La emergencia de la Ciencia Ciudadana

Luis A. Núñez

Escuela de Física - Facultad de Ciencias

Universidad Industrial de Santander

La Agenda para este coloquio

- El Contexto (económico) de una nueva era en la manera como producimos conocimiento
- La comunicación científica como motor de la relaciones investigador/investigador e investigador/sociedad
- Participación ciudadana en la producción de conocimiento
- PolyMath un ejemplo de inteligencia colectiva
- Sloan Digital Sky Survey y Galaxy Zoo, ejemplos de participación ciudadana

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Nuevos Paradigmas, Nuevas Realidades, Una Revolución Informacional.

★ **Nuevo modo de producción Capitalista**
- ***Cambio de los procesos implica cambios más allá de las TIC***
- ***De la Economía Industrial a la Economía Informacional***
- ***De los bienes materiales a los Servicios***
- ***El Conocimiento como Materia Prima para Producir nuevo Conocimiento***

★ **La Economía Informacional**

- ***Global: Procesos de Escala Mundial en Tiempo Real.***
- ***Las economías nacionales se convierten en estrategia nacional.***
- ***Funciona en Red interdependiente***
- ***Requiere RR.HH. Altamente capacitados y creativos***

★ **Nueva Cultura Científica e-Investigación**

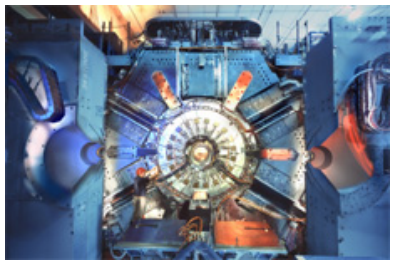
- ***Teoría - Experimentos - Simulación***
- ***Multidisciplinaria & Colaboración Remota***
- ***Data intensiva vs Cómputo Intensiva***
- ***Medición y Minería de Datos.***
- ***Nueva forma de Comunicación: preservación-diseminación del Conocimiento***

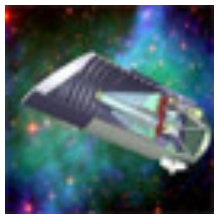
Ciencia/Arte, Ciencia Industrial, e-Ciencia/Ciencia 2.0

- **Ciencia Arte:** Esfuerzo, ingenio y destrezas personales

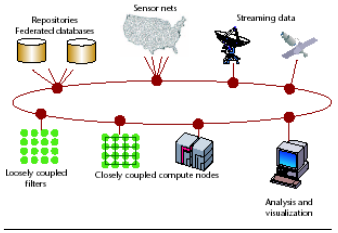


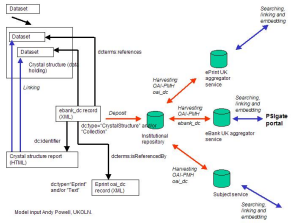
- **Ciencia Industrial:** Esfuerzo Colectivo, destrezas e ingenio tecnológico

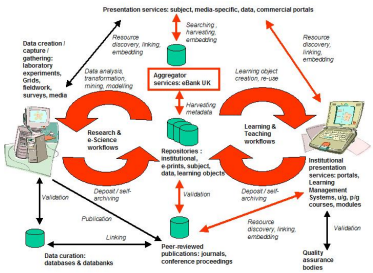



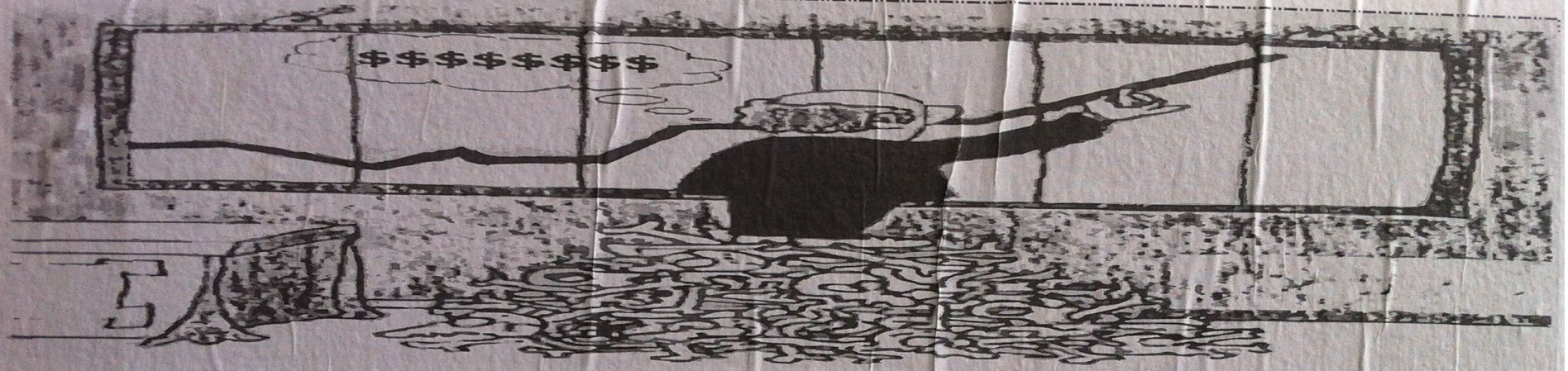


- **e-Investigación/Ciencia 2.0:** Esfuerzo Global, destrezas e ingenio informacional





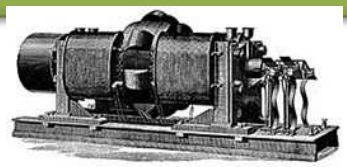




No queremos cátedras de Ciencias donde los tecnócratas cientifistas mienten que los esquemas de la física, la química, la biología y las matemáticas son herramientas suficientes para construir un mundo moderno, ignorando estructuras sociales que las hacen estériles. No queremos laboratorios donde enajenados (vendidos) especialistas investiguen micromundos para cubrir las necesidades subsidiarias de los planes de investigación de las metrópolis, mientras la industria nacional se desangra en regalías.

Tomado de: "Lo que queremos los estudiantes", por los estudiantes de la Universidad Nacional de Tucumán, Argentina -1969

Distribución y penetración de la electricidad en nuestras vidas replica el proceso de distribución y penetración de las TIC



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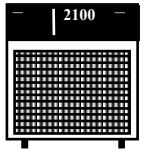
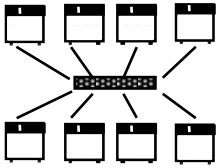


Cluster Paralelo local



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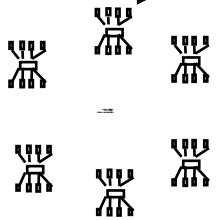

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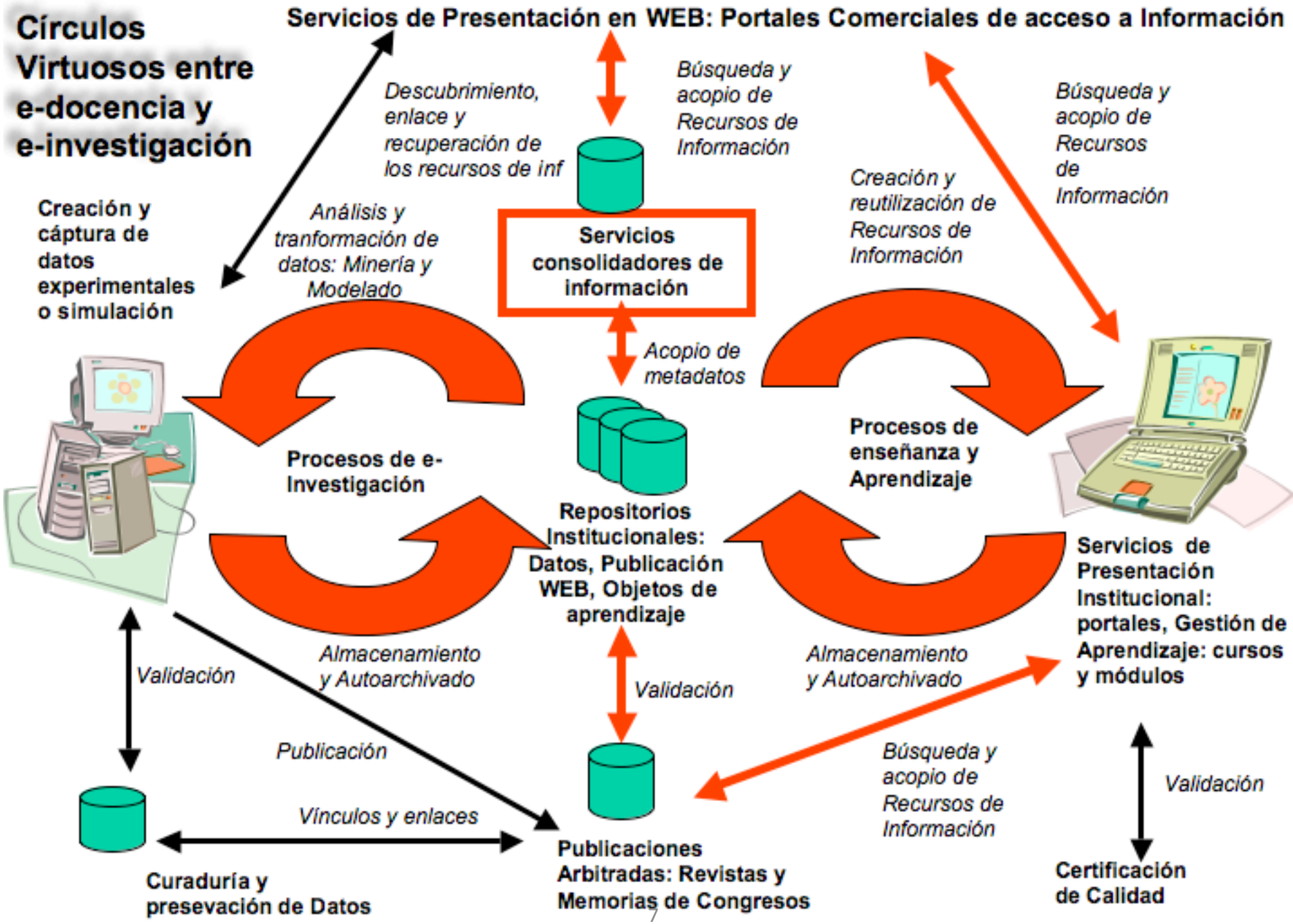

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General Relativity and Quantum Cosmology

Nonlocal Equation of State in Anisotropic Static Fluid Spheres in General Relativity

H. Hernandez, L.A. Nunez

(Submitted on 6 Jul 2001 (v1), last revised 1 Apr 2002 (this version, v2))

We show that it is possible to obtain credible static anisotropic spherically symmetric matter configurations starting from known density profiles and satisfying a nonlocal equation of state. These particular types of equation of state describe, at a given point, the components of the corresponding energy-momentum tensor not only as a function at that point, but as a functional throughout the enclosed configuration. To establish the physical plausibility of the proposed family of solutions satisfying nonlocal equation of state, we study the constraints imposed by the junction and energy conditions on these bounded matter distributions.
We also show that it is possible to obtain physically plausible static anisotropic spherically symmetric matter configurations, having nonlocal equations of state\textit{,}concerning the particular cases where the radial pressure vanishes and, other where the tangential pressures vanishes. The later very particular type of relativistic sphere with vanishing tangential stresses is inspired by some of the models proposed to describe extremely magnetized neutron stars (magnetars) during the transverse quantum collapse.

Comments: 21 pages, 1 figure, minor changes in the text, references added, two new solutions studied
Subjects: **General Relativity and Quantum Cosmology (gr-qc)**
Journal reference: Can.J.Phys. 82 (2004) 29-51
Cite as: arXiv:gr-qc/0107025v2

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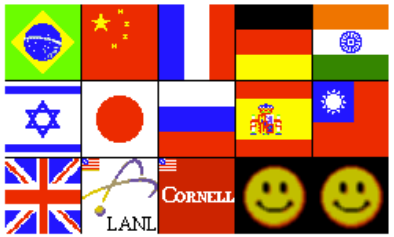

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Finite extinction time for the solutions to the Ricci flow on certain three-manifolds

Grisha Perelman

(Submitted on 17 Jul 2003)

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any initial riemannian metric on M the solution to the Ri
math.DG/0303109, becomes extinct in finite time. The
by Richard Hamilton, and a regularization of the curve s

Comments: 7 pages
Subjects: **Differential Geometry (math.DG)**
MSC classes: 53C
Cite as: **arXiv:math/0307245v1 [math.DG]**

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what happens far away. We also verify several
geometrization conjecture for closed three-ma
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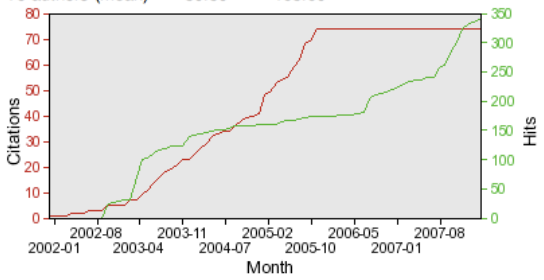

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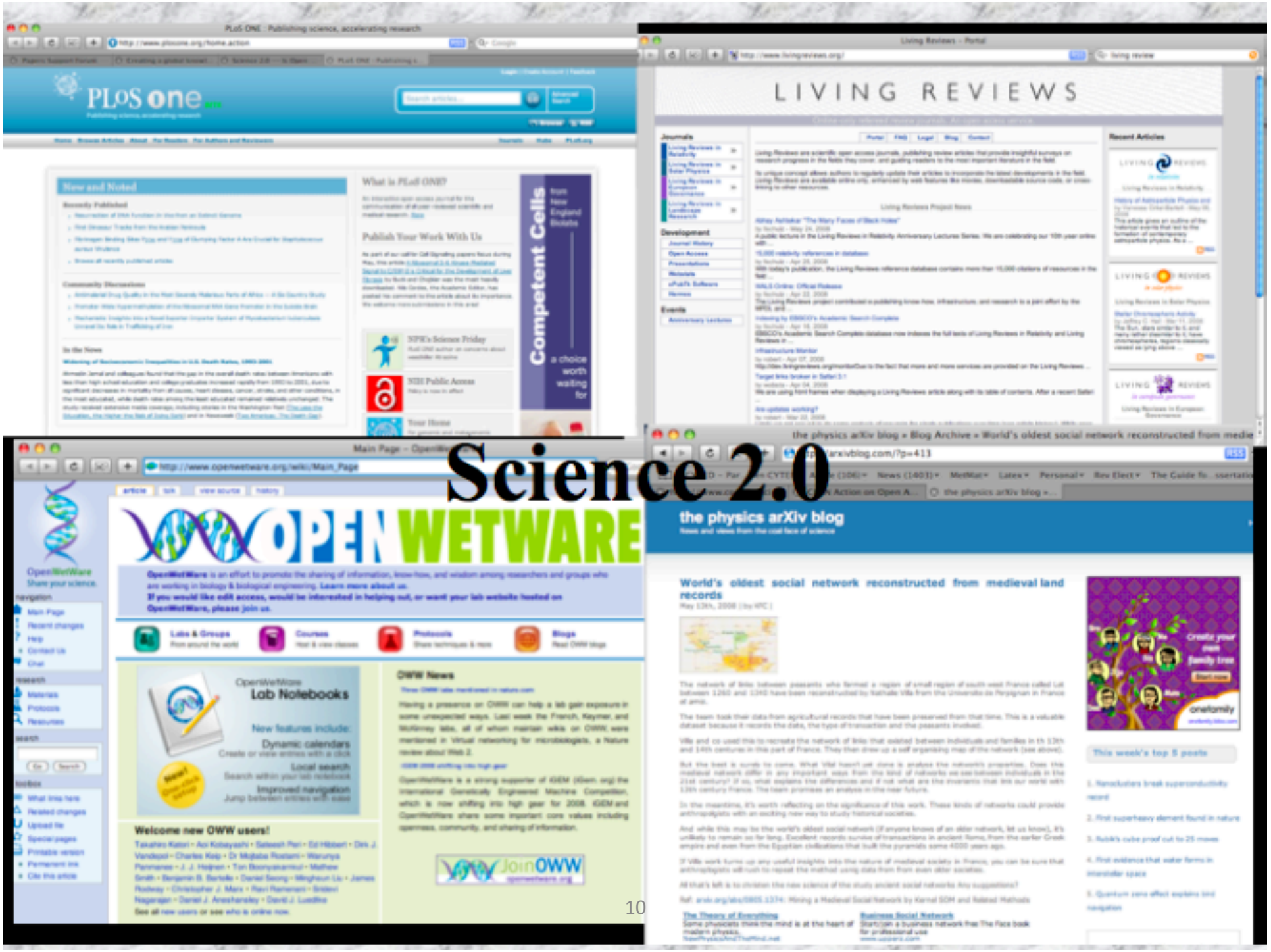
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In this week PLoS ONE media digest: feathered dinosaurs, living next to highways is bad for blood vessels, removing badgers does not remove cattle tuberculosis, a an drink and fly.
Extent of the Preserved Feathers on the Four-Winged Dinosaur Microraptor gui nder Ultraviolet Light by David Hone, Helmut Tischlinger, Xing Xu and Fucheng Zhang was published yesterday and is already garnering great press. David Hone, the lead author of the article, has written a blog post on Archosaur Musings blog about the findings. So did Andrew Farke, the academic editor who handled this manuscript, on The Open Source Paleontologist. You can read the interview with David Hone on Dinochick Blogs, and additional coverage on Smithsonian's Dinosaur Tracking and Dracovenator.
Ambient Air Pollution and the Progression of Atherosclerosis in Adults by Künzli and colleagues is the first study to demonstrate an association with air polution and the development of atherosclerosis in humans. The study was broadly covered in the media, including in Los Angeles Times, Orange County Register, CBS
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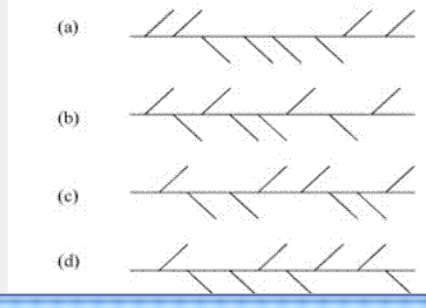
Mathematician solves rowing boat "wiggle" problem

A mathematician has discovered two entirely new arrangements of rowers in a racing Eight in which the transverse forces cancel out, making the boat wiggle-free



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How to set up a science blog

Damian Carrington

30 September 2008 | EN | 中文

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- What to blog on — and how?
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- Getting a readership
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Science blogs let you share your passion and expertise with the widest possible audience. *Damian Carrington* shows it's easy to get started.

The World Wide Web has changed the world by providing the cheapest information sharing network ever seen. And the development of blogging software, now powerful and free to use, allows anyone to share their thoughts instantly with anyone else in the world with an Internet connection.

That personal link is at the heart of blogging. The very word blog comes from

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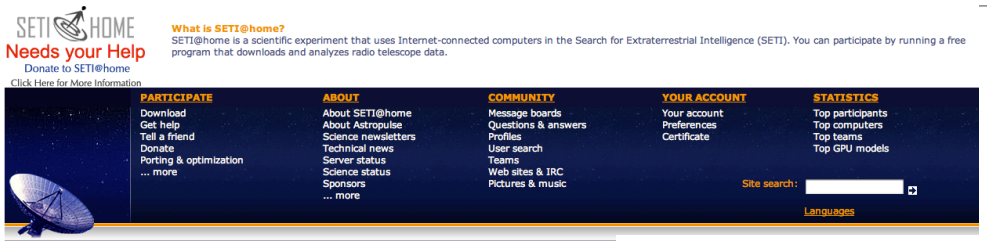

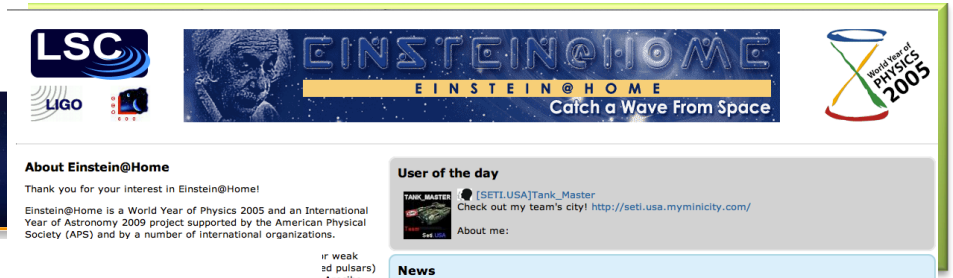

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Thank you for your interest in Einstein@Home!

Einstein@Home is a World Year of Physics 2005 and an International Year of Astronomy 2009 project supported by the American Physical Society (APS) and by a number of international organizations.

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News

Three new pulsars found in Parkes Multi-Beam Pulsar Survey (PMPS) data!
Einstein@Home volunteers have discovered three more new radio pulsars in data from the Parkes Multi-Beam Pulsar Survey (PMPS). Congratulations to:

- Rolf Schuster, Neu-Isenburg, Germany
- Rudzik Bogusław Sobczak, Krakow, Poland
- Sirko Rosenberg, Bautzen, Germany
- Steve Mellor, Perth WA, Australia
- Ton van Born, Amsterdam, the Netherlands
- Darren Chase, Adelaide, South Australia

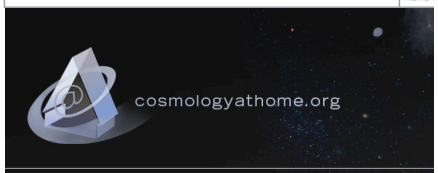
Further details about these new discoveries can be found on this web page and will be published in due course. These discoveries bring the Einstein@Home discovery total to 9 new radio pulsars in the first two months of 2012!

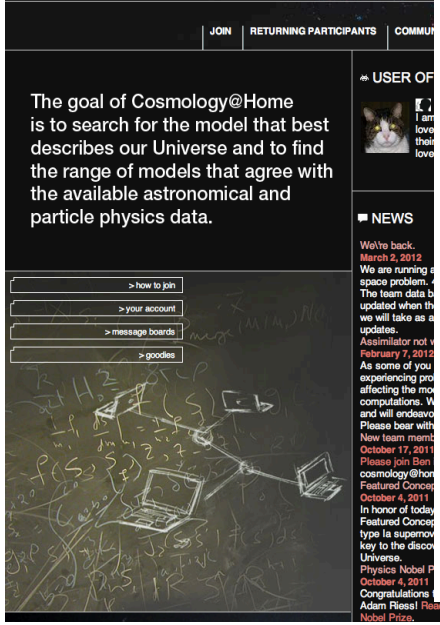
Bruce Allen
Director, Einstein@Home
1 Mar 2012 13:04:59 UTC · Comment

Three more pulsars confirmed in Arecibo data!
Einstein@Home volunteers have discovered **three new radio pulsars** -- the 11'th, 12'th, and 13'th new radio pulsars found by our volunteers in Arecibo data. Six of these pulsars have been discovered in 2012: almost one per week! Congratulations to:

- Gerald Schrader, San Diego, California, USA
- Uwe Tittmar, Kressbronn, Germany
- Thomas Herdtle, St. Paul, Minnesota, USA
- Zsolt Szvoboda, Szentendre, Hungary
- Carat@voice, Ichikawa City, Japan
- Rensk, Switzerland

Further details are available on this web page, and will be published in due course.





About MilkyWay@Home

Milkyway@Home uses the BOINC platform to harness volunteered computing resources, creating a highly accurate three dimensional model of the Milky Way galaxy using data gathered by the Sloan Digital Sky Survey. This project enables research in both astroinformatics and computer science.

In computer science, the project is investigating different optimization methods which are resilient to the fault-prone, heterogeneous and asynchronous nature of Internet computing; such as evolutionary and genetic algorithms, as well as asynchronous newton methods. While in astroinformatics, Milkyway@Home is generating highly accurate three dimensional models of the Sagittarius stream, which provides knowledge about how the Milky Way galaxy was formed and how tidal tails are created when galaxies merge.

Milkyway@Home is a joint effort between Rensselaer Polytechnic Institute's departments of Computer Science and Physics, Applied Physics and Astronomy. Feel free to contact us via our forums, or email astro [at] cs [dot] rpi [dot] edu.

Join MilkyWay@Home

- Read our rules and policies
- This project uses BOINC. If you're already running BOINC, select Attach to Project. If not, download BOINC.
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google.org Flu Trends

Language: English (United States)

Google.org home

Flu Trends

Home

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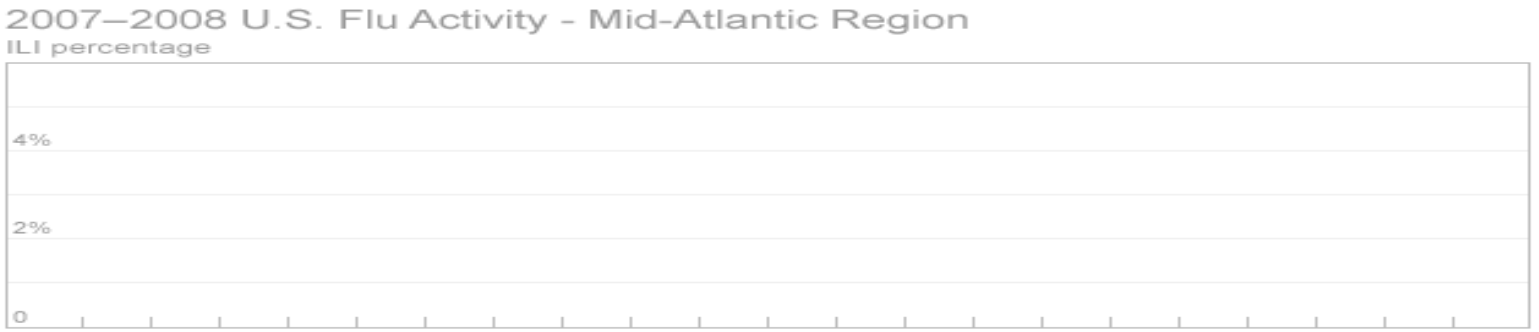
How does this work?

FAQ

http://www.google.org/flutrends/about/how.html

How does this work?

We've found that certain search terms are good indicators of flu activity. Google Flu Trends uses aggregated Google search data to estimate current flu activity around the world in near real-time.



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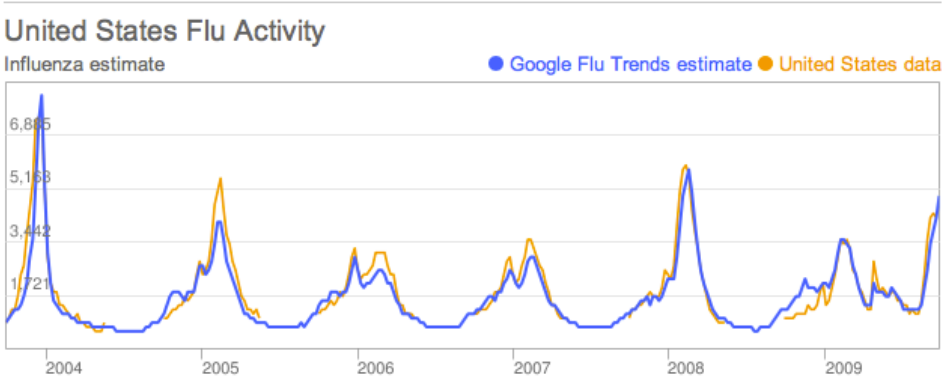
Each week, millions of users around the world search for health information online. As you might expect, there are more flu-related searches during flu season, more allergy-related searches during allergy season, and more sunburn-related searches during the summer. You can explore all of these phenomena using Google Insights for Search. But can search query trends provide the basis for an accurate, reliable model of real-world phenomena?

We have found a close relationship between how many people search for flu-related topics and how many people actually have flu symptoms. Of course, not every person who searches for "flu" is actually sick, but a pattern emerges when all the flu-related search queries are added together. We compared our query counts with traditional flu surveillance systems and found that many search queries tend to be popular exactly when flu season is happening. By counting how often we see these search queries, we can estimate how much flu is circulating in different countries and regions around the world. Our results have been published in

Historical estimates See data for: United States



United States: Influenza-like illness (ILI) data provided publicly by the U.S. Centers for Disease Control.


nature International weekly journal of science

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nature.com > Journal home > Table of Contents

Letter

Nature **457**, 1012-1014 (19 February 2009) | doi:10.1038/nature07634; Received 14 August 2008; Accepted 13 November 2008; Published online 19 November 2008; Corrected 19 February 2009

Detecting influenza epidemics using search engine query data

Jeremy Ginsberg[1], Matthew H. Mohebbi[1], Rajan S. Patel[1], Lynnette Brammer[2], Mark S. Smolinski[1] & Larry Brilliant[1]

1. Google Inc., 1600 Amphitheatre Parkway, Mountain View, California 94043, USA
2. Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, Georgia 30333, USA

Correspondence to: Matthew H. Mohebbi[1] Correspondence and requests for materials should be addressed to J.G. or M.H.M. (Email: flutrends-support@google.com).

Seasonal influenza epidemics are a major public health concern, causing tens of millions of respiratory illnesses and 250,000 to 500,000 deaths worldwide each year[1]. In addition to seasonal influenza, a new strain of influenza virus against which no previous immunity exists and that demonstrates human-to-human transmission could result in a pandemic with millions of fatalities[2]. Early detection of disease activity, when followed by a rapid response, can reduce the impact of both seasonal and pandemic influenza[3–5]. One way to improve early detection is to monitor health-seeking behaviour in the form of queries to online search engines, which are submitted by millions of users around the world each day. Here we present a method of analysing large numbers of Google search queries to track influenza-like illness in a population. Because the relative frequency of certain queries is highly correlated with the percentage of physician visits in which a patient presents with influenza-like symptoms, we can accurately estimate the current level of weekly influenza activity in each region of the United States, with a reporting lag of about one day. This approach may make it possible to use search queries to detect influenza epidemics in areas with a large population of web search users.

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NQ: The possibility of

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March 2012 >>						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24

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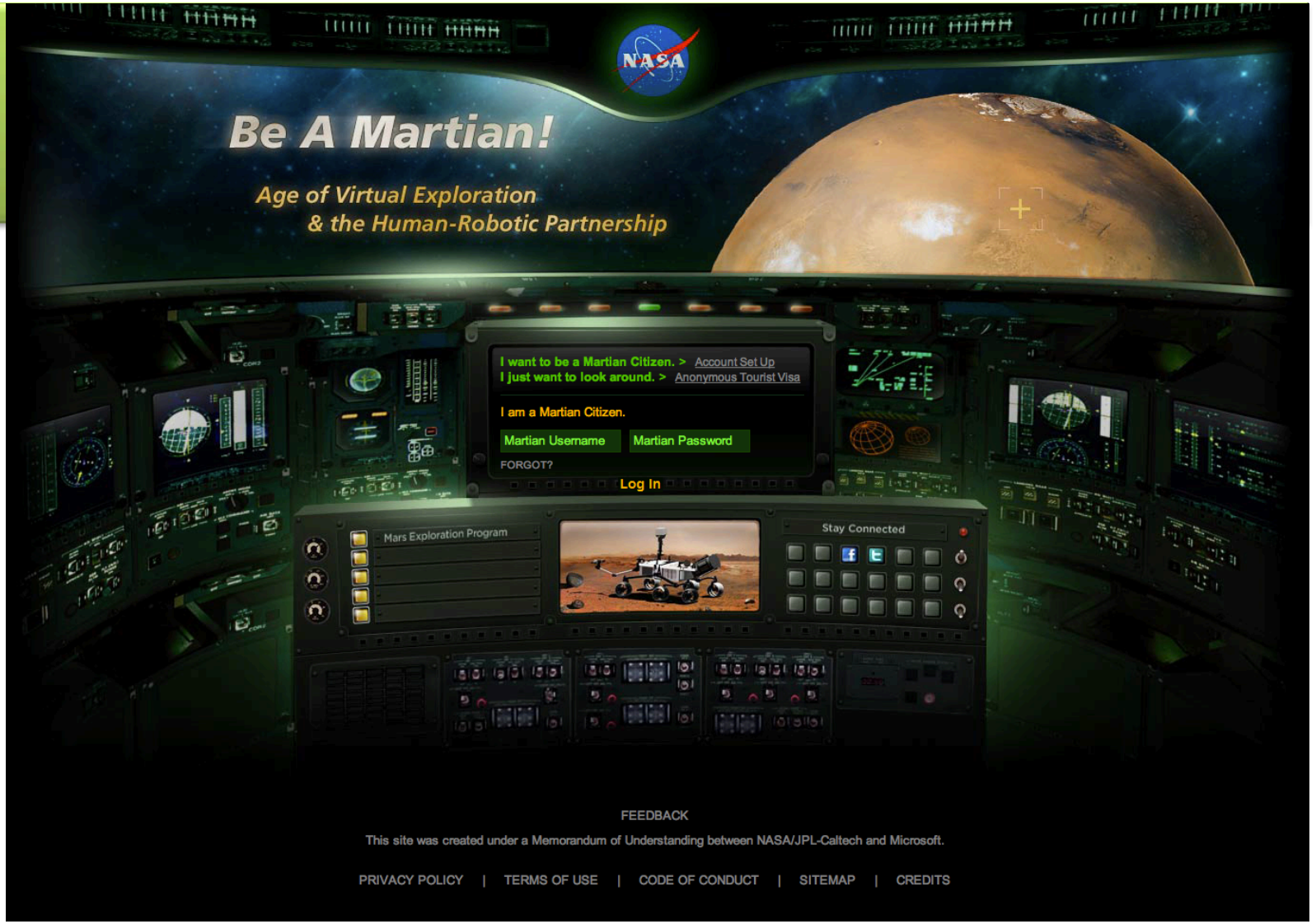

One game asks people to count craters in photos of Mars; the other asks people to match small, high-res photos of the Martian surface with their corresponding locations on a low-res photo taken from a higher altitude

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http://fold.it/portal/

nature International weekly journal of science

NATURE | NEWS

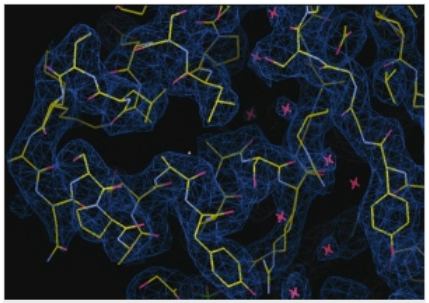
Victory for crowdsourced biomolecule design

Players of the online game Foldit guide researchers to a better enzyme.

Jessica Marshall

22 January 2012

Obsessive gamers' hours at the computer have now topped scientists' efforts to improve a model enzyme, in what researchers say is the first crowdsourced redesign of a protein.



An enzyme designed by players of the protein-folding game Foldit was better than anything scientists could come up with.

The online game Foldit, developed by teams led by Zoran Popovic, director of the Center for Game Science, and biochemist David Baker, both at the University of Washington in Seattle, allows players to fiddle at folding proteins on their home computers in search of the best-scoring (lowest-energy) configurations.

The researchers have previously reported successes by Foldit players in folding proteins[1], but the latest work moves into the realm of protein design, a more open-ended problem. By posing a series of puzzles to Foldit players and then testing variations on the players' best designs in the lab, researchers have created an enzyme with more than 18-fold higher activity than the original. The work is published today in *Nature Biotechnology*[2].

"I worked for two years to make these enzymes better and I couldn't do it," says Justin Siegel, a post-doctoral researcher working in biophysics in Baker's group. "Foldit players were able to make a large jump in structural space and I still don't fully understand how they did it."

The project has progressed from volunteers donating their computers' spare processing power for protein-structure research, to actively predicting protein structures, and now to designing new proteins. The game has 240,000 registered players, 2,200 of whom were active last week.

The project has progressed from volunteers donating their computers' spare processing power for protein-structure research, to actively predicting protein structures, and now to designing new proteins. The game has 240,000 registered players, 2,200 of whom were active last week.

fold it BETA 07:09:25 GMT
Solve Puzzles for Science

BLOG | PUZZLES | FEEDBACK | GROUPS | FORUM | PLAYERS | WIKI | RECIPES | FAQ | CONTESTS | ABOUT | CREDITS

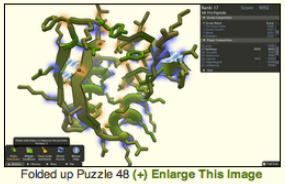
The Science Behind Foldit

Foldit is a revolutionary new computer game enabling *you* to contribute to important scientific research. This page describes the science behind Foldit and how your playing can help.

Page Contents:
- What is protein folding?
- Why is this game important?
- Foldit Scientific Publications
- News Articles about Foldit
- News Articles about Rosetta
- Rosetta@Home Screensaver
- Community Guidelines

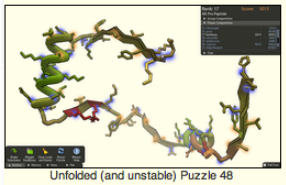
What is protein folding?

What is a protein? Proteins are the workhorses in every cell of every living thing. Your body is made up of trillions of cells, of all different kinds: muscle cells, brain cells, blood cells, and more. Inside those cells, proteins are allowing your body to do what it does: break down food to power your muscles, send signals through your brain that control the body, and transport nutrients through your blood. Proteins come in thousands of different varieties, but they all have a lot in common. For instance, they're made of the same stuff: every protein consists of a long chain of joined-together amino acids.



Folded up Puzzle 48 (+) Enlarge This Image

What are amino acids? Amino acids are small molecules made up of atoms of carbon, oxygen, nitrogen, sulfur, and hydrogen. To make a protein, the amino acids are joined in an unbranched chain, like a line of people holding hands. Just as the line of people has their legs and feet "hanging" off the chain, each amino acid has a small group of atoms (called a sidechain) sticking off the main chain (backbone) that connects them all together. There are 20 different kinds of amino acids, which differ from one another based on what atoms are in their sidechains. These 20 amino acids fall into different groups based on their chemical properties: acidic or alkaline, hydrophilic (water-loving) or hydrophobic (greasy).



Unfolded (and unstable) Puzzle 48
(+) Enlarge This Image

What shape will a protein fold into? Even though proteins are just a long chain of amino acids, they don't like to stay stretched out in a straight line. The protein folds up to make a compact blob, but as it does, it keeps some amino acids near the center of the blob, and others outside; and it keeps some pairs of amino acids close together and others far apart. Every kind of protein folds up into a very specific shape -- the same shape every time. Most proteins do this all by themselves, although some need extra help to fold into the right shape. The unique shape of a particular protein is the most stable state it can adopt. Picture a ball at the top of a hill -- the ball

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Timo van&n... 101 56	524: Symmetry C...zle	15,103
Bletchley Park 4 21	523: CASP ROLL ...10	10,020
grabhorn 113 46	Bonus Symmetry ...zle	17,993
tokens 130 49	Beginner Puzzle...ein	10,202
kumori 203 1225	Beginner Puzzle...ein	9,886
JackWeaver 203 844	Beginner Puzzle...ein	10,067

FULL

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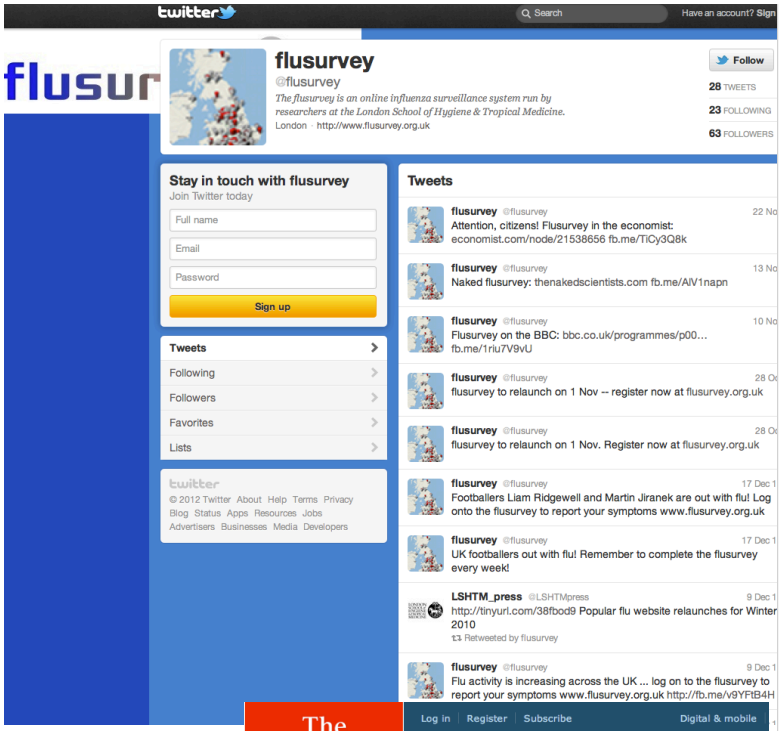
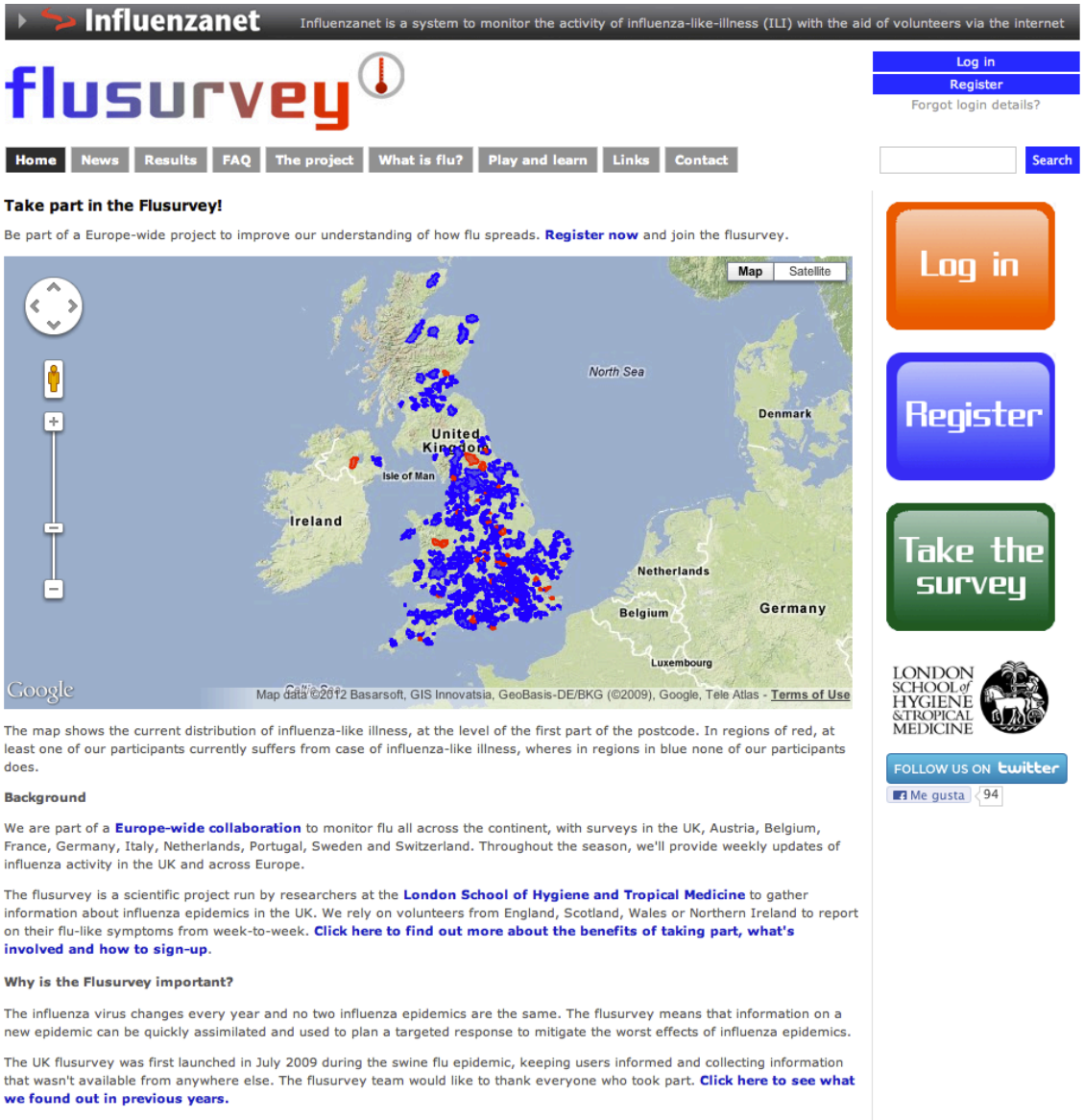
Foldit en Facebook
Me gusta 10,075

TOP NEW USERS
- AlexSun





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Sus denuncias se ven en Vanguardia.com

The School of Ants project is a citizen-scientist driven study of the ants that live in urban areas, particularly around homes and schools. Participation is open to anyone interested in contributing…..
The maps that we create with these data are telling us quite a lot about native and introduced ants in cities, not just here in North Carolina, but across the United States and, as this project grows, about the ants of the world! I

http://schoolofants.org/

http://www.innocentive.com/

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The Economist-InnoCentive Smart Systems Challenge — See details
Deadline: 03/17/2012 | 496 active solvers | Referral award: See details

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CITIZEN SCIENCE ALLIANCE

Home Partners Structure Projects Philosophy Proposals Join

The first call for proposals has been announced. Next selection round February 2012 - click here to get started

" The **CSA** is a collaboration of scientists, software developers and educators who collectively develop, manage and utilise **internet-based citizen science projects** in order to further science itself, and the public understanding of both science and of the scientific process. These projects use the time, abilities and energies of a **distributed community** of citizen scientists who are our collaborators "

On this site you can find out who we are, how we're organised and read about our Projects and about the philosophy behind them. You can also find out how you or your institution can get involved.

If you're looking to take part as a citizen scientist you can find our collection of projects over at the Zooniverse.

If your research could benefit from a citizen science project, find out how you can submit a project Proposal.

- http://www.citizensciencealliance.org/
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Our Web page provides the ability for our observers to see their observations mapped out in "real time", as well as providing a wealth of information for our data users.

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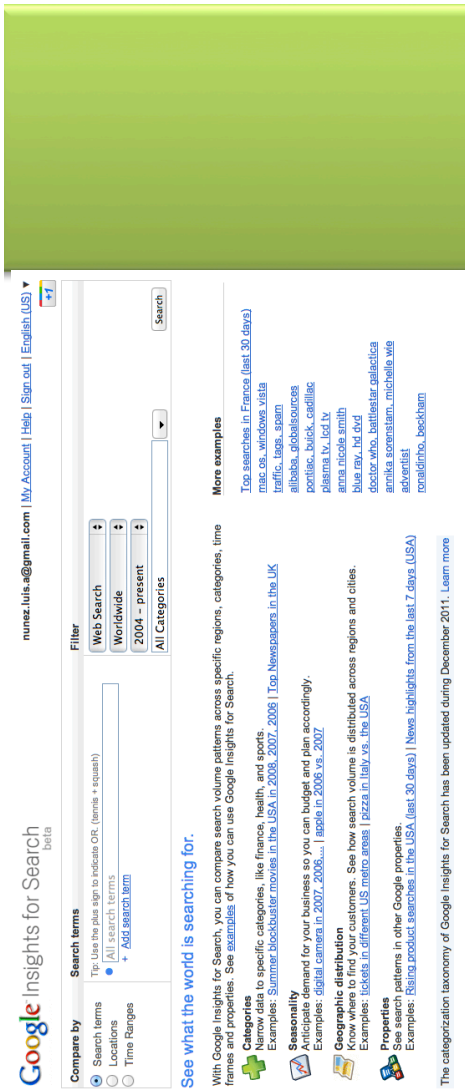

Web Search Interest: citizen science

Worldwide, 2004 - present

Categories: Science (10-25%), Jobs & Education (0-10%), Law & Government (0-10%) , more...

⚠ The categorization taxonomy of Google Insights for Search has been updated during December 2011. Learn more

⚠ An improvement to our geographical assignment was applied retroactively from 1/1/2011. Learn more

Totals

citizen science	56

Interest over time

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Google Embed this chart

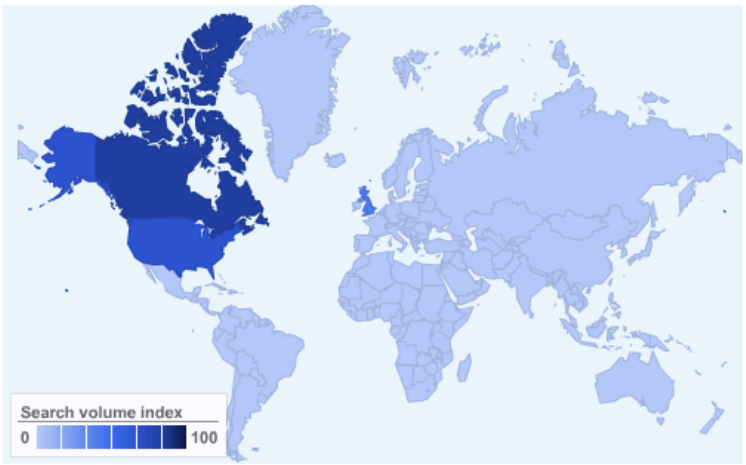
See worldwide top rising searches by clearing the search terms

A Citizen science goes 'extreme'
B Divers volunteer for 'citizen science'
C Citizen Science Takes Off: Could Community Labs Hatch the Next Generation of Bio Innovators?
D Pennsylvania DCNR Unveils New Twist on CSI: Citizen Science Investigators
E Citizen science: Armies of volunteers aid research
F Citizen Science Projects
G La forza della Citizen Science Quando ...

Regional interest

Region City

1.	Canada	100
2.	United States	80
3.	United Kingdom	49



View change over time

Search terms

Top searches

1.	citizen science projects	100
2.	citizen science project	70
3.	cornell citizen science	50
4.	citizen science canada	50
5.	citizen science program	45

Rising searches

1.	citizen science canada	Breakout
2.	citizen science program	Breakout
3.	citizen science project	Breakout
4.	citizen science projects	Breakout
5.	cornell citizen science	Breakout

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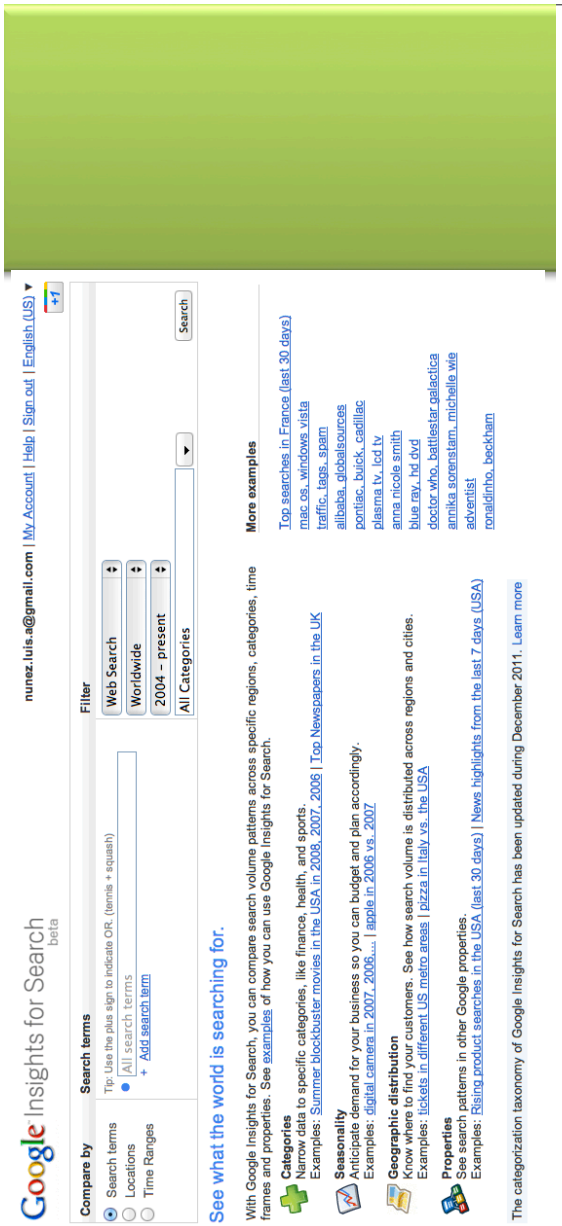

Web Search Interest: crowdsource

Worldwide, 2004 - present

Categories: Business & Industrial (25-50%), Internet & Telecom (0-10%) , more...

⚠ The categorization taxonomy of Google Insights for Search has been updated during December 2011. Learn more

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Totals

crowdsource	29

Interest over time

☑ Forecast ☑ News headlines

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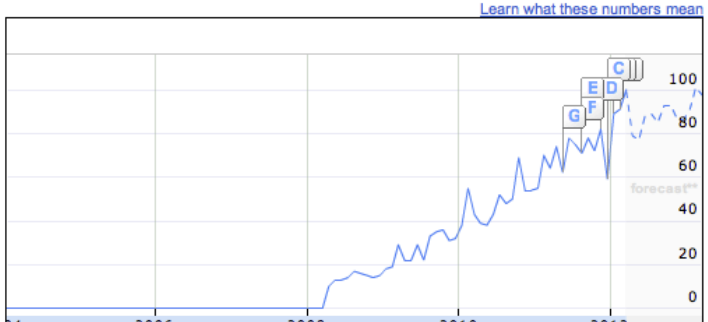

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Google Embed this chart

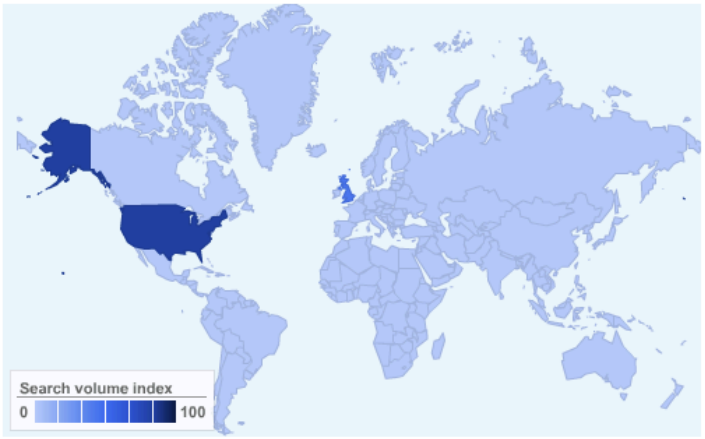
See worldwide top rising searches by clearing the search terms

- A Daily CrowdSource Names CrowdSource a Company to Watch
- B CrowdSource, LLC Launches Write.com
- C Irreverent atheists crowdsource charitable giving
- D CrowdSource to Partner with Amazon on Webinar Presentation
- E CrowdSource, LLC Announces Addition of "Worker Profiles" to the Scalable Workforce Platform.
- F CrowdSource, LLC Launches as a Major Competitor in the Crowdsourcing Industry
- G Scalable Workforce, LLC Announces the Acquisition of Crowdsource.com

Regional interest

Region City

1.	United States	100
2.	United Kingdom	52



View change over time

Search terms

Top searches

1.	crowdsourcing	100
2.	crowdsource design	80
3.	crowdsource logo	60
4.	crowd source	40
5.	logo design crowdsource	35
6.	how to crowdsource	25
7.	crowdsource funding	25

Rising searches

1.	crowd source	Breakout
2.	crowdsource design	Breakout
3.	crowdsource funding	Breakout
4.	crowdsource logo	Breakout
5.	crowdsourcing	Breakout
6.	how to crowdsource	Breakout
7.	logo design crowdsource	Breakout

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PolyMath

El Proyecto Polymath

http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

- 1991-1995 Department of Mathematics at University College London.
- In 1996Prize of the European Mathematical Society
- 1998 the Fields Medal for research on functional analysis and combinatorics.

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Gowers's Weblog

Mathematics related discussions

« A Tricki issue Background to a Polymath project »

Is massively collaborative mathematics possible?

Of course, one might say, there are certain kinds of problems that lend themselves to huge collaborations. One has only to think of the proof of the classification of finite simple groups, or of a rather different kind of example such as a search for a new largest prime carried out during the downtime of thousands of PCs around the world. But my question is a different one. What about the solving of a problem that does not naturally split up into a vast number of subtasks? Are such problems best tackled by n people for some n that belongs to the set $\{1, 2, 3\}$? (Examples of famous papers with four authors do not count as an interesting answer to this question.)

It seems to me that, at least in theory, a different model could work: different, that is, from the usual model of people working in isolation or collaborating with one or two others. Suppose one had a forum (in the non-technical sense, but quite possibly in the technical sense as well) for the online discussion of a particular problem. The idea would be that anybody who had anything whatsoever to say about the problem could chip in. And the ethos of the forum — in whatever form it took — would be that comments would mostly be kept short. In other words, what you would *not* tend to do, at least if you wanted to keep within the spirit of things, is spend a month thinking hard about the problem and then come back and write ten pages about it. Rather, you would contribute ideas even if they were undeveloped and/or

Hales–Jewett theorem

From Wikipedia, the free encyclopedia

In mathematics, the **Hales–Jewett theorem** is a fundamental combinatorial result of Ramsey theory, concerning the degree to which high-dimensional objects must necessarily exhibit some combinatorial structure; it is impossible for such objects to be "completely random".[1]

An informal geometric statement of the theorem is that for any positive integers n and c there is a number H such that if the cells of a H-dimensional $n \times n \times n \times \ldots \times n$ cube are colored with c colors, there must be one row, column, diagonal etc. of length n all of whose cells are the same color. In other words, the higher-dimensional, multi-player, n-in-a-row generalization of game of tic-tac-toe cannot end in a draw, no matter how large n is, no matter how many people c are playing, and no matter which player plays each turn, provided only that it is played on a board of sufficiently high dimension H. By a standard strategy stealing argument, one can thus conclude that if two players alternate, then the first player has a winning strategy when H is sufficiently large, though no constructive algorithm for obtaining this strategy is known.

More formally, let W_n^H be the set of words of length H over an alphabet with n letters; that is, the set of sequences of $\{1, 2, \ldots, n\}$ of length H. This set forms the hypercube that is the subject of the theorem. A *variable word* $w(x)$ over W_n^H still has length H but includes the special element x in place of at least one of the letters. The words $w(1)$, $w(2)$, ..., $w(n)$ obtained by replacing all instances of the special element x with 1, 2, ..., n, form a *combinatorial line* in the space W_n^H; combinatorial lines correspond to rows, columns, and (some of the) diagonals of the hypercube. The Hales–Jewett theorem then states that for given positive integers n and c, there exists a positive integer H, depending on n and c, such that for any partition of W_n^H into c parts, there is at least one part that contains an entire combinatorial line.

For example, take $n = 3$, $H = 2$, and $c = 2$. The hypercube W_n^H in this case is just the standard tic-tac-toe board, with nine positions:

11 12 13

21 22 23

31 32 33

A typical combinatorial line would be the word 2x, which corresponds to the line 21, 22, 23; another combinatorial line is xx, which is the line 11, 22, 33. (Note that the line 13, 22, 31, while a valid line for the game tic-tac-toe, is not considered a combinatorial line.) In this particular case, the Hales–Jewett theorem does not apply; it is possible to divide the tic-tac-toe board into two sets, e.g. {11, 22, 23, 31} and {12, 13, 21, 32, 33}, neither of which contain a combinatorial line (and would correspond to a draw in the game of tic-tac-toe). On the other hand, if we increase H to, say, 8 (so that the board is now eight-dimensional, with $3^8 = 6561$ positions!), and partition this board into two sets (the "noughts" and "crosses"), then one of the two sets must contain a combinatorial line (i.e. no draw is possible in this variant of tic-tac-toe). For a proof, see below.

Contents [hide]

Proof of Hales–Jewett theorem (in a special case) [edit]

We now prove the Hales–Jewett theorem in the special case $n = 3$, $c = 2$, $H = 8$ discussed above. The idea is to reduce this task to that of proving simpler versions of the Hales–Jewett theorem (in this particular case, to the cases $n = 2$, $c = 2$, $H = 2$ and $n = 2$, $c = 6$, $H = 6$). One can prove the general case of the Hales–Jewett theorem by similar methods, using mathematical induction.

Each element of the hypercube W_3^8 is a string of eight numbers from 1 to 3, e.g. 13211321 is an element of the hypercube. We are assuming that this hypercube is completely filled with "noughts" and "crosses". We shall use a proof by contradiction and assume that neither the set of noughts nor the set of crosses contains a combinatorial line. If we fix the first six elements of such a string and let the last two vary, we obtain an ordinary tic-tac-toe board, for instance 132113?? gives such a board. For each such board abcdef??, we consider the positions abcdef11, abcdef12, abcdef22. Each of these must be filled with either a nought or a cross, so by the pigeonhole principle two of them must be filled with the same symbol. Since any two of these positions are part of a combinatorial line, the third element of that line must be occupied by the opposite symbol (since we are assuming that no combinatorial line has all three elements filled with the same symbol). In other words, for each choice of abcdef (which can be thought of as an element of the six-dimensional hypercube W_3^6), there are

El Proyecto Polymath

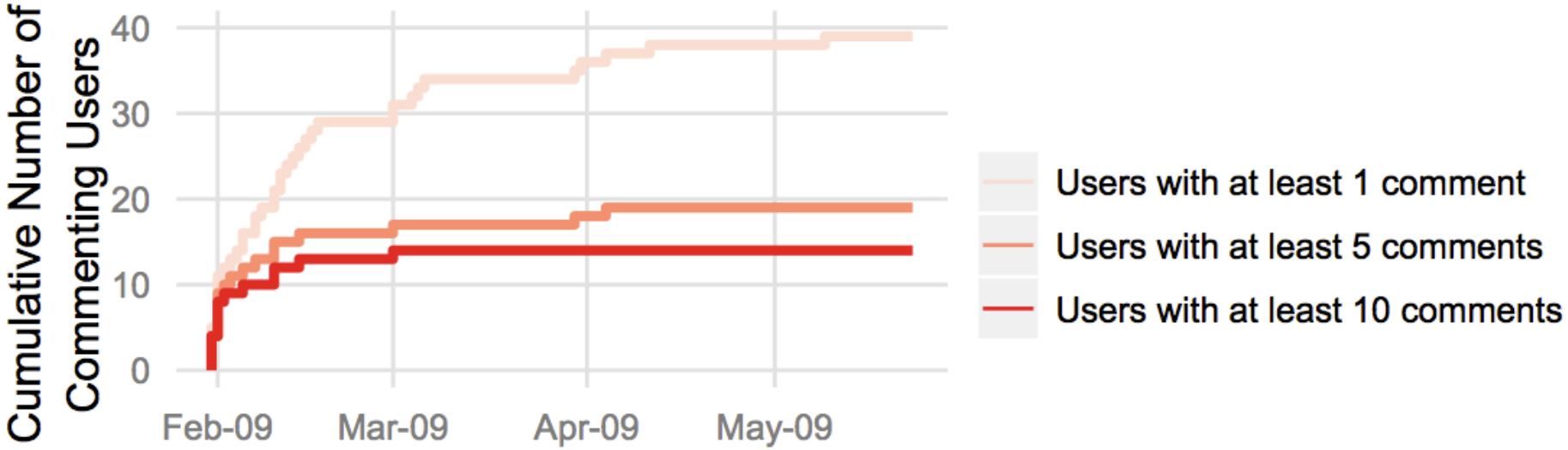
http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

- Se organizó un blog (http://polymathprojects.org/) y ese apoyó en un wiki (http://michaelnielsen.org/polymath1) para desarrollo de ideas y exponer material de consulta
- Se presentaron claramente las reglas del juego:
  - Incentivan el trabajo en grupo amplio:
    - "The ideal outcome would be a solution of the problem with no single individual having to think all that hard. The hard thought would be done by a sort of super-mathematician whose brain is distributed amongst bits of the brains of lots of interlinked people. So try to resist the temptation to go away and think about something and come back with carefully polished thoughts: just give quick reactions to what you read and hope that the conversation will develop in good directions."
    - "The aim will be to produce a proof in a top-down manner. Thus, at least to start with, comments should be short and not too technical: they would be more like feasibility studies of various ideas "
    - "Comments should be as easy to understand as is humanly possible. For a truly collaborative project it is not enough to have a good idea: you have to express it in such a way that others can build on it "
    - "Similarly, suppose that somebody has an imprecise idea and you think that you can write out a fully precise version. This could be extremely valuable to the project, but don't rush ahead and do it. First, announce in a comment what you think you can do. If the responses to your comment suggest that others would welcome a fully detailed proof of some substatement, then write a further comment with a fully motivated explanation of what it is you can prove, and give a link to a pdf file that contains the proof."
  - Obligan a el trato respetuoso
    - "If you can see why somebody else's comment is stupid, point it out in a polite way. And if someone points out that your comment is stupid, do not take offence: better to have had five stupid ideas than no ideas at all. And if somebody wrongly points out that your idea is stupid, it is even more important not to take offence: just explain gently why their dismissal of your idea is itself stupid."
    - "Don't actually use the word "stupid", except perhaps of yourself.".
  - Respetan la autoría intelectual colectiva
    - "Suppose the experiment actually results in something publishable. Even if only a very small number of people contribute the lion's share of the ideas, the paper will still be submitted under a collective pseudonym with a link to the entire online discussion "

El Proyecto Polymath

http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

- Se organizó la discusión en ideas/propuestas y comentarios. Puede haber varios "hilos" de discusión paralelos
- Cada propuesta tendrá un max 100 comentarios. Una vez alcanzado el máximo, se resumen este hilo de discusión
- A pesar de lo técnico de la discusión, se tiene particular interés con los recien llegados que aportan ideas frescas

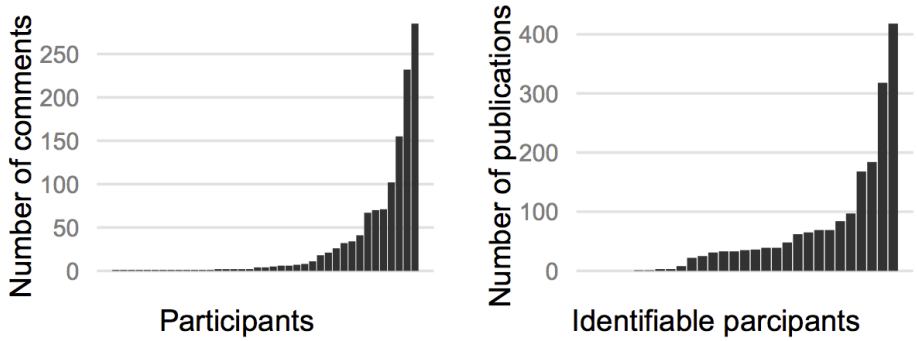


Justin Cranshaw y Aniket Kittur. **The polymath project: lessons from a successful online collaboration in mathematics**. *Proceedings of the 2011 annual conference on Human factors in computing systems*, CHI '11, pag 1865–1874, New York, NY, USA, 2011. ACM

El Proyecto Polymath

http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

- En 37 días 39 participantes (Medallistas Field, matemáticos profesionales hasta maestros de escuela) escribieron 800 comentarios tratando de encontrar una prueba simple (alternativa a las existentes) para el un caso partircular del teorema de Hales–Jewett.
- Esta comunidad comparte la forma de abordar la solución de los problemas en Matemáticas.
- Los comentarios de los mas expertos guiaron/ organizaron la discusión.
- Si bien un alto número de los comentarios vinieron de 3 o cuatro expertos, éstos reconocieron que los comentarios de todos guiaron mucha de su reflexión. Hubo una suma de ideas para lograr la prueba.
- Los recien llegados pudieron incorporarse a la discusión de fácil mente y aumentó el número de contribuciones



Justin Cranshaw y Aniket Kittur. **The polymath project: lessons from a successful online collaboration in mathematics**. *Proceedings of the 2011 annual conference on Human factors in computing systems*, CHI '11, pag 1865–1874, New York, NY, USA, 2011. ACM

- **Hoy existen 5 proyectos Polymath y 2 Problemas propuestos registrados en el wiki.**
- **Congregan a mas de 300 participantes quienes han expuesto mas de 5000 comentarios**

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Cornell University Library

arXiv.org > math > arXiv:0910.3926

Search

PolyMath

Mathematics > Combinatorics

A new proof of the density Hales-Jewett theorem

D. H. J. Polymath

(Submitted on 20 Oct 2009 (v1), last revised 16 Feb 2010 (this version, v2))

The Hales-Jewett theorem asserts that for every r and every k there exists n such that every r-colouring of the n-dimensional grid {1,...,k}^n contains a combinatorial line. This result is a generalization of van der Waerden's theorem, and it is one of the fundamental results of Ramsey theory. The theorem of van der Waerden has a famous density version, conjectured by Erdos and Turan in 1936, proved by Szemeredi in 1975, and given a different proof by Furstenberg in 1977. The Hales-Jewett theorem has a density version as well, proved by Furstenberg and Katznelson in 1991 by means of a significant extension of the ergodic techniques that had been pioneered by Furstenberg in his proof of Szemeredi's theorem. In this paper, we give the first elementary proof of the theorem of Furstenberg and Katznelson, and the first to provide a quantitative bound on how large n needs to be. In particular, we show that a subset of {1,2,3}^n of density delta contains a combinatorial line if n is at least a tower of 2's of height O(1/delta^3). Our proof is reasonably simple: indeed, it gives what is arguably the simplest known proof of Szemeredi's theorem.

Comments: See also this http URL
Subjects: **Combinatorics (math.CO)**
MSC classes: 05D10
Cite as: **arXiv:0910.3926v2 [math.CO]**

Submission history

From: Ryan O'Donnell [view email]
[v1] Tue, 20 Oct 2009 17:52:06 GMT (90kb,D)
[v2] Tue, 16 Feb 2010 11:17:10 GMT (42kb)

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2	2011arXiv1105.2419D Dodos, Pandelis; Kanellopoulos, Vassilis; Tyros, Konstantinos	1.000 Dense subsets of products of finite trees	05/2011	A	X	R	
3	2011arXiv1105.2417D Dodos, Pandelis; Kanellopoulos, Vassilis; Tyros, Konstantinos	1.000 Measurable events indexed by trees	05/2011	A	X	R	
4	2010arXiv1006.0491A Austin, Tim	1.000 Multiple recurrence and the structure of probability-preserving systems	06/2010	A	X	R C	U
5	2010arXiv1003.2978C Croot, Ernie; Sisask, Olof	1.000 A probabilistic technique for finding almost-periods of convolutions	03/2010	A	X	R C	U
6	2009arXiv0912.1150P Pór, Attila; Wood, David R.	1.000 On Visibility and Blockers	12/2009	A	X	R C	U

arXiv.org > math > arXiv:1002.0374

Search

Mathematics > Combinatorics

Density Hales-Jewett and Moser numbers

D.H.J. Polymath

(Submitted on 2 Feb 2010 (v1), last revised 25 Apr 2010 (this version, v2))

For any $n \geq 0$ and $k \geq 1$, the \emph{density Hales-Jewett number} $c_{n,k}$ is defined as the size of the largest subset of the cube $[k]^n$:= $\{1,...,k\}^n$ which contains no combinatorial line; similarly, the Moser number $c'_{n,k}$ is the largest subset of the cube $[k]^n$ which contains no geometric line. A deep theorem of Furstenberg and Katznelson shows that $c_{n,k}$ = $o(k^n)$ as $n \to \infty$ (which implies a similar claim for $c'_{n,k}$); this is already non-trivial for $k = 3$. Several new proofs of this result have also been recently established.
Using both human and computer-assisted arguments, we compute several values of $c_{n,k}$ and $c'_{n,k}$ for small n,k. For instance the sequence $c_{n,3}$ for $n=0,...,6$ is $1,2,6,18,52,150,450$, while the sequence $c'_{n,3}$ for $n=0,...,6$ is $1,2,6,16,43,124,353$. We also prove some results for higher k, showing for instance that an analogue of the LYM inequality (which relates to the $k = 2$ case) does not hold for higher k, and also establishing the asymptotic lower bound $c_{n,k} \geq k^n \exp(- O(\sqrt[\ell]{\log n}))$ where ℓ is the largest integer such that $2k > 2^\ell$.

Comments: 49 pages. To appear, Szemeredi birthday conference proceedings
Subjects: **Combinatorics (math.CO)**
MSC classes: 05D05, 05D10
Cite as: **arXiv:1002.0374v2 [math.CO]**

Submission history

From: Terence C. Tao [view email]
[v1] Tue, 2 Feb 2010 00:55:11 GMT (114kb,D)
[v2] Sun, 25 Apr 2010 19:22:50 GMT (114kb,D)

Inteligencia colectiva que genera conocimiento

El Proyecto Polymath

http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

http://michaelnielsen.org/polymath1/index.php?title=Main_Page

Existing polymath projects

- Polymath1: New proofs and bounds for the density Hales-Jewett theorem. Initiated Feb 1, 2009; research results have now been submitted for publication.
- Polymath2: Must an "explicitly defined" Banach space contain c_0 or l_p? Initiated Feb 17, 2009; attempts to relaunch via wiki, June 9 2010.
- Mini-polymath1: Solving Problem 6 of the 2009 International Mathematical Olympiad. Initiated July 20, 2009; five proofs obtained so far.
- Polymath3. The polynomial Hirsch conjecture. Proposed July 17, 2009; launched, September 30, 2010.
- Polymath4: A deterministic way to find primes. Proposed July 27, 2009; launched Aug 9, 2009. Research results have been submitted for publication.
- Polymath5. The Erdős discrepancy problem. Proposed Jan 10, 2010; launched Jan 19, 2010.
- Mini-polymath2: Solving Problem 5 the 2010 International Mathematical Olympiad. Proposed Jun 12, 2010; launched Jul 8, 2010; solved, Jul 8 2010.
- Polymath6. Improving the bounds for Roth's theorem. Proposed Feb 5, 2011.
- Mini-polymath3: Solving a problem from the 2011 International Mathematical Olympiad. Proposed Jun 9, 2010.

Polymath-like projects

- Scott Aaronson's "philomath project": "Sensitivity vs. Block sensitivity" (see also this Math Overflow question). Launched Jul 13, 2010.
- A wiki page clearinghouse for Deolalikar P vs NP paper. Launched Aug 10, 2010.

Proposed polymath projects

- The cap set problem. Proposed March 25, 2009 (see also these two followup posts).
- Boshernitzan's problem. Proposed July 27, 2009.
- Possible future polymath projects. Discussion opened September 16, 2009.
- A possible polymath project: Proposal by Richard Lipton to attack a conjecture due to Erdos, about a class of Diophantine equations.

A (partial) list of proposed projects can be found here.

If you have a tentative proposal for a polymath project, you can either make a post on it on your own blog, or place it here.

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http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/

July 19, 2011

Minipolymath3 project: 2011 IMO

Filed under: research — Terence Tao @ 8:00 pm

This post marks the official opening of the mini-polymath3 project to solve a problem from the 2011 IMO. I have decided to use Q2, in part to see how the polymath format would cope with a more geometrically themed problem.

> **Problem 2.** Let S be a finite set of at least two points in the plane. Assume that no three points of S are collinear. A *windmill* is a process that starts with a line ℓ going through a single point $P \in S$. The line rotates clockwise about the pivot P until the first time that the line meets some other point Q belonging to S. This point Q takes over as the new pivot, and the line now rotates clockwise about Q, until it next meets a point of S. This process continues indefinitely.
> Show that we can choose a point P in S and a line ℓ going through P such that the resulting windmill uses each point of S as a pivot infinitely many times.

The comments to this post shall serve as the research thread for the project, in which participants are encouraged to post their thoughts and comments on the problem, even if (or especially if) they are only partially conclusive. Participants are also encouraged to visit the discussion thread for this project, and also to visit and work on the wiki page to organise the progress made so far.
This project will follow the general polymath rules. In particular:

1. **All are welcome.** Everyone (regardless of mathematical level) is welcome to participate. Even very simple or "obvious" comments, or comments that help clarify a previous observation, can be valuable.
2. **No spoilers!** It is inevitable that solutions to this problem will become available on the internet very shortly. If you are intending to participate in this project, I ask that you refrain from looking up these solutions, and that those of you have already seen a solution to the problem refrain from giving out spoilers, until at least one solution has already been obtained organically from the project.
3. **Not a race.** This is **not** intended to be a race between individuals; the purpose of the polymath experiment is to solve problems *collaboratively* rather than individually, by proceeding via a multitude of small observations and steps shared between all participants. If you find yourself tempted to work out the entire problem by yourself in isolation, I would request that you refrain from revealing any solutions you obtain in this manner until *after* the main project has reached at least one solution on its own.
4. **Update the wiki.** Once the number of comments here becomes too large to easily digest at once, participants are encouraged to work on the wiki page to summarise the progress made so far, to help others get up to speed on the status of the project.
5. **Metacomments go in the discussion thread.** Any non-research discussions regarding the project (e.g. organisational suggestions, or commentary on the current progress) should be made at the discussion thread.
6. **Be polite and constructive, and make your comments as easy to understand as possible.** Bear in mind that the mathematical level and background of participants may vary widely.

Have fun!

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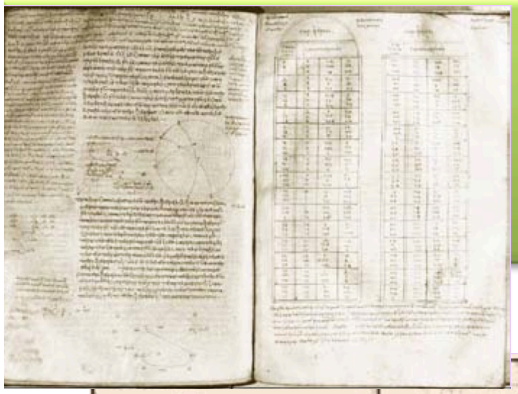
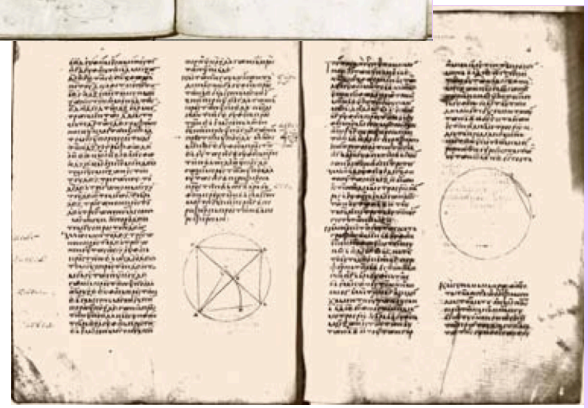
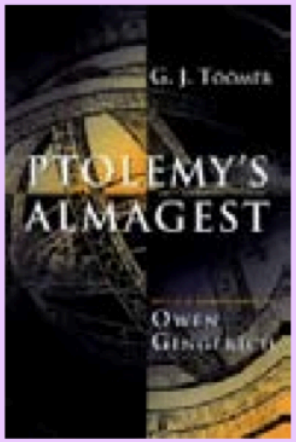
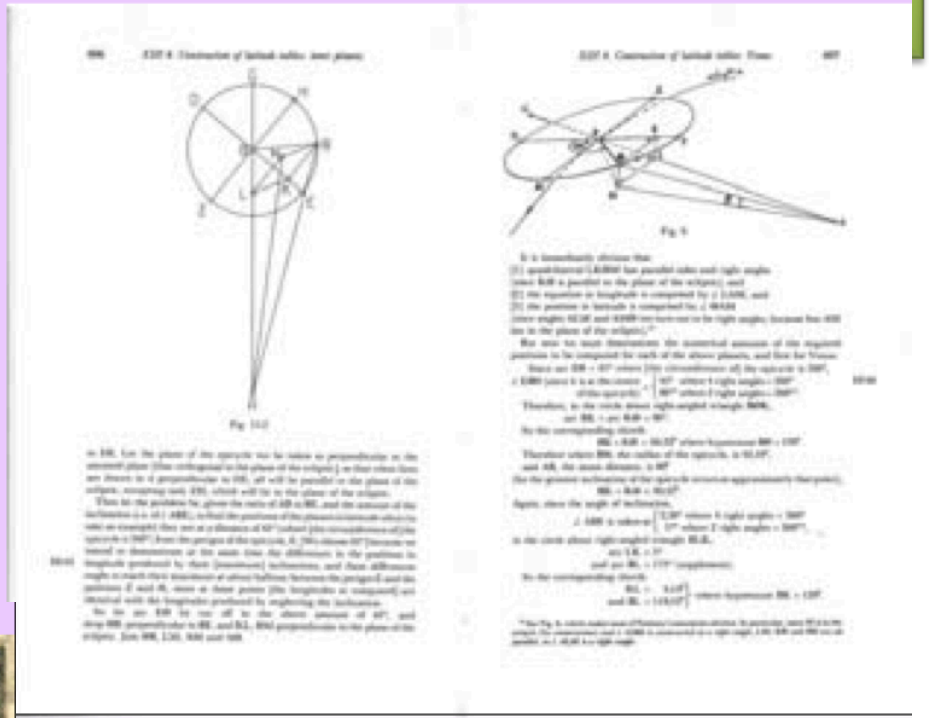
http://polymathprojects.org/

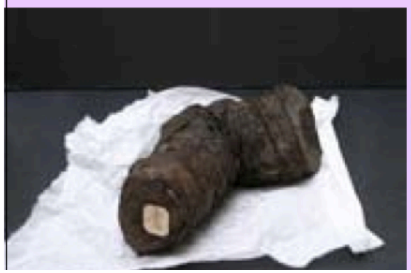






Best translation:
G. J. Toomer, 1984 (paperback 1998)





Ptolomeno de Alejandría logró catalogar (sin instrumentos) 1022 estrellas.
Fue la referencia por casi 800 años

Sloan Digital Sky Survey

Mapping the Universe

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http://www.sdss.org/

The Sloan Digital Sky Survey

The Sloan Digital Sky Survey (SDSS) is one of the most ambitious and influential surveys in the history of astronomy. Over eight years of operations (SDSS-I, 2000-2005; SDSS-II, 2005-2008), it obtained deep, multi-color images covering more than a quarter of the sky and created 3-dimensional maps containing more than 930,000 galaxies and more than 120,000 quasars.

SDSS data have been released to the scientific community and the general public in annual increments, with the final public data release from SDSS-II occurring in October 2008. That release, Data Release 7, is available through this website.

Meanwhile, SDSS is continuing with the Third Sloan Digital Sky Survey (SDSS-III), a program of four new surveys using SDSS facilities. SDSS-III began observations in July 2008 and released its first public data as Data Release 8 to emphasize its continuity with previous SDSS releases. SDSS-III will continue operating and releasing data through 2014.

Data Release 8 contains all images from the SDSS telescope - the largest color image of the sky ever made. It also includes measurements for nearly 500 million stars and galaxies, and spectra of nearly two million. All the images, measurements, and spectra are available free online. You can browse through sky images, look up data for individual objects, or search for objects anywhere in the sky based on any criteria.

The SDSS used a dedicated 2.5-meter telescope at Apache Point Observatory, New Mexico, equipped with two powerful special-purpose instruments. The 120-megapixel camera imaged 1.5 square degrees of sky at a time, about eight times the area of the full moon. A pair of spectrographs fed by optical fibers measured spectra of (and hence distances to) more than 600 galaxies and quasars in a single observation. A custom-designed set of software pipelines kept pace with the enormous data flow from the telescope. The two key technologies that enabled the SDSS, optical fibers and the digital imaging detectors known as CCDs, were the discoveries awarded the 2009 Nobel Prize in Physics.

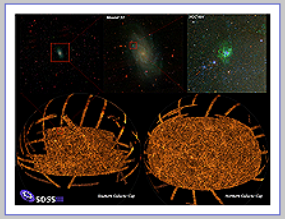
During its first phase of operations, 2000-2005, the SDSS imaged more than 8,000 square degrees of the sky in five optical bandpasses, and it obtained spectra of galaxies and quasars selected from 5,700 square degrees of that imaging. It also obtained repeated imaging (roughly 30 scans) of a 300 square degree stripe in the southern Galactic cap.

With new financial support and an expanded collaboration including 25 institutions around the globe, SDSS-II carried out three distinct surveys:

- The Sloan Legacy Survey completed the original SDSS imaging and spectroscopic goals. The final dataset includes 230 million celestial objects detected in 8,400 square degrees of imaging and spectra of 930,000 galaxies, 120,000 quasars, and 225,000 stars.
- SEGUE (the Sloan Extension for Galactic Understanding and Exploration) probed the structure and history of the Milky Way galaxy, with new imaging of 3500 square degrees and spectra of 240,000 stars in a variety of categories in selected fields.
- The Sloan Supernova Survey carried out repeat imaging of the 300 square degree southern equatorial stripe to discover and measure supernovae and other variable objects. In the course of three 3-month campaigns, the supernova survey discovered nearly 500 spectroscopically confirmed Type Ia supernovae, which are being used to determine the history of the accelerating cosmic expansion over the last 4 billion years.

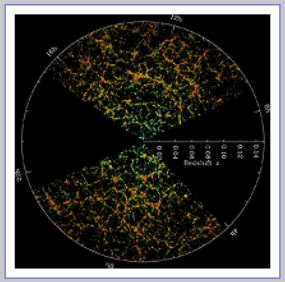
SDSS data have supported fundamental work across an extraordinary range of astronomical disciplines, including the properties of galaxies, the evolution of quasars, the structure and stellar populations of the Milky Way, the dwarf galaxy companions of the Milky Way and M31, asteroids and other small bodies in the solar system, and the large scale structure and matter and energy contents of the universe; this site includes For a brief overview of SDSS science contributions. A more in-depth view can be found in the

Images of the SDSS
(click for more information)



The Final Survey

The Whirlpool Galaxy (M51)



SDSS Galaxy Map

SDSS data have contributed to more than 2000 articles in refereed journals, with more than 70,000 citations. More than 70 PhD theses based on SDSS data were completed under the supervision of SDSS participants (and probably many more with public data).

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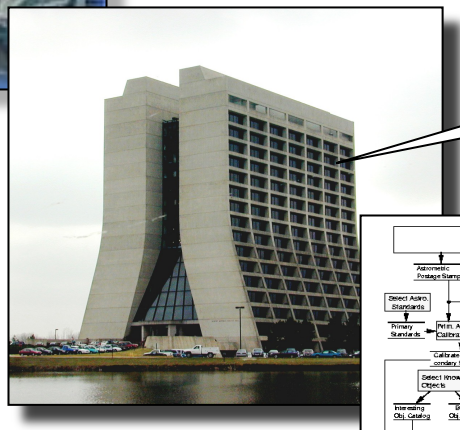
Data Flow (Datos en varios niveles)

Pixel data collected by telescope



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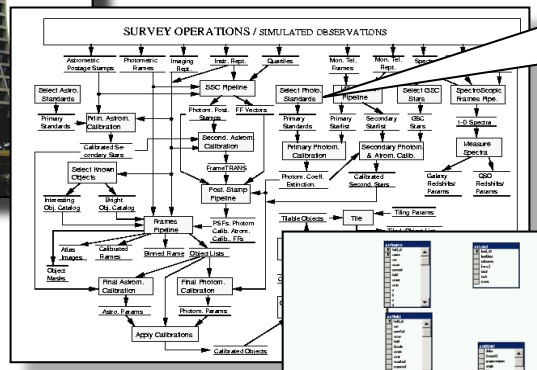
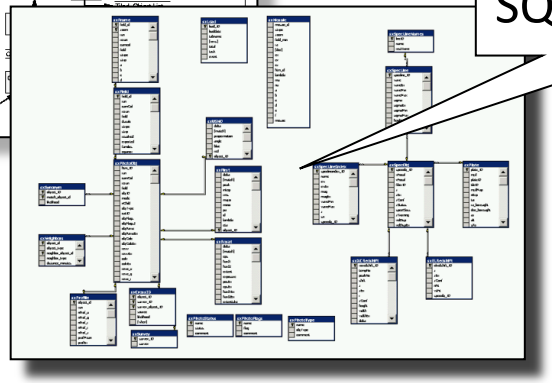


Beowulf Cluster produces catalog



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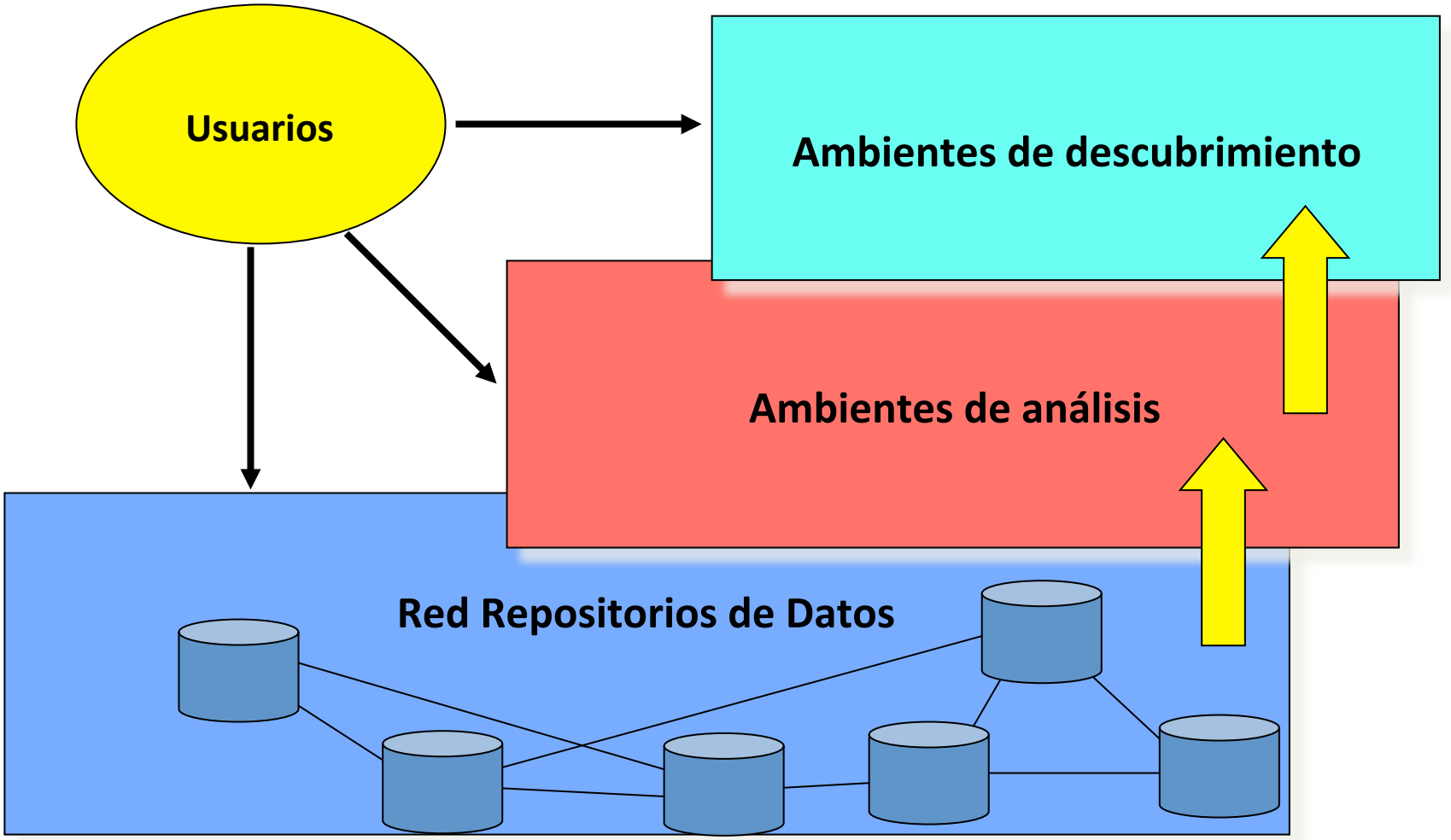
VO: Arquitectura Conceptual



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1. **The Sloan Digital Sky Survey: Technical Summary.**
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FEATURE | FEBRUARY 29, 2012 | BY LORI ANN WHITE

For three and a half years, the Fermi Gamma-ray Space Telescope has been circling the planet in low-Earth orbit, scanning the sky for evidence of the most energetic objects in the universe. For three and a half years, data captured by Fermi's instruments have been accumulating on a NASA server at Goddard Space Flight Center in Maryland.

Who accesses those data, who analyzes those data, who owns those data—the very stuff of discovery—is not who you might expect.

The telescope itself is a space-worthy particle detector built to capture some of the most energetic photons in the universe—gamma-ray photons slung out of the magnetic fields of neutron stars or the blazing hearts of active galactic nuclei, or thrown off the spinning accretion disks of black holes.

It's a hybrid project, born of a partnership between astrophysics and high-energy physics, led, not surprisingly, by NASA and the US Department of Energy. And when it comes to handling data, most scientists working on the project represent one of two distinct cultures.

Illustration by Sandbox Studios.

In particle physics, researchers tend to keep their data close, holding it within their experimental collaborations. Many of them have worked on specific particle detectors for years, designing and building and tweaking the equipment. They argue that only collaboration members understand the detectors well enough to interpret the data correctly.

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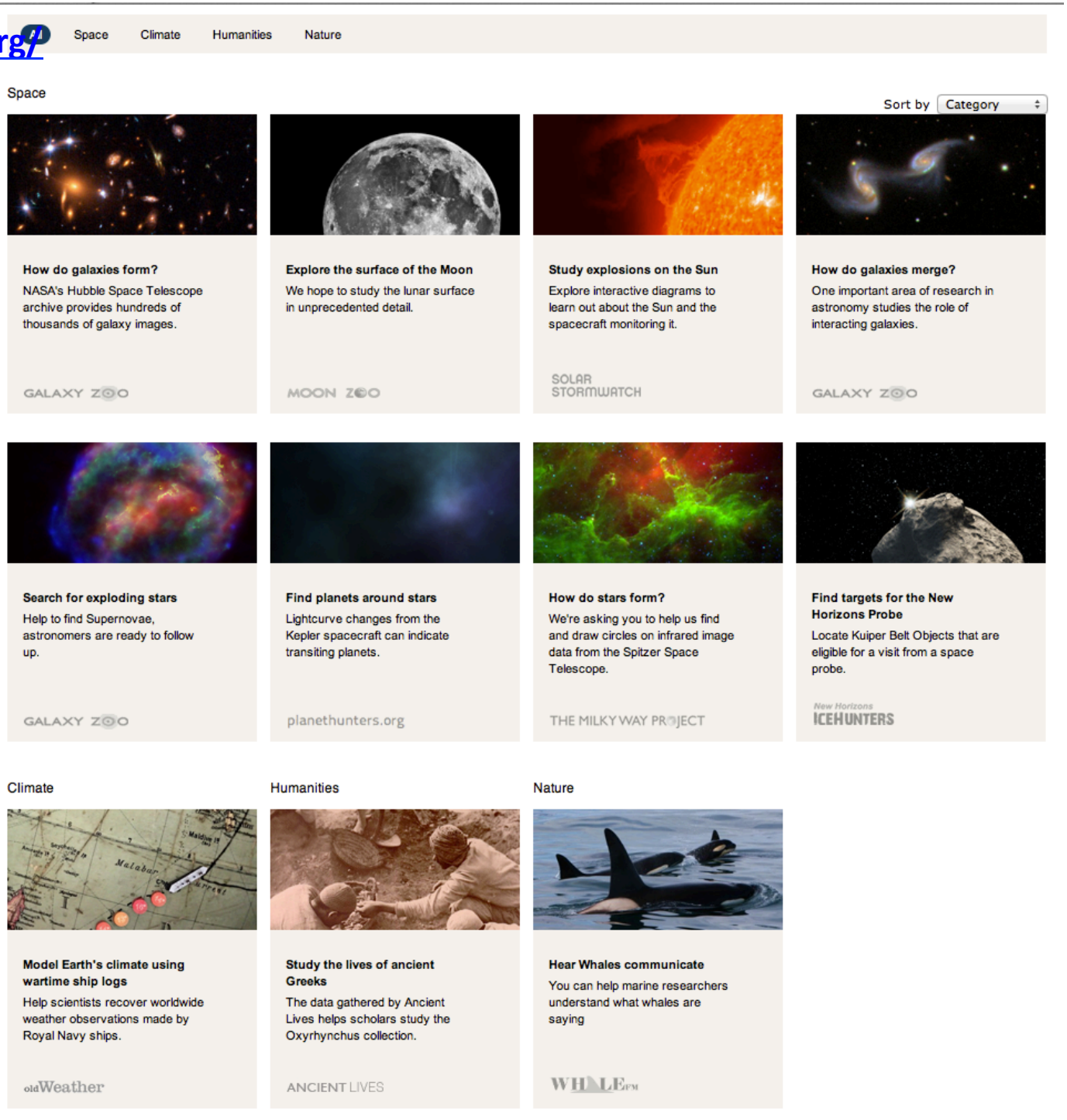

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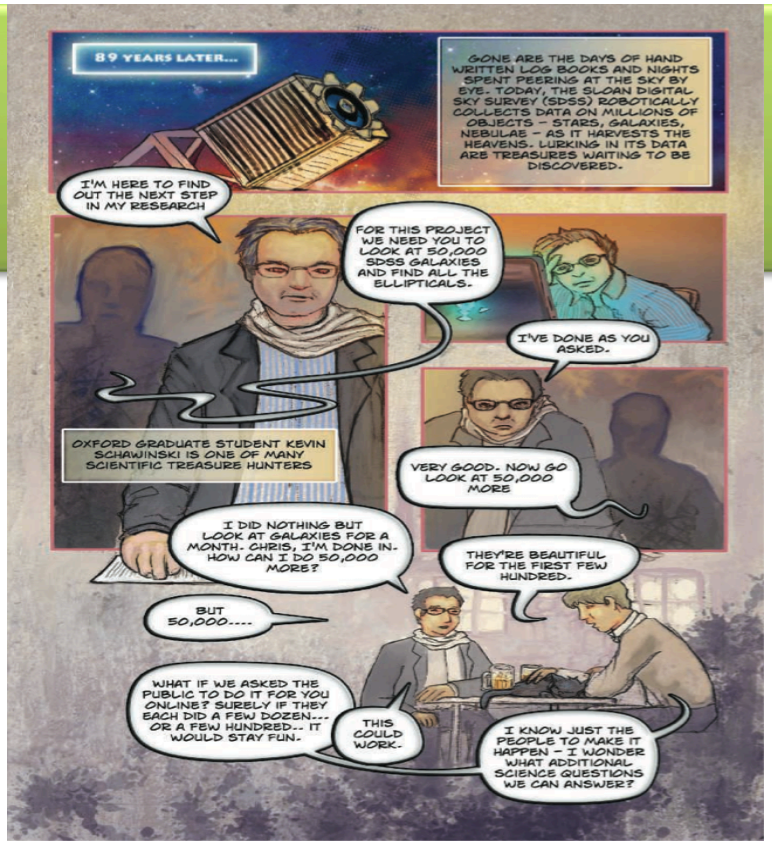

The original Galaxy Zoo was launched in July 2007, with a data set made up of a million galaxies imaged with the robotic telescope of the Sloan Digital Sky Survey. With so many galaxies, the team thought that it might take at least two years for visitors to the site to work through them all.

Within 24 hours of launch, the site was receiving 70,000 classifications an hour, and more than 50 million classifications were received by the project during its first year, from almost 150,000 people

A news story on a BBC Web site set the ball rolling; after just 3 hours, Schawinski recalls, traffic was so heavy that Galaxy Zoo's site, hosted by Johns Hopkins University, crashed.

Clery, D. 2011. "Galaxy Zoo Volunteers Share Pain and Glory of Research." Science 333 (6039): 173

The Science

Galaxy Zoo 1 and 2 have already produced lots of brand new science — have a look at 'The Story So Far' section for details of what we've done with all the clicks on the websites. However, they only give us a glimpse of the nearby Universe. With Galaxy Zoo: Hubble we can look further back than ever before, and begin to understand how the Universe has changed over time.

What we want to know

Just as with the original incarnations of Galaxy Zoo, the aim of the project is to collect information on the shape of the galaxies. This one fact turns out to be a guide to many other facts about a galaxy. Find a spiral galaxy and normally - but crucially not always — you'll know that it's a rotating disk which has plenty of fuel for its ongoing star formation. A typical elliptical, on the other hand, has older stars and will have long since finished forming stars.

These rules don't always hold, and finding the exceptions has been one of the important results from Galaxy Zoo to date, but they do illustrate just how important knowing the shape of a galaxy is. With Galaxy Zoo: Hubble, we want to see how the mix of galaxies has changed over time. More stars were forming back then, so does that mean we should expect more spirals? Or does the proportion of blue ellipticals increase as we travel back in time? Only you can tell us.

Another critical question is what happens to the number of merging galaxies. We know that a merger can have a dramatic effect on the galaxies involved; one good way to form an elliptical, for example, is to collide two spirals together. The question is how much of an effect mergers had in producing the mix of galaxies we see today and to determine that to know how common they were in the past. Yesterday's mergers may well have produced today's galaxies.

Each of the questions we ask is designed to get more useful information about the galaxies that lurk in the ima shapes of ellipticals contain information about their past, and many spiral galaxies have bars across their centres, our own Milky Way galaxy. How these bars formed, how long they exist, and what their connection is to galaxy ev also a currently debated topic, and comparing Hubble and Sloan data will help us unravel the answers.

Then there are other questions to ask about a galaxy, such as: What fraction of galaxies have two, three, or mo How tightly wound are the spiral arms? Does the galaxy have a 'boxy' or a 'rounded' bulge? How many galaxies a with 'irregular' morphologies? Answering these questions about every galaxy, one galaxy at a time, is essential if we to understand the fine details of galaxy formation.

Those of you who took part in Galaxy Zoo 2 will have noticed that there's a whole new set of questions. Previous s galaxy shapes in Hubble data sets have noticed a greater number of irregular galaxies, and so we want to make systematic study of these intriguing objects.

We want to know the answer to all these questions, and more. The primary goal of Galaxy Zoo is to construct a dat detailed shape information for almost all the galaxies the Hubble Space Telescope has ever seen. Such a database substantial legacy value for the international astronomy community. In short, we hope to find out everything there is about the appearance of galaxies!

If you've read the 'How to Take Part' page then you know that we're also asking you to keep a look out for sor objects.

Rare Objects

The sharp-eyed visitors to the Galaxy Zoo are very good at spotting the weird and wonderful — indeed, this is one of the most active areas of the discussion forum. So, we'd like to see if we can help the community be more effective at discovering certain types of rare object. We have several examples in mind for GZ2, based on the kinds of things found by the community so far.

Gravitational Lenses

Gravitational lenses are galaxies and groups of galaxies that are so massive that they bend the path of light from more distant objects towards themselves, distorting the shapes of background galaxies into arcs and rings, and even causing multiple copies of the images of galaxies and quasars to appear in symmetrical patterns around them on the sky. These cosmic alignments are quite rare — only about one in a thousand elliptical galaxies is acting as a lens in this way. In some cases it is possible to find them using clever image analysis software, but the most interesting cases are too complex for this. However, humans seem to be very good at recognising the tell-tale signs of gravitational lensing!

Why do we want to know about more instances of gravitational lensing? The separation of the multiple images allows us to weigh the lens galaxy, something that is typically very hard to do in astronomy. Once we have measured the mass of the lens, we then know how strong a lens it is — and how much magnifying power it has. The lensed images appear typically 10-100 times brighter than they would without the lens: we can use gravitational lenses as cosmic telescopes to observe the very distant universe. And as usual, the more telescopes we have the better!

Galaxy Mergers

Galaxies can grow in two ways: by forming stars, or by merging together. Our current theories of galaxy formation expect there to be a lot of merging happening, and indeed we do see many examples, but it is very difficult to reliably measure how much merging is really going on. We need big samples, and keen eyes — Sounds like a job for Galaxy Zoo!

Expect the Unexpected — Hanny's Voorwerp

One of the most exciting discoveries from the original Galaxy Zoo was something we never expected. Hanny Van Arkel, a Dutch schoolteacher and Galaxy Zoo volunteer, posted an image to the Galaxy Zoo forum and asked 'What's the blue stuff below?' No one knew. The object became known as Hanny's 'Voorwerp' — Dutch for 'object'. The original images from the Sloan Digital Sky Survey couldn't tell us what it was, so we've taken follow-up telescope observations, in the optical, ultra-violet, and radio ranges, as well X-ray measurements from several satellites and exquisite images from the Hubble Space Telescope.

Blog links:

- Nature of Voorwerp
- The Mystery Deepens
- Follow-up observations
- HST plans

The Voorwerp is shown above but you can read more about it and see additional examples on the Galaxy Zoo blog article: The Mystery Deepens.

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Hanny Van Arkel

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Conclusiones

- Hay un número cada vez más creciente de experiencias que impulsan la participación ciudadana
- La necesidad de incorporar a la ciudadanía en la creación de conocimiento aumenta el conocimiento de la ciencia en la sociedad y fundamenta su financiamiento
- Los estudiantes, nativos digitales requieren cada vez más mecanismos distintos a los tradicionales para incorporarlos tempranamente a la producción de conocimiento
- Los ambientes web 2.0 parece acelerar la producción de conocimiento
- La generación de conocimiento en estos ambientes tiene una dinámica propia que debemos aprender los advenedizos digitales

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Gracias…

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