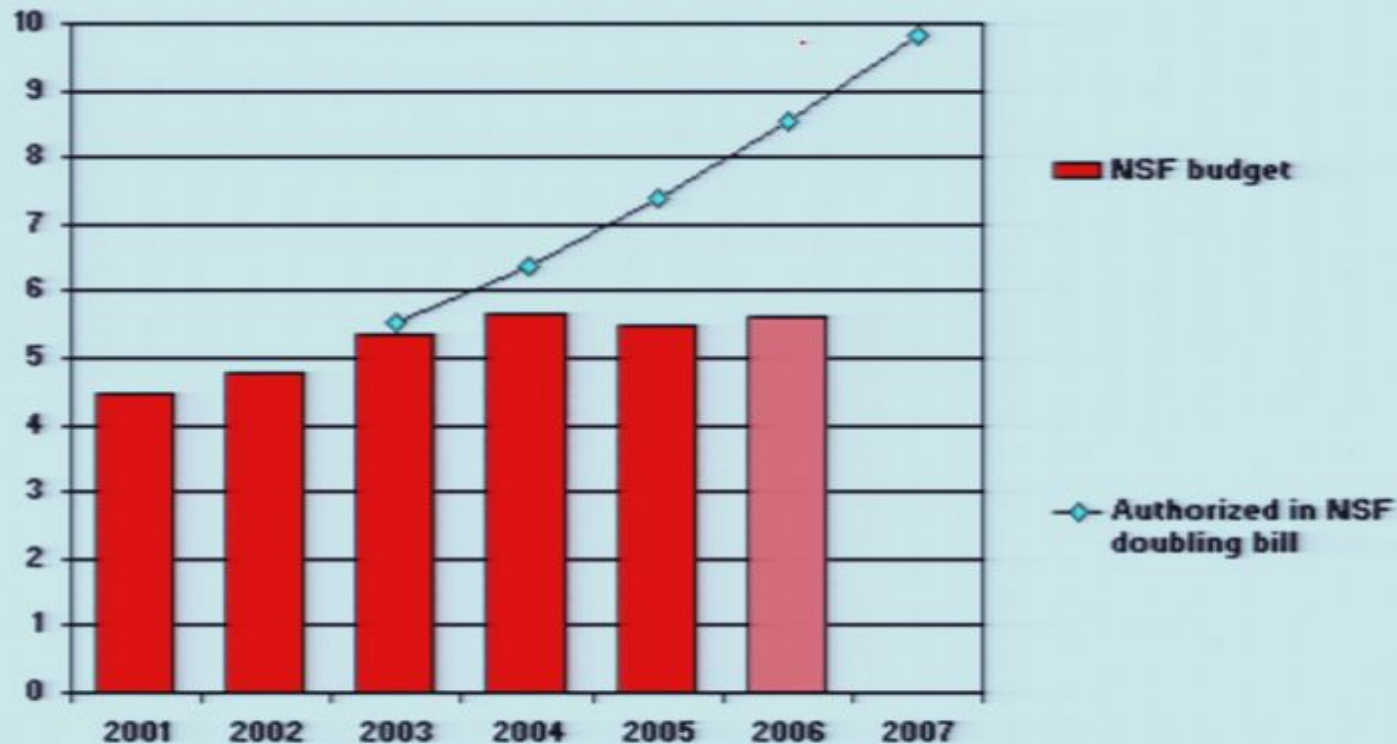


Clinton pledge to double NIH budget in 1998, then flat

Funding Consequences

National Science Foundation Budget vs. Authorization, FY 2001-2007

(budget authority in billions of dollars)



Source: National Science Foundation, Public Law 107-368, and latest AAAS estimates of NSF appropriations. FY 2006 is budget request. Authorized levels are authorizations in Public Law 107-368 (Dec. 2002). FEB. '05 ♦ 2005 AAAS



2008 Funding Cuts

Why did Congress slash high-energy physics funding in 2008?

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No follow-through in November (expected)

What to Do?

Public knowledge and appreciation of science are not very good

As scientists, we need to do a better job

Engage public interest

Create a constituency for science

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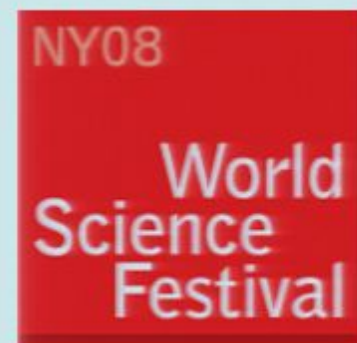
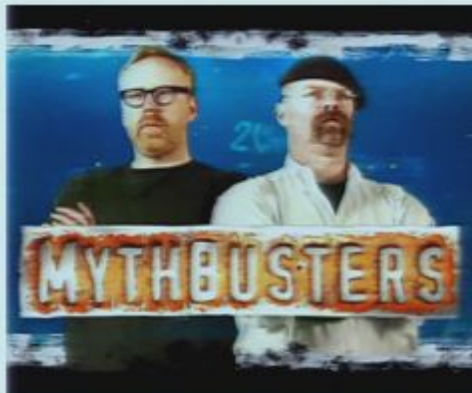
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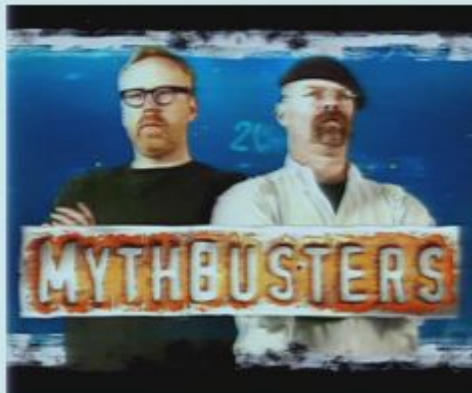
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- Buy and promote science books
- Demand science from the media

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 - Not just hot-button issues
- Train and support science teachers

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- ➔ Encourage science students in other careers
- ➔ Encourage good communicators

Move beyond “Get back in the lab!”

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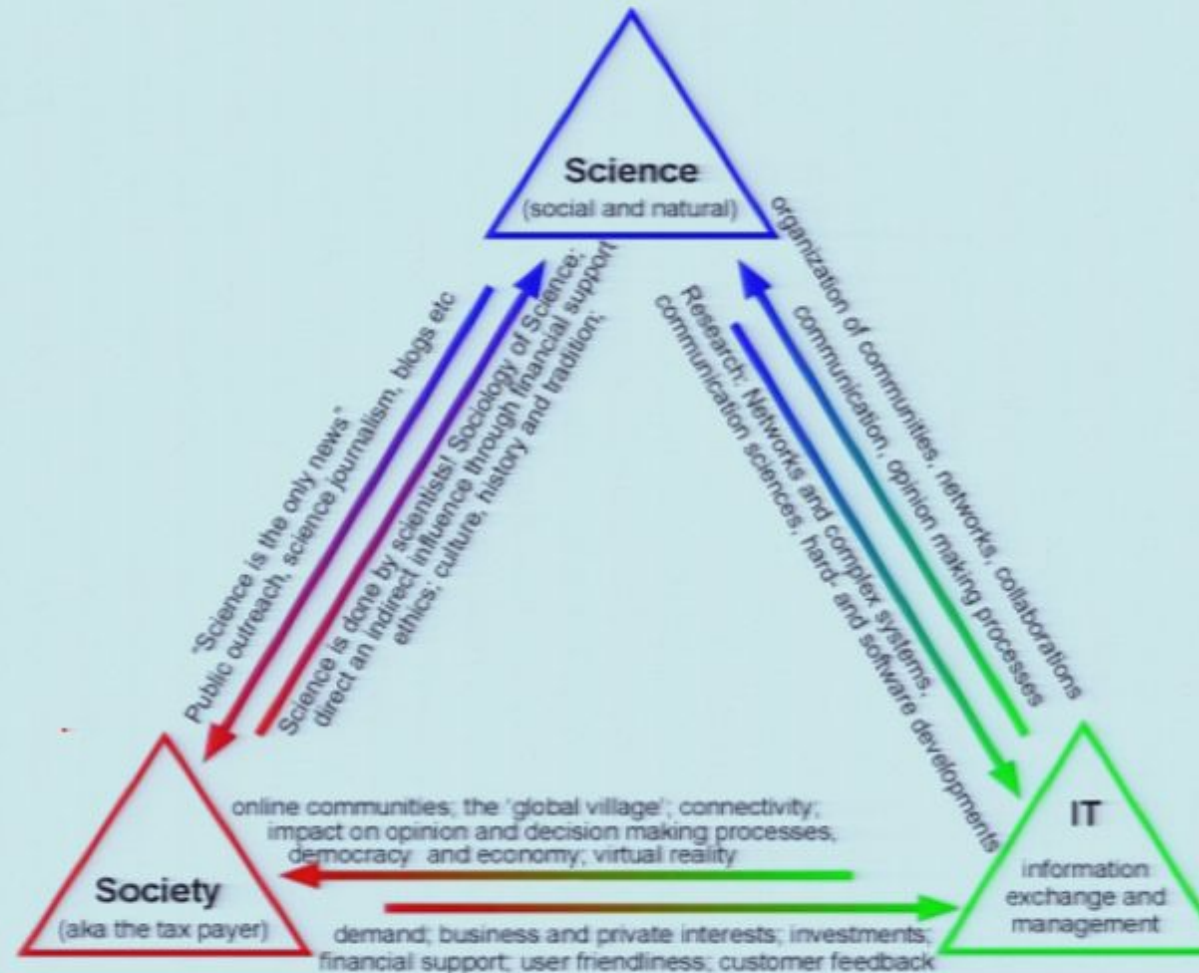
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Encourage Galileos, don't force them to be Newtons

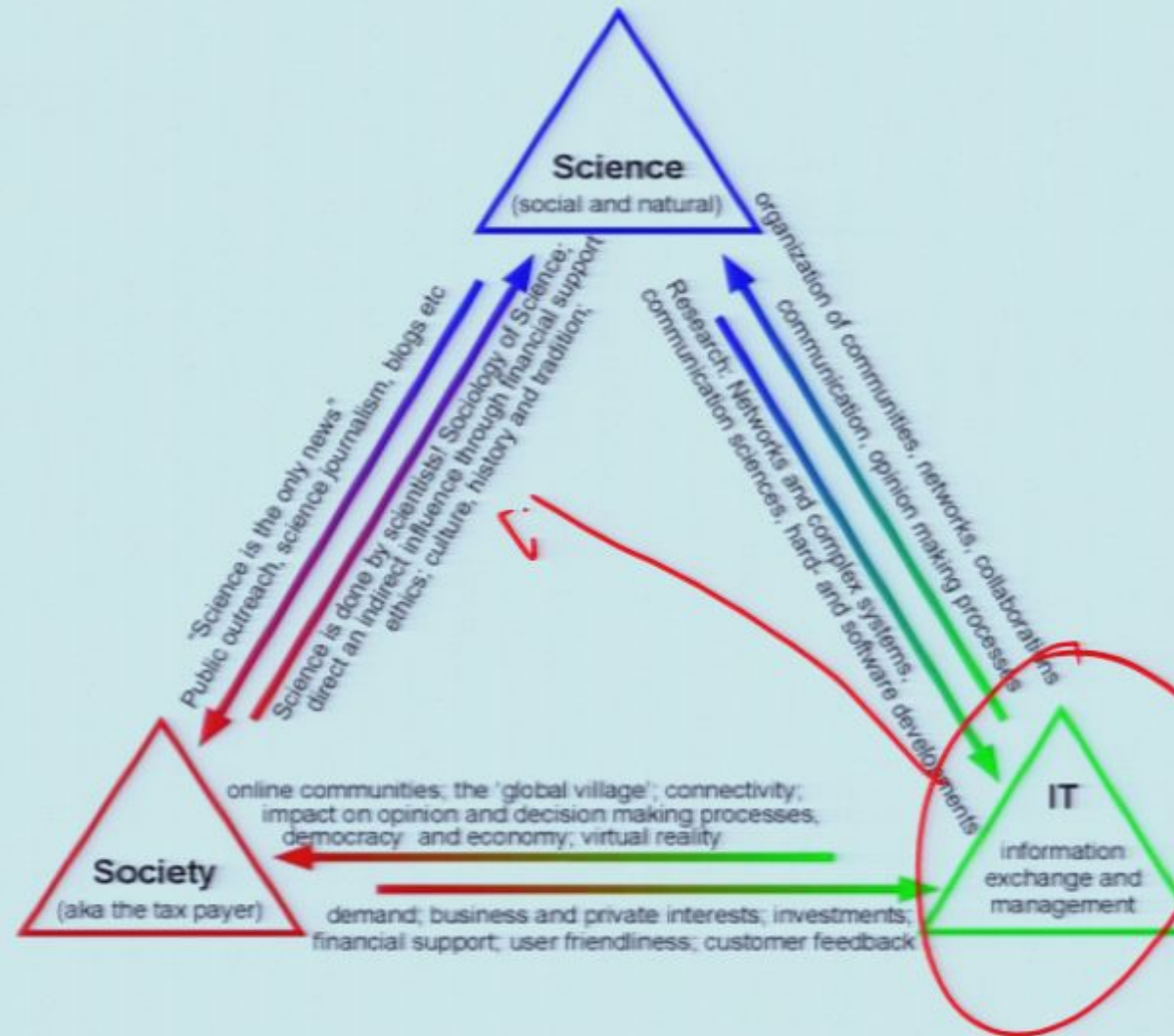
What Does This Have to Do With Anything?

New communications tools



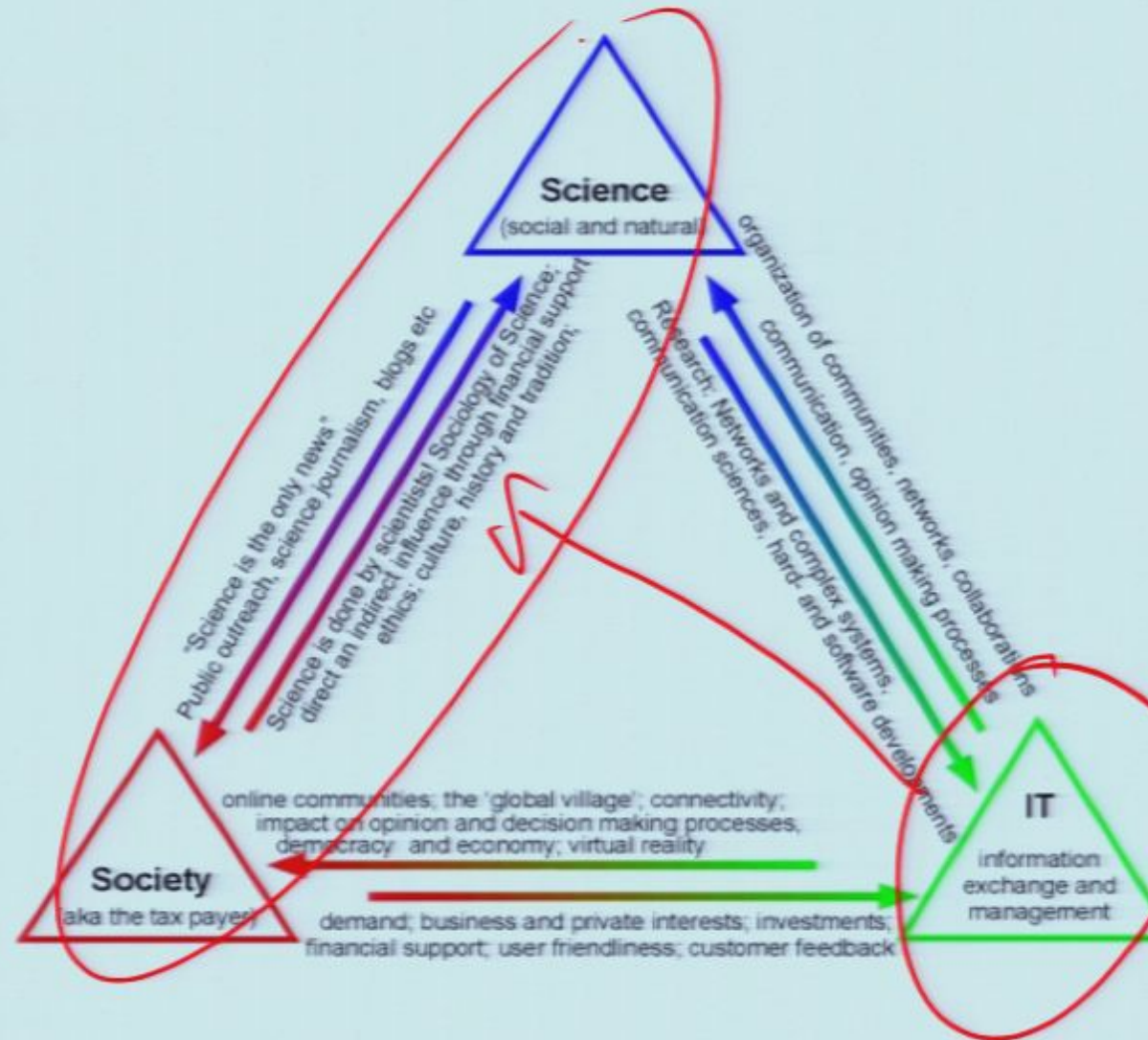
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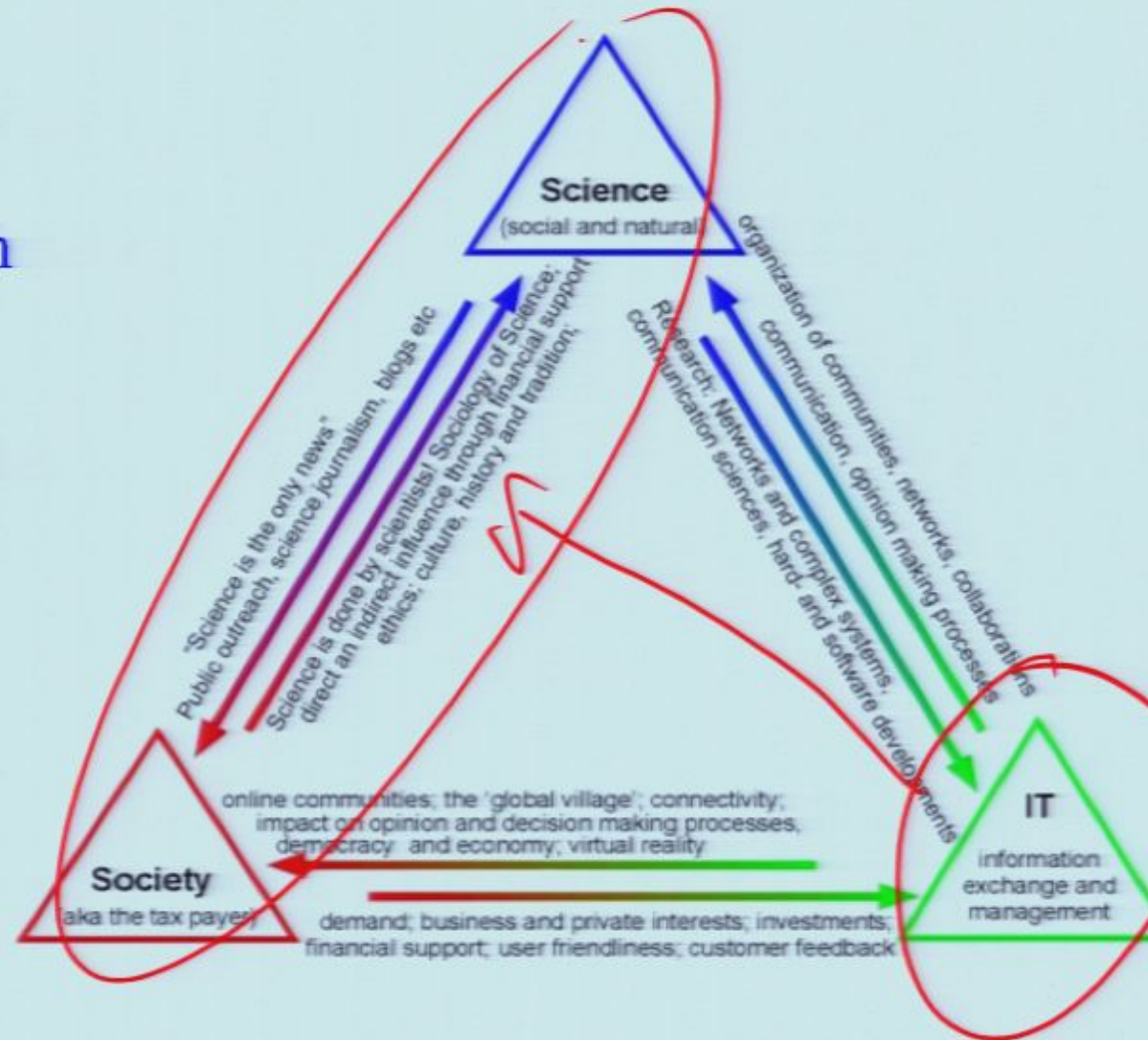


What Does This Have to Do With Anything?

New communications tools

Enable scientists to reach
a global audience

Make outreach easy and
(relatively) painless



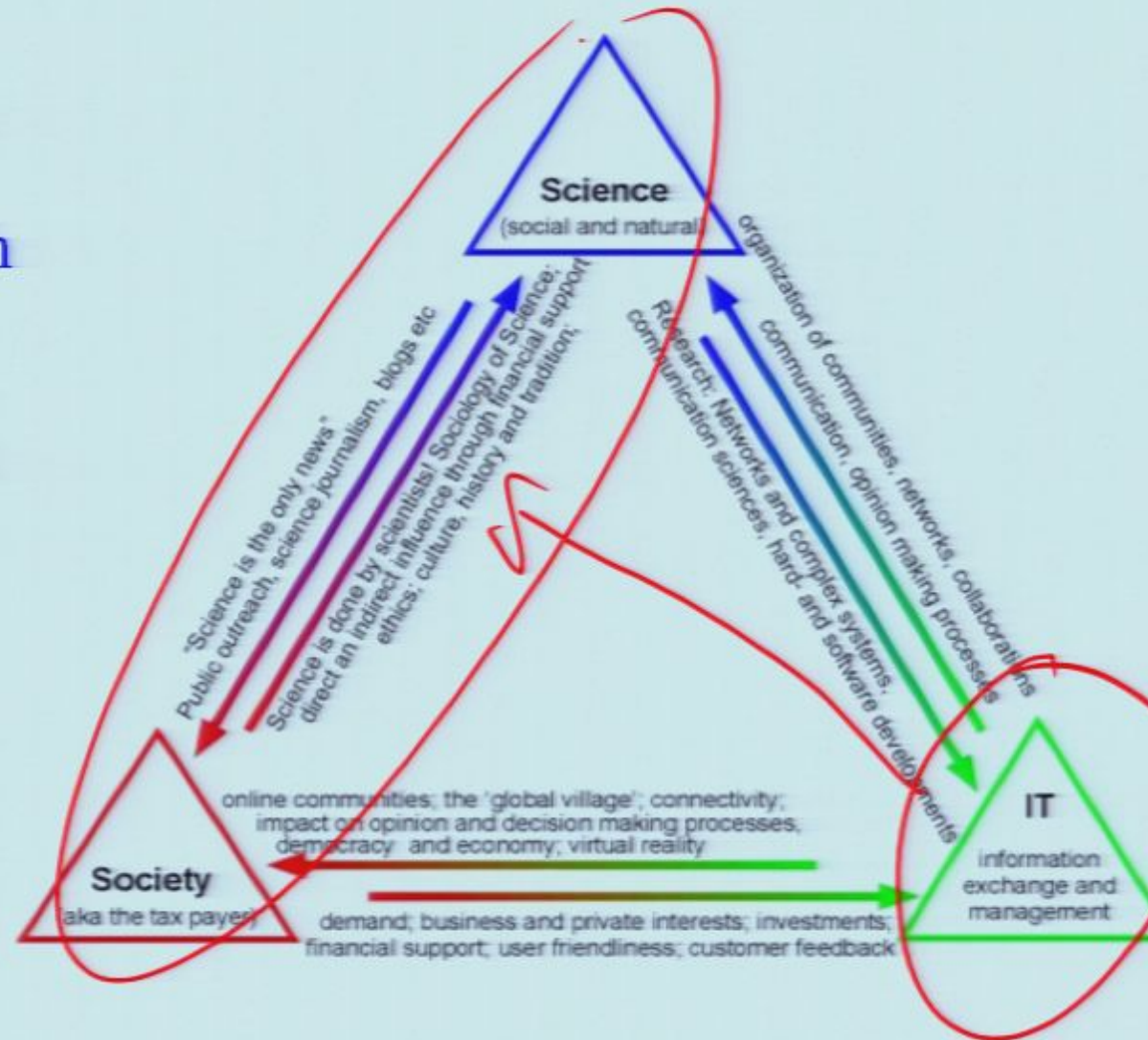
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→ Weblogs as a tool for
public outreach



Blogs

“Blog” (short for “web log”)

Regularly updated personal site

Short essays, pictures, links to
other pages of interest



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“Blog” (short for “web log”)

Regularly updated personal site

Short essays, pictures, links to
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“A Directory of Wonderful Things”

(tag line of Boing Boing, but could serve generally)



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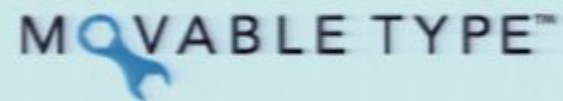
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“A Directory of Wonderful Things”

(tag line of Boing Boing, but could serve generally)

Best-known blogs deal with politics, gadgets, celebrity gossip



Blogs

“Blog” (short for “web log”)

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MOVABLE TYPE™



“A Directory of Wonderful Things”

(tag line of Boing Boing, but could serve generally)

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A Directory of Wonderful Things



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75,167 posts

972,659 comments

TOP SCIENCE STORIES

Green Revolution 2.0
As the global food system reaches its natural limits, it's time to rethink genetic engineering.

Seed's Daily Zeitgeist:

Evolution in Schools Redux
THE BUZZ IN THE BLOGOSPHERE

Sunday's New York Times Magazine profiled David Campbell, of Orange Park, Florida, an Anglican high school biology teacher who fought to keep evolution in the official state science curriculum. That battle won, Campbell now fights a more difficult one in his classroom: many religious students just won't buy that humans descended from apes.

LATEST RELATED ENTRIES

How were you taught about evolution?
08.25.2008 • Brian Switek
... many more elementary school teachers standing up for good science education. What I particularly liked about the article was that Campbell did not shy away from human evolution, the most controversial and powerful example of evolution that there...

Back To School Special: What to do with Bible thumping students
08.25.2008 • Greg Laden
... David Campbell is a life science teacher in Florida who was recently profiled in the New York Times because of his involvement in the

A world without Baw Baw frogs?
08.25.2008 • Darren Naish
... J., Bain, R. H., Haas, A., Haddad, C. F. B., De Sá, R. O., Channing, A., Wilkinson, M., Donnellan, S. C., Razworthy, C. J., Campbell, J. A., Blotto, B. L., Moler, P., Drewes, R. C., Nussbaum, R. A., ...

Why teaching evolution is dangerous
08.25.2008 • Cobiornix
... hypotheses rather than simply accept things at face value. He was the first teacher who ever taught me how, not what, to think, and Mr. Campbell is the reason I am now a biologist, studying evolutionary biology. Thank...

Will we ever stop running away from the source of the problem?
08.24.2008 • PZ Myers
... refuse to listen to this evolution stuff. There is a villain here, but the article doesn't point a finger directly nor

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"But hey, Don't Panic. Extinction is the only real certainty right? Like Livingston and Evans, 'Qué Será, Será.' After all, how many good millennia does a planet have?"

The Intersection - Best Of: So Long, and Thanks for All the Fish - August 15, 2008

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My personal blog

started 2002

moved to SB
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Posted on: August 5, 2008 9:42 AM, by Chad Orzel

Optical Control of Ultracold Collisions in Metastable Xenon

(This is the first in a [planned series of posts](#) writing up each of the scientific papers on which I am an author. A short description and a link to a PDF of the paper can be found at [the archived Optical Control page](#).)

The essence of the optical control paper is contained in this one figure:

$\beta_1^{(0)} - \beta_1^{(1)} (10^{-10} \text{ cm}^3/\text{s})$

Legend: \square 132Xe, \circ 136Xe

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~300,000
views/month

The screenshot shows the Research Blogging website. At the top, there's a green header with the site logo and navigation links: Home, Blogs, Register, News, About, Help. A login section is on the right. Below the header is a 'Post List' section. The first post is titled 'Fische, Salz und dicke Gräten' by Lars Fischer in Fischblog, dated September 2, 2008. The second post is 'Angry? Get Distracted' by Mark Brandt in Social Psychology Daily, also dated September 2, 2008. The third post is 'Spin polarization and quantum statistical effects in ultracold ionizing collisions' by Chad Covel in Uncertain Principles, dated September 2, 2008. On the right side, there's a search bar and a sidebar with 'TOPICS' and 'DATES' lists. The 'TOPICS' list includes various scientific fields like Anthropology, Astronomy, Biology, Chemistry, etc. The 'DATES' list shows frequency options like All, Today, Yesterday, etc. At the bottom right, there's a 'JOIN US!' section with a brief description of the site's purpose and a 'Register Now' link.

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Basic Concepts

Posts written for
very general audience
covering most
essential elements of
various fields

Collected by
John Wilkins



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John Wilkins is an aged, eternal student, who thinks philosophy of biology is at least as interesting

as politics or sport and twice as important. He has a PhD from the University of Melbourne and a position as a Postdoctoral Fellow Sessional Lecturer at the University of Queensland, in Australia. After a varied career, involving factories, gardening, civil service, publishing, graphics, public relations but not, unfortunately for the CV, driving a truck, John finally completed his thesis on species concepts in 2004, which he has worked into two books. *Species Definitions: A Sourcebook* (Peter Lang) will come out in 2008; *Species: A History of an Idea*

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Basic Concepts: Physics and Astronomy, Geology, and Chemistry

Category: **Basic Concepts**

Posted on: August 21, 2008 8:50 AM, by **John S. Wilkins**

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- [Phase changes](#), by Janet Stemwedel at [Adventures in Science and Ethics](#).
- [Seasonal variations](#) by ScienceWoman at [On being a scientist and a woman](#)
- [Turbulence in Flow around Bodies](#), by Arun Narasimhan at [Nanoscience](#)

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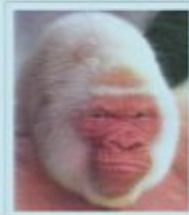


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Another useful service:

BAD ASTRONOMY

Debunking bad science



DELTOID

To Draw a Deltoid (First Method):

Draw a circle, center O , and a diameter AB . Mark points on this circle at intervals of 5° , starting from B , and number them $0, 1, 2, 3, \dots$, in anticlockwise order, the point B itself being numbered 0 . Number alternate points again, starting from A , in clockwise order, the intervals 0 to $1, 1$ to 2 , etc., being now 10° instead of 5° . Join the pairs of points having the same numbers, continuing until a three-lobed curve is completed. This curve is the deltoid. (Fig. 51)

Responding to kooks,
cranks, charlatans

Good Math, Bad Math

Finding the fun in good math
Squashing bad math and the fools who promote it

Answer political
abuse of science



RESPECTFUL INSOLENCE

"A statement of fact cannot be insolent." The miscellaneous ramblings of a surgeon/scientist on medicine, quackery, science, pseudoscience, history, and pseudohistory (and anything else that interests him)

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Can't prevent posting of distorted science, but can provide correct
information for the public

BAD ASTRONOMY



DELTOID

To Draw a Deltoid (Three Methods)

Draw a circle, center O , and a diameter AB . Mark points on this circle at intervals of 3° , starting from B , and number them $0, 1, 2, 3, \dots$, in anticlockwise order, the point B itself being numbered 0 . Number alternate points again, starting from A , in clockwise order, the intervals 0 to $1, 1$ to 2 , etc., being now 10° instead of 3° . Join the pairs of points having the same numbers, continuing until a three-lobed curve is completed. This curve is the deltoid? (Fig. 51)

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Humanizing of Scientists

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TV, Books, Movies

Art and Music

Polls, “memes,” etc.

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"I think so, SteelyKid, but what if the rhinoceros doesn't want to be milked?"

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Polls, “memes,” etc.

Scientists are people,
contrary to myth

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Why Blogs?

Advantages of blogging as a communications tool:

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Easy to do

Simple web-based tools, free hosting services

Flexible time commitment— do on “hobby” basis

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Springboard for future Galileians...

What About the Dog?

January, 2007:

“Bunnies Made of Cheese” Imaginary conversation about QED

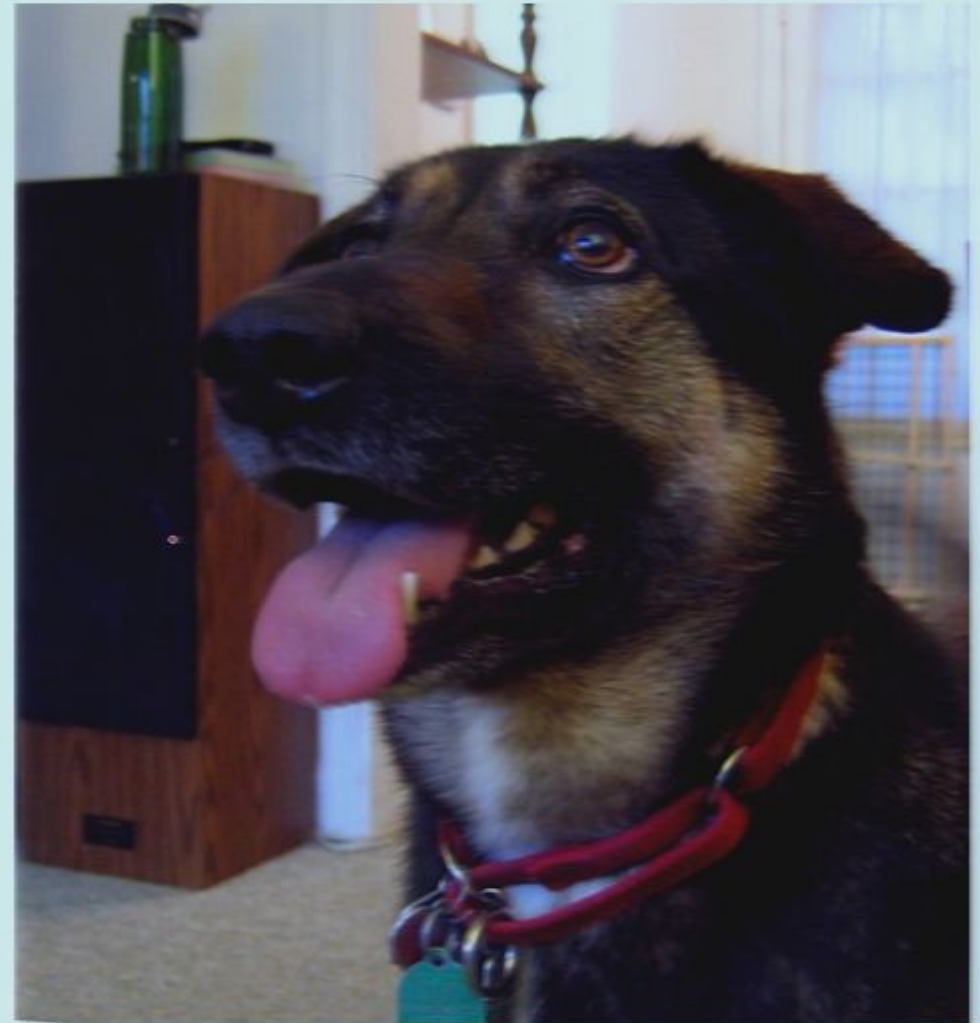
The dog is standing at the window, wagging her tail excitedly. I look outside, and the back yard is empty.

"What are you looking at?" I ask.

"Bunnies made of cheese!," she says. I look again, and the yard is still empty.

Dramatic Reading: 📢

(CNET Buzz Podcast, ~2min)



Emmy, Queen of Niskayuna

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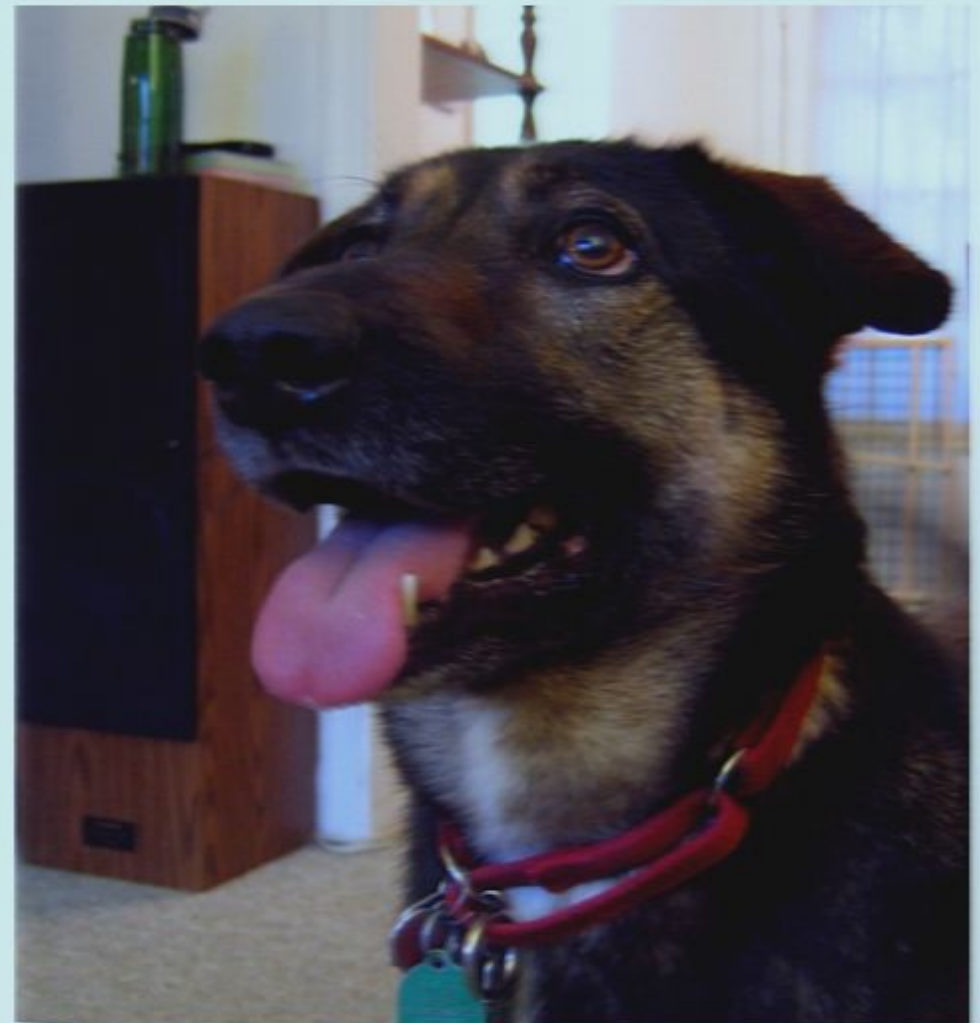
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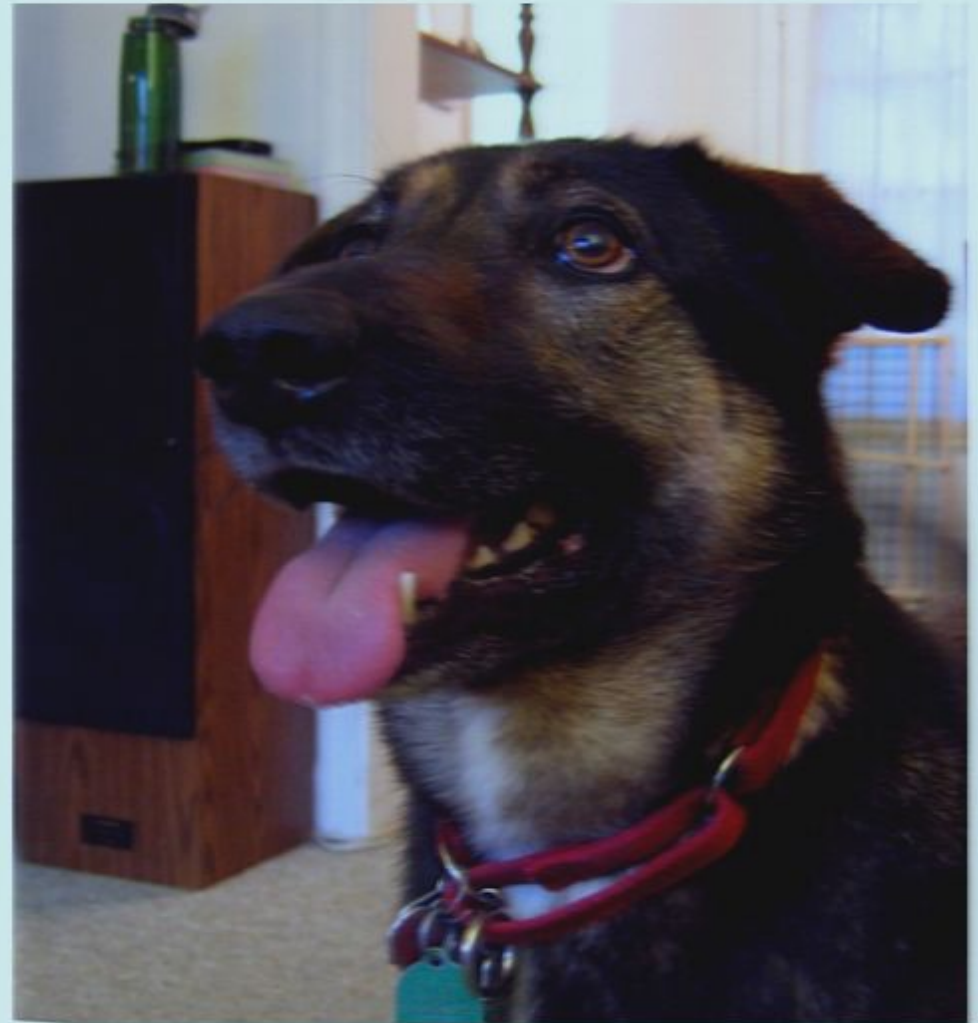
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♦ Dramatic Reading: 
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Emmy, Queen of Niskayuna

Many Worlds, Many Treats

May 2007:

I'm sitting at the computer typing, when the dog bumps up against my legs. I look down, and she's sniffing the floor around my feet intently.

"What are you doing down there?"

"I'm looking for steak!" she says, wagging her tail hopefully.

"I'm pretty certain that there's no steak down there," I say. "I've never eaten steak at the computer, and I've certainly never dropped any on the floor."

"You did in some universe," she says, still sniffing.



Bunnies Made of Cheese: The Book

“Many Worlds, Many Treats” linked by Boing Boing, Digg

➔ more than 50,000 readers

Contacted by agent

➔ Book proposal, bought by Scribner

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Should be published early 2009

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Extreme example, but illustrates general principle

Use blogs to promote science

produce new opportunities for outreach

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Posts re-printed in magazines, other sites

Books: Janet Stemwedel, *The Open Laboratory* collections, etc.

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“Greatest Physics Experiment,” “Top 100 Science Books”

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Quantum Diaries

QUANTUM DIARIES

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Follow physicists from around the world as they live the World Year of Physics.



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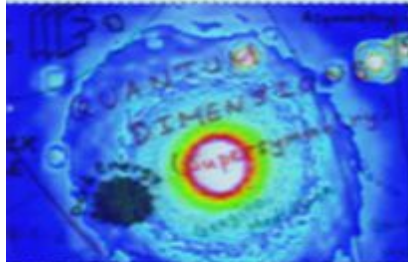
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Ursula Bassler
IN2P3
France
Lang: English

Ursula co-leads a team that's improving measurements of very high-energy proton-antiproton collisions. She played the melodica, which is essentially a piano you blow into.



New

A fond farewell

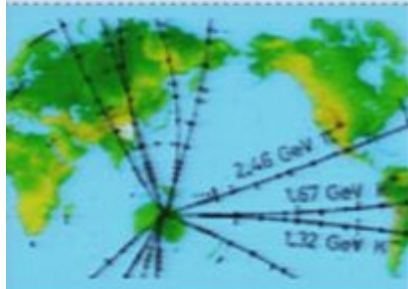
Thanks for joining us as we chronicled 2005, the World Year of Physics, through the eyes of thirty-three working physicists.

Relive the World Year

You can experience the World Year of Physics all over again by [visiting the Quantum Diaries archives](#).

Last words

Read the Quantum Diarists' [famous last words](#), as they review the year past and look ahead to the year to come.



December 28, 2005

The scientific method is not just a tool for finding out mere facts about isolated phenomena in the world: it's a whole way of looking at everything around you, from science to culture to politics. [Read more...](#)

Peter Steinberg



December 26, 2005

As it turns out, I'm not so special. Between my fear of wild animals to my thesis troubles, there was always a reader, or five, who had been in the exact same predicament. And I realize it is a bit cheesy to say, but it was nice to know I wasn't alone. [Read more...](#)

Caoilinn O'Connell

LHC Blogs

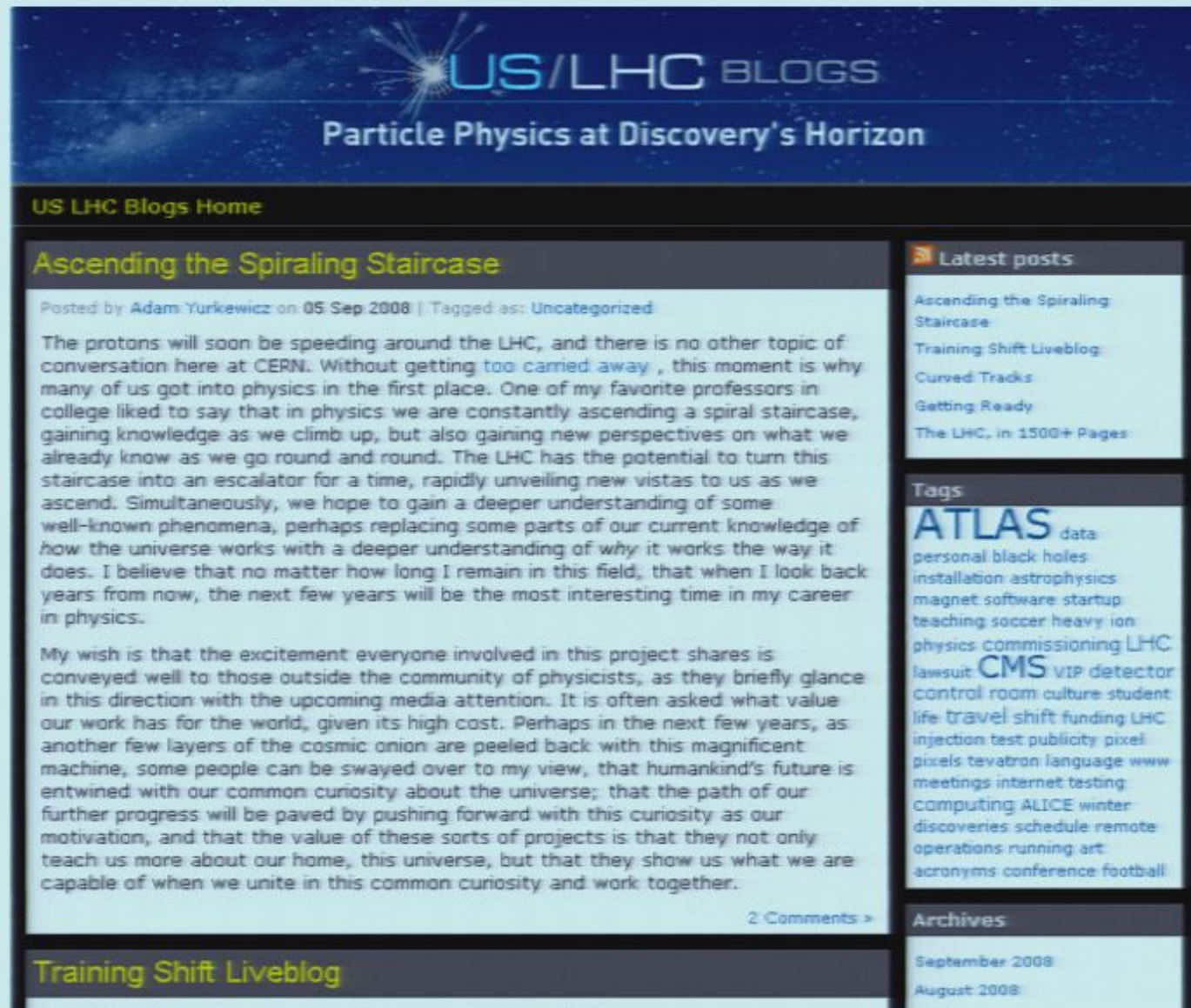
Institutional blogs
starting to appear

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Mostly high-energy
physics

Learned from SSC



The screenshot shows the homepage of the US/LHC Blogs website. The header features the text "US/LHC BLOGS" and "Particle Physics at Discovery's Horizon". Below the header, there is a navigation bar with "US LHC Blogs Home". The main content area displays a blog post titled "Ascending the Spiraling Staircase" by Adam Yurkewicz, dated 05 Sep 2008. The post discusses the LHC project and the author's perspective on the future of physics. To the right of the post, there is a sidebar with "Latest posts" and "Tags". The "Latest posts" section lists several recent blog entries, including "Ascending the Spiraling Staircase", "Training Shift Liveblog", "Curved Tracks", "Getting Ready", and "The LHC, in 1500+ Pages". The "Tags" section lists various topics related to the LHC, such as "ATLAS", "CMS", "VIP detector", "control room culture", "student life", "travel shift", "funding LHC", "injection test", "publicity pixel", "pixels", "tevatron", "language", "www", "meetings", "internet", "testing", "computing", "ALICE", "winter", "discoveries", "schedule", "remote", "operations", "running", "art", "acronyms", "conference", and "football". At the bottom of the page, there is a "Training Shift Liveblog" section and an "Archives" section showing the months of September 2008 and August 2008.

US/LHC BLOGS
Particle Physics at Discovery's Horizon

US LHC Blogs Home

Ascending the Spiraling Staircase

Posted by Adam Yurkewicz on 05 Sep 2008 | Tagged as: Uncategorized

The protons will soon be speeding around the LHC, and there is no other topic of conversation here at CERN. Without getting [too carried away](#), this moment is why many of us got into physics in the first place. One of my favorite professors in college liked to say that in physics we are constantly ascending a spiral staircase, gaining knowledge as we climb up, but also gaining new perspectives on what we already know as we go round and round. The LHC has the potential to turn this staircase into an escalator for a time, rapidly unveiling new vistas to us as we ascend. Simultaneously, we hope to gain a deeper understanding of some well-known phenomena, perhaps replacing some parts of our current knowledge of how the universe works with a deeper understanding of why it works the way it does. I believe that no matter how long I remain in this field, that when I look back years from now, the next few years will be the most interesting time in my career in physics.

My wish is that the excitement everyone involved in this project shares is conveyed well to those outside the community of physicists, as they briefly glance in this direction with the upcoming media attention. It is often asked what value our work has for the world, given its high cost. Perhaps in the next few years, as another few layers of the cosmic onion are peeled back with this magnificent machine, some people can be swayed over to my view, that humankind's future is entwined with our common curiosity about the universe; that the path of our further progress will be paved by pushing forward with this curiosity as our motivation, and that the value of these sorts of projects is that they not only teach us more about our home, this universe, but that they show us what we are capable of when we unite in this common curiosity and work together.

2 Comments >

Training Shift Liveblog

Latest posts

- Ascending the Spiraling Staircase
- Training Shift Liveblog
- Curved Tracks
- Getting Ready
- The LHC, in 1500+ Pages

Tags

ATLAS data personal black holes installation astrophysics magnet software startup teaching soccer heavy ion physics commissioning LHC lawsuit CMS VIP detector control room culture student life travel shift funding LHC injection test publicity pixel pixels tevatron language www meetings internet testing computing ALICE winter discoveries schedule remote operations running art acronyms conference football

Archives

- September 2008
- August 2008

Physics Buzz

Physics Central blog

APS outreach program

General-interest physics
news stories

Professional groups
starting to catch on

Still more to be done

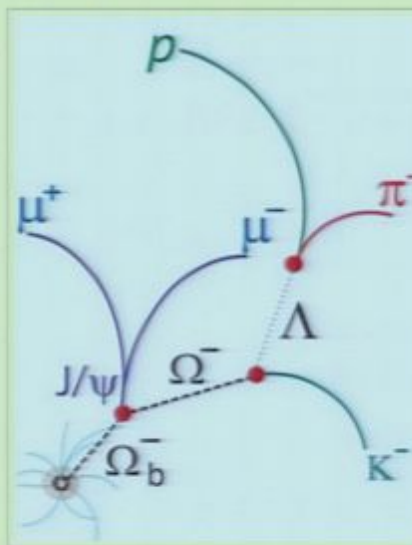
Physics Buzz

Physics Fun and Science News. Socks Optional.

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FRIDAY, SEPTEMBER 05, 2008

Quarky New Particle.



Particle physics is notorious for its funny-sounding jargon, and "quark" is no exception.


Physicists at Fermi National Accelerator Laboratory have discovered a new particle, Omega-sub-b. The particle is made of three quarks (two strange quarks and one bottom quark).

Quarks are fundamental particles that join

together in different combinations to make more familiar particles like protons and neutrons. Omega-sub-b is about six times heavier than the mass of a proton. It was discovered by Fermilab's DZero experiment, using the tevatron particle collider.

Quarks are gregarious, they're always found in combination with other quarks and never alone. As you can imagine, this makes obtaining

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Feeds

-  [Atom Feed](#)

Conclusions

Public understanding, support for science shaky

Feast-or-famine funding instability

Academic culture does not reward public outreach

Technical, “Newtonian” publication preferred

Claim: Need more outreach to build constituency for science

“Galileian” publication

Claim: Web logs offer a powerful tool for public outreach

Training ground for future Galileians