

# La emergencia de la Ciencia Ciudadana

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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



# 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*

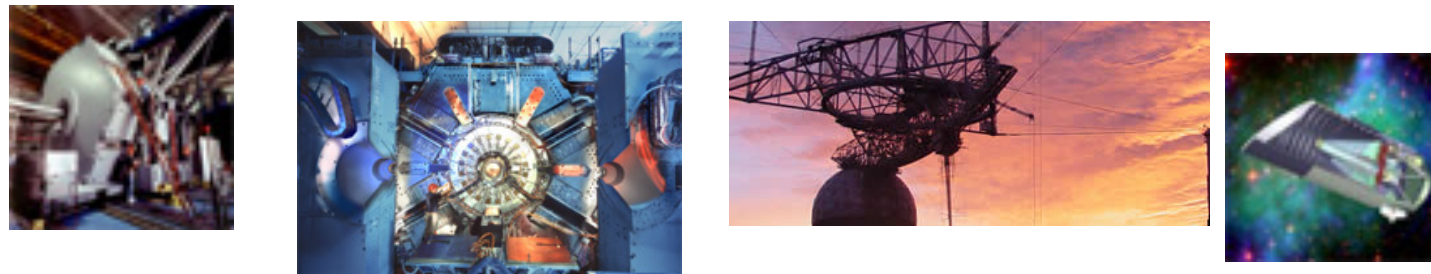


# Ciencia/Arte, Ciencia Industrial, e-Ciencia/Ciencia 2.0

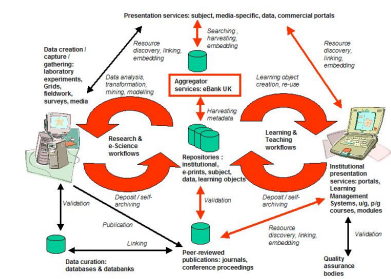
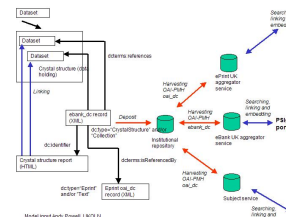
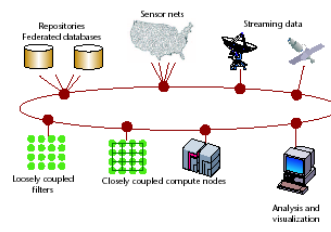
- **Ciencia Arte:** Esfuerzo, ingenio y destrezas personales

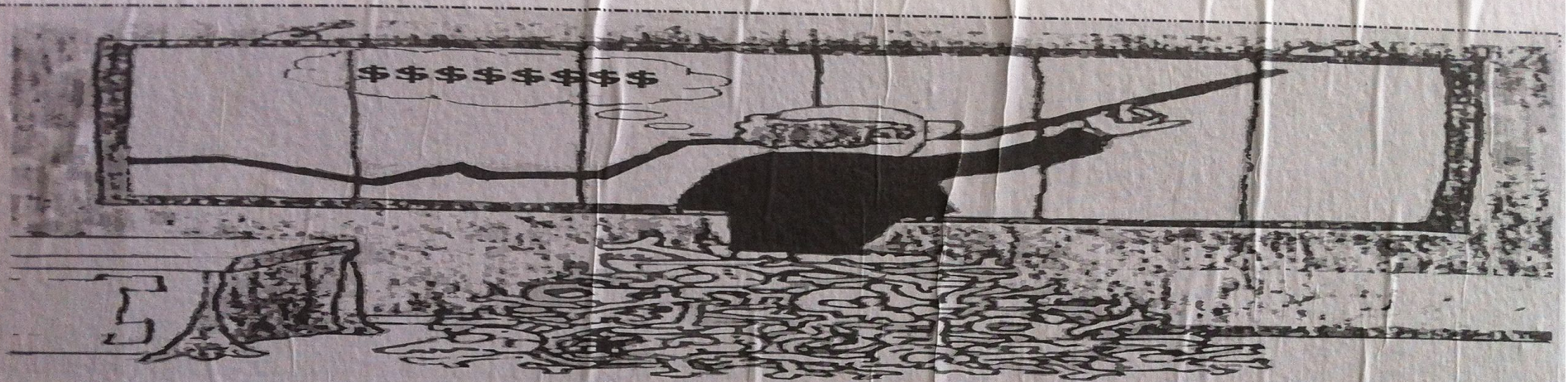


- **Ciencia Industrial:** Esfuerzo Colectivo, destrezas e ingenio tecnológico



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

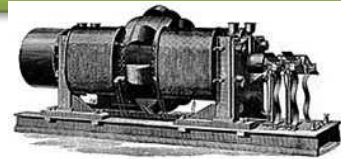




No queremos cátedras de Ciencias donde los tecnócratas científicos mienten que los esquemas de la física, la química, la biología y las matemáticas son herramientas suficientes para construir un mundo moderno, ignorando estructuras sociales que las hacen estériles. No queremos laboratorios donde enajenados (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*

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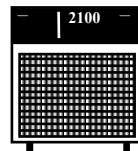
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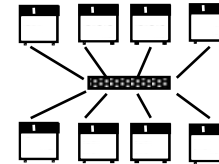
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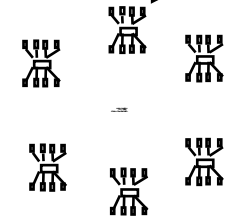
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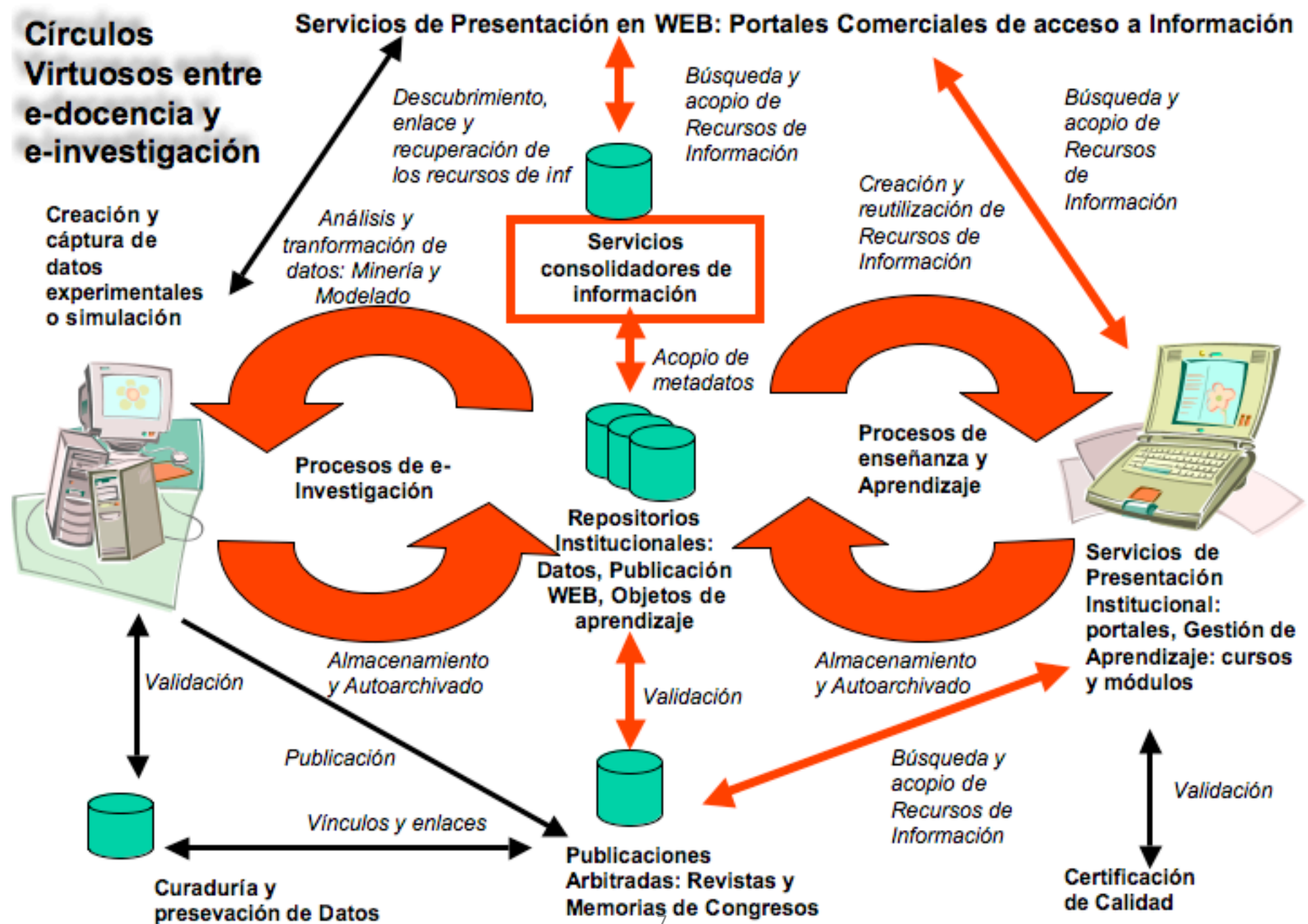
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**Círculos Virtuosos entre e-docencia y e-investigación**



## 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, 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

### Submission history

From: Hector Hernandez [view email]

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Mathematics > Differential Geometry

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

Grisha Perelman

(Submitted on 17 Jul 2003)

Let  $M$  be a closed oriented three-manifold, whose prime any initial riemannian metric on  $M$  the solution to the Ricci flow [math.DG/0303109](#), becomes extinct in finite time. The result is due to Richard Hamilton, and a regularization of the curve...

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

### Submission history

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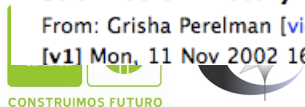
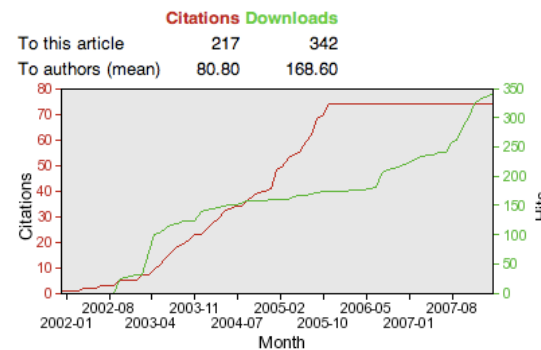


controlled by the curvature, (2) Ricci flow can what happens far away. We also verify several a geometrization conjecture for closed three-man of earlier results on collapsing with local lower curvature bound.

Comments: 39 pages  
 Subjects: Differential Geometry (math.DG)  
 MSC classes: 53C  
 Cite as: [arXiv:math/0211159v1](#) [math.DG]

### Submission history

From: Grisha Perelman [view email]  
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Three OWW labs mentioned in nature.com

Having a presence on OWW can help a lab gain exposure in some unexpected ways. Last week the French, Kaylor, and Muller labs, all of whom mention wikis on OWW, were mentioned in Virtual networking for microbiologists, a Nature review about Wikis 2.

OWW 2008 winning into high gear

OpenWetWare is a strong supporter of GEM (Open.org) the International Genetically Engineered Machine Competition, which is now shifting into high gear for 2008. GEM and OpenWetWare share some important core values including openness, community, and sharing of information.

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**World's oldest social network reconstructed from medieval land records**

May 12th, 2008 (by HPC)

The network of bills between peasants who formed a region of small region of south west France called Lât between 1260 and 1290 have been reconstructed by Nathalie Vélizy from the Université de Perpignan in France et al.

The team took their data from agricultural records that have been preserved from that time. This is a valuable dataset because it records the date, the type of transaction and the peasants involved.

Vélizy et al used this to recreate the network of bills that existed between individuals and families in th 13th and 14th centuries in this part of France. They then drew up a self-organising map of the network (see above).

But the best is surely to come. What Vélizy hasn't yet done is analyse the network's properties. Does the medieval network differ in any important ways from the kind of networks we see between individuals in the 21st century? If so, what explains the differences and if not what are the invariants that link our world with 13th century France. The team promises an analysis in the near future.

In the meantime, it's worth reflecting on the significance of this work. These kinds of networks could provide anthropologists with an exciting new way to study historical societies.

And while this may be the world's oldest social network (if anyone knows of an older network, let us know), it's unlikely to remain so for long. Excellent records survive of transactions in ancient Rome, from the earlier Greek empire and even from the Egyptian civilisations that built the pyramids some 4000 years ago.

If Vélizy work turns up any useful insights into the nature of medieval society in France, you can be sure that anthropologists will rush to repeat the method using data from from even older societies.

All that's left to do is to obtain the raw science of the study ancient social networks. Any suggestions?

Ref: arxiv.org/abs/0805.1274: Mining a Medieval Social Network by Karim GDM and Related Methods

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Some physicists think the mind is at the heart of modern physics.  
NewPhysicsAndTheMind.net

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**Weekly PLoS ONE News and Blog Round-Up**

on February 10, 2010 by Bora Zivkovic

In this week's PLoS ONE media digest: feathered dinosaurs, living next to highways is bad for you, blood vessels, removing badgers does not remove cattle tuberculosis, and you can drink and fly.

[Extent of the Preserved Feathers on the Four-Winged Dinosaur Microraptor quill under 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 pollution 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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Friday, November 20, 2009

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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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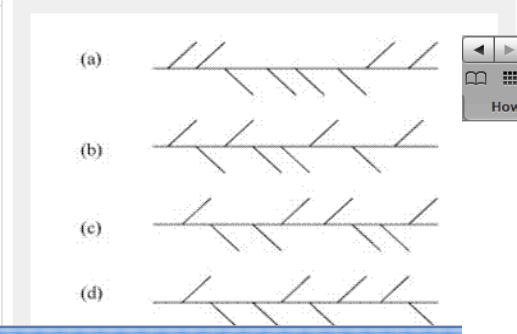
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Damian Carrington  
30 September 2008 | EN | 中文



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| <p><b>PARTICIPATE</b></p> <ul style="list-style-type: none"> <li>Download</li> <li>Get help</li> <li>Tell a friend</li> <li>Donate</li> <li>Porting &amp; optimization</li> <li>... more</li> </ul> | <p><b>ABOUT</b></p> <ul style="list-style-type: none"> <li>About SETI@home</li> <li>Science newsletters</li> <li>Technical news</li> <li>Server status</li> <li>Science status</li> <li>Sponsors</li> <li>... more</li> </ul> | <p><b>COMMUNITY</b></p> <ul style="list-style-type: none"> <li>Message boards</li> <li>Questions &amp; answers</li> <li>Profiles</li> <li>User search</li> <li>Teams</li> <li>Web sites &amp; IRC</li> <li>Pictures &amp; music</li> </ul> | <p><b>YOUR ACCOUNT</b></p> <ul style="list-style-type: none"> <li>Your account</li> <li>Preferences</li> <li>Certificate</li> </ul> | <p><b>STATISTICS</b></p> <ul style="list-style-type: none"> <li>Top participants</li> <li>Top computers</li> <li>Top teams</li> <li>Top GPU models</li> </ul> |
|---|---|--|---|---|

Site search:  Languages

Get started

- 1 Read our rules and policies
  - 2 Download, install and run the BOINC software used by SETI@home. When prompted, enter the URL: <http://setiathome.berkeley.edu>
- Have questions or need help? Contact a volunteer using [BOINC online help](#).

Special instructions:

- For SETI@home Classic participants
- For users of command-line and pre-5.0 clients.

POWERED BY BOINC Keep your computer busy when SETI@home has no work - participate in other BOINC-based projects.

User of the day

 **jackal@Turkey**  
from Turkey  
Computer Programmer  
Technologies, Music, Movies, Electronic

News

**Monday Morning Outage**  
The entire lab is undergoing some electrical p servers will be unreachable for 2 hours (from 10:00 to 12:00). We resumed normal operations to

**Project Back Online After Overnight Out**  
Update: After reaching a logical (i.e. not phys were lost. We resumed normal operations to

**Huffington Post SETI@home Blog.**  
SETI@home Project Scientist Eric Korpela has Berkeley SETI bloggers may follow. Dependin things directly related to SETI@home, or we

**First Look at Kepler SETI Candidate Sign**  
Check out our [First Look at Kepler SETI Cand](#)

**2 Billion Results**  
Tuesday morning we reached 2 Billion BOINC 31 results (2,147,483,648). This explains w to accept larger numbers.

**BOINC download server is down.**  
The BC <http://milkyway.cs.rpi.edu/mi>

...MORE

News 1



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](mailto: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.
- When prompted, enter <http://milkyway.cs.rpi.edu/milkyway/>
- If you're running a command-line or pre-5.0 version of BOINC, create an account first.
- If you have any problems, get help here.

Community

- Donate to MilkyWay@Home via the Dudley Observatory
- Message boards
- Server Status
- Profiles
- User search
- Statistics
- Languages

Science

- Search Progress Plots
- Astrophysics Overview
- Publications, Public Talks and Funding
- Donations

Read Ben's post about today's Physics Nobel Prize.

cosmologyathome.org

JOIN RETURNING PARTICIPANTS COMMUNITY

The goal of Cosmology@Home is to search for the model that best describes our Universe and to find the range of models that agree with the available astronomical and particle physics data.

USER OF THE MONTH

NEWS

We've back. March 2, 2012. We are running a space problem. The team data b updated when th we will take as a updates. Assimilator not v February 7, 2012. As some of you experiencing pro affecting the mo computations. W and will endow Please bear with New team memb October 17, 2011. Please join Bin cosmology@h Featured Concept October 4, 2011. In honor of today Featured Concept type its supernov key to the disco Universe. Physics Nobel P October 4, 2011. Congratulations Adam Riess! Read Ben's post about today's Physics Nobel Prize.

> how to join

> your account

> message boards


> goodies

EINSTEIN@HOME  
EINSTEIN@HOME  
Catch a Wave From Space

About Einstein@Home

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.

User of the day

 **[SETI.USA]Tank\_Master**  
Check out my team's city! <http://seti.usa.mymincity.com/>  
About me:

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 Boguslaw Sobczak, Krakow, Poland
- Sirko Rosenburg, 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 11th, 12th, and 13th 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 Titmar, Kressbronn, Germany
- Thomas Herdtle, St. Paul, Minnesota, USA
- Zsolt Szvoboda, Szentendre, Hungary
- Carat@voice, Ichikawa City, Japan
- Rensik, Switzerland

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

Folding@home distributed computing

Home Download Guides FAQ Stats Science Results Awards About Us

Our goal: to understand protein folding, misfolding, and related diseases

You can help scientists studying these diseases by simply running a piece of software.

Folding@home is a distributed computing project -- people from throughout the world download and run software to band together to make one of the largest supercomputers in the world. Every computer takes the project closer to our goals. Folding@home uses novel computational methods coupled to distributed computing, to simulate problems millions of times more challenging than previously achieved.

**Download Folding@home**

**Protein folding is linked to disease, such as Alzheimer's, ALS, Huntington's, Parkinson's disease, and many Cancers.**  
Moreover, when proteins do not fold correctly (i.e. "misfold"), there can be serious consequences, including many well known diseases, such as Alzheimer's, Mad Cow (BSE), CJD, ALS, Huntington's, Parkinson's disease, and many Cancers and cancer-related syndromes.

**What is protein folding?**  
Proteins are biology's workhorses -- its "nanomachines." Before proteins can carry out these important functions, they assemble themselves, or "fold." The process of protein folding, while critical and fundamental to virtually all of biology, in many ways remains a mystery.

**What have we done so far?**  
We have had several successes. You can read about them on our Science page, on our Awards page, or go directly to our Results page.

**Want to learn more?**  
Click on the links at the top of the page for downloads, install guides, or more information. You can also download our Executive Summary, which is a PDF suitable for distribution. One can also help by donating funds to the project, via Stanford University.

Site search

[Google.org home](#)

Flu Trends

[Home](#)

Select country/region

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.

### 2007–2008 U.S. Flu Activity - Mid-Atlantic Region ILI percentage



[Download video \(QuickTime\)](#)

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

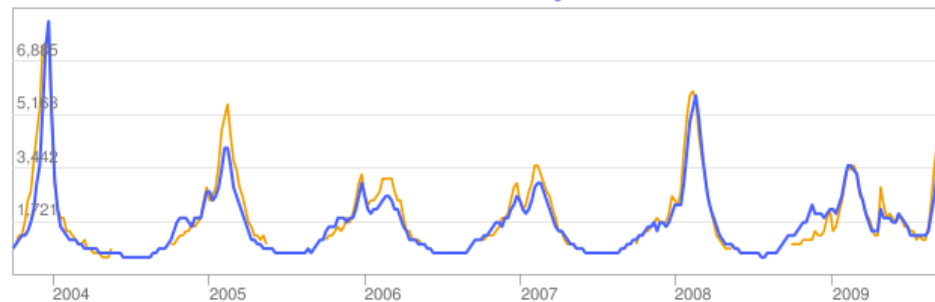
Historical estimates

See data for: United States

### United States Flu Activity

Influenza estimate

● Google Flu Trends estimate ● United States data



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



**Access**  
To read this story in full you will need to login or make a payment (see right).  
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<sup>1</sup>, Matthew H. Mohebbi<sup>1</sup>, Rajan S. Patel<sup>1</sup>, Lynnette Brammer<sup>2</sup>, Mark S. Smolinski<sup>1</sup> & Larry Brilliant<sup>1</sup>

<sup>1</sup> Google, Inc., 1600 Amphitheatre Parkway, Mountain View, California 94034, USA  
<sup>2</sup> Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, Georgia 30333, USA

Correspondence to: Matthew H. Mohebbi<sup>1</sup> Correspondence and requests for materials should be addressed to J.G. or M.H.M. (Email: [flutrends-support@google.com](mailto: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<sup>1</sup>. 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<sup>2</sup>. Early detection of disease activity, when followed by a rapid response, can reduce the impact of both seasonal and pandemic influenza<sup>3–5</sup>. 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.

To read this story in full you will need to login or make a payment (see right).

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- Jeremy Ginsberg
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**open innovation challenges**

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<http://www.worldwatermonitoringday.org/>

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World Water Monitoring Challenge  
Test. Share. Protect.

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Take the Challenge!

**25** Participants **4** Countries and counting for 2012...  
\*updated every five weeks

**World Water Monitoring Challenge™** is an international education and outreach program that builds public awareness and involvement in protecting water resources around the world by engaging citizens to conduct basic monitoring of their local water bodies.

In 2011, approximately 340,000 people in 77 countries monitored their local waterways. We challenge you to test the quality of your waterways, share your findings, and protect our most precious resource!

Select a Language

### On Location

#### Sabinas, Mexico



We received our test kit on September 1st. We practiced the use of each component and also conducted the real

### WWMC Superstar

#### Nelson Coronel Quispe Sacaba, Bolivia



WWMC: What drew you to the program—why did you want to get involved?

NQ: The possibility of

### WWMC Calendar

| 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  |    |



<http://www.youtube.com/watch?v=TTYsmHsQ4gk>

<http://beamartian.jpl.nasa.gov/>



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





## Victory for crowdsourced biomolecule design

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

Jessica Marshall

22 January 2012

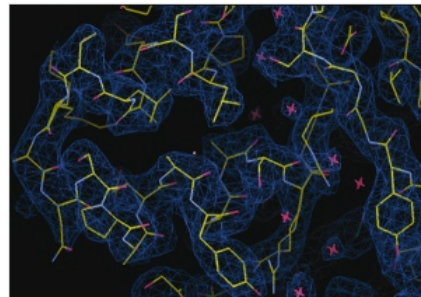
Obsessive gamers' hours at the computer have now topped scientists' efforts to improve a model enzyme, in what researchers say is the first crowdsourced redesign of a protein.

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<sup>1</sup>, 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*<sup>2</sup>.

"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.



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

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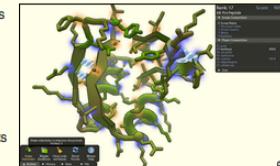
### The Science Behind Foldit

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](#)

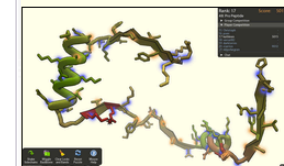
#### What is protein folding?

**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

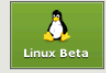
#### GET STARTED: DOWNLOAD



Windows (XP/Vista/7)



OSX (Intel 10.4 or later)



Linux (64-bit)

#### RECOMMEND FOLDIT

#### USER LOGIN

Username: \*

Password: \*

- 
- 
- 

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#### SOLOISTS EVOLVERS GROUPS TOPICS

| PLAYER               | PUZZLE                | SCORE  |
|----------------------|-----------------------|--------|
| pvc78 203 24         | 525: RosettaSer...ns  | 8,533  |
| 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   |

#### FACEBOOK FAN PAGE

 [Foldit en Facebook](#)  
 10,075

#### TOP NEW USERS

[AlexSun](#)

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.

flusurvey

The flusurvey is an online influenza surveillance system run by researchers at the London School of Hygiene & Tropical Medicine. London · http://www.flusurvey.org.uk

28 TWEETS  
23 FOLLOWING  
63 FOLLOWERS

Stay in touch with flusurvey  
Join Twitter today

Full name  
Email  
Password

Sign up

Tweets

flusurvey @flusurvey  
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Naked flusurvey: thenakedscientists.com fb.me/AIV1napn

flusurvey @flusurvey  
Flusurvey on the BBC: bbc.co.uk/programmes/p00... fb.me/1riu7V9VU

flusurvey @flusurvey  
flusurvey to relaunch on 1 Nov -- register now at flusurvey.org.uk

flusurvey @flusurvey  
flusurvey to relaunch on 1 Nov. Register now at flusurvey.org.uk

flusurvey @flusurvey  
Footballers Liam Ridgeway and Martin Jiraneck are out with flu! Log onto the flusurvey to report your symptoms www.flusurvey.org.uk

flusurvey @flusurvey  
UK footballers out with flu! Remember to complete the flusurvey every week!

LSHTM\_press @LSHTMpress  
http://tinyurl.com/38fbod9 Popular flu website relaunches for Winter 2010  
Retweeted by flusurvey

flusurvey @flusurvey  
Flu activity is increasing across the UK ... log on to the flusurvey to report your symptoms www.flusurvey.org.uk http://fb.me/v9YF1B4H

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Influenza  
Attention, citizens!

A new project to study the spread and seriousness of flu

Nov 19th 2011 | from the print edition

Like 68 Tweet 60

AS THE influenza season splutters into life across the northern hemisphere, millions will head to their computers in search of information, advice and remedies. Since 2008 Google has used these inquiries to track influenza-like illnesses (ILIs)—as symptoms not backed up by a definitive viral test are officially known—among its users around the world. Google Flu Trends displays whizzy graphs and colourful maps showing the intensity and progress of each seasonal epidemic.

This approach is not perfect, though. In order to stay accurate, Google has to tweak its algorithms regularly, to match the incidence of illness in the world. For this, it relies on data provided by America's Centres for Disease Control and Prevention, and similar institutions in other countries. But different countries have different reporting cultures. Belgium, for example, typically reports five times as many ILIs as its neighbour, the Netherlands (employees' need for a doctor's certificate to take more than one day of medical leave is probably to blame), and even England and Scotland—supposedly part of the same United Kingdom—cannot agree on what constitutes a flu epidemic. The system is also prone to false alarms. When the H1N1 swine-flu pandemic stole headlines in the summer of 2009, Google searches went through the roof long before most people fell ill.



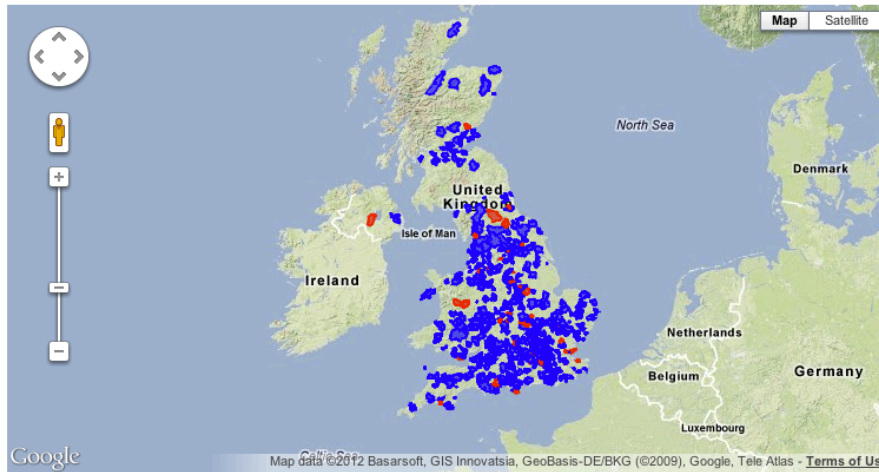
Influenzanet Influenzanet is a system to monitor the activity of influenza-like-illness (ILI) with the aid of volunteers via the internet

flusurvey

Home News Results FAQ The project What is flu? Play and learn Links Contact

Take part in the Flusurvey!

Be part of a Europe-wide project to improve our understanding of how flu spreads. Register now and join the flusurvey.



The map shows the current distribution of influenza-like illness, at the level of the first part of the postcode. In regions of red, at least one of our participants currently suffers from case of influenza-like illness, whereas in regions in blue none of our participants does.

Background

We are part of a Europe-wide collaboration to monitor flu all across the continent, with surveys in the UK, Austria, Belgium, France, Germany, Italy, Netherlands, Portugal, Sweden and Switzerland. Throughout the season, we'll provide weekly updates of influenza activity in the UK and across Europe.

The flusurvey is a scientific project run by researchers at the London School of Hygiene and Tropical Medicine to gather information about influenza epidemics in the UK. We rely on volunteers from England, Scotland, Wales or Northern Ireland to report on their flu-like symptoms from week-to-week. Click here to find out more about the benefits of taking part, what's involved and how to sign-up.

Why is the Flusurvey important?

The influenza virus changes every year and no two influenza epidemics are the same. The flusurvey means that information on a new epidemic can be quickly assimilated and used to plan a targeted response to mitigate the worst effects of influenza epidemics.

The UK flusurvey was first launched in July 2009 during the swine flu epidemic, keeping users informed and collecting information that wasn't available from anywhere else. The flusurvey team would like to thank everyone who took part. Click here to see what we found out in previous years.

<http://flusurvey.org.uk/>

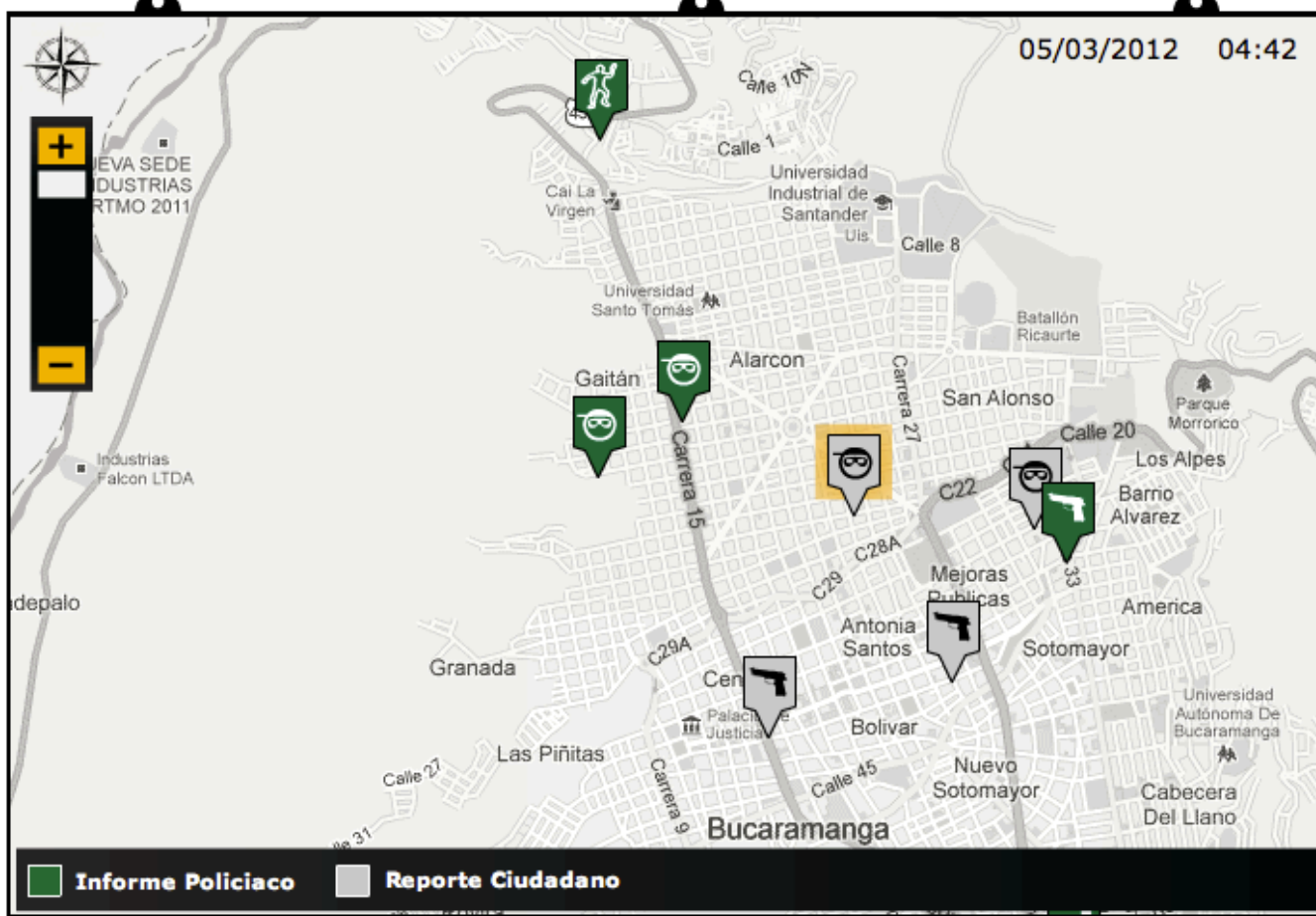
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 **Fletero:**  
25 de enero de 2012  
Carrera 33 con calle 34 +

 **Homicidio:**  
Jueves 26 de enero  
Cll 16AN con Cr 22 Barrio +

 **Homicidio:**  
Lunes 16 de enero  
Vereda La Colina en Ruit +

 **Homicidio:**  
Domingo 15 de enero  
Zona Industrial de Chimit +

 **Homicidio:**  
Viernes 13 de enero  
Cr 59 con Cll 22 Barrio La +

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# SCHOOL OF ANTS

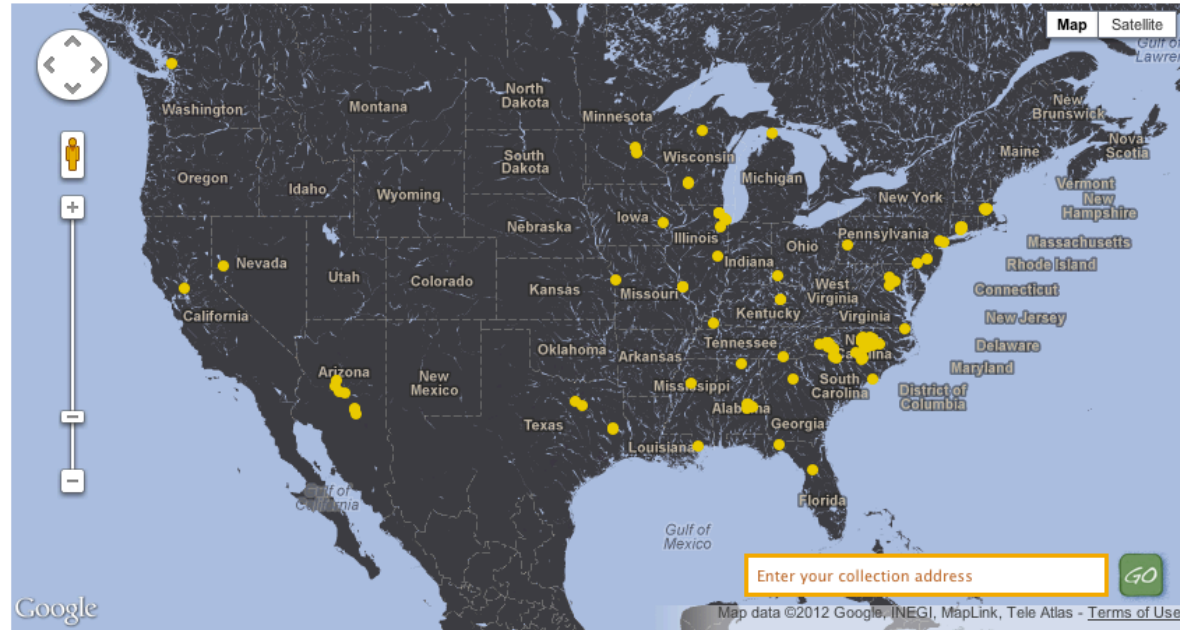
GET STARTED >> ENTER MY DATA >> SEE MY ANTS



ABOUT PARTICIPATE! DISCOVERIES MORE ABOUT ANTS FAQ CONTACT LOG IN REGISTER

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/>



## ABOUT THE SCHOOL OF ANTS



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- <http://www.citizensciencealliance.org/>
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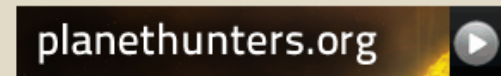
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**Compare by**

- Search terms
- Locations
- Time Ranges

**Search terms**

Tip: Use the plus sign to indicate OR, (terms) + squash

All search terms  
+ Add search term

**Filter**

Web Search  
Worldwide  
2004 - present  
All Categories

See what the world is searching for.

With Google Insights for Search, you can compare search volume patterns across specific regions, categories, time frames and properties. See examples of how you can use Google Insights for Search.

**Categories**  
Use specific categories, like fitness, health and sports.  
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**Seasonality**  
Demand for your business so you can budget and plan accordingly.  
Examples: digital camera in 2007, 2006... | laptop in 2006 vs. 2007

**Geographic distribution**  
Know where to find your customers. See how search volume is distributed across regions and cities.  
Examples: tickets in different US metro areas | pizza in Italy vs. the USA

**Properties**  
See search patterns in other Google properties.  
Examples: Rising product searches in the USA (last 30 days) | News highlights from the last 7 days (USA)

More examples

Top searches in France (last 30 days)  
mac.os, windows.vista  
traffic, legs, sperm  
albata, globalissues  
portico, buick, cardillac  
pasma.tv, led.tv  
ama.michael.smith  
blue.ray, hot.tot  
doctor.who, bertelskar, galactica  
armia.sorenstam, michela.wie  
apartment  
transformo, beckham

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

Web Search Interest: citizen science

Worldwide, 2004 - present

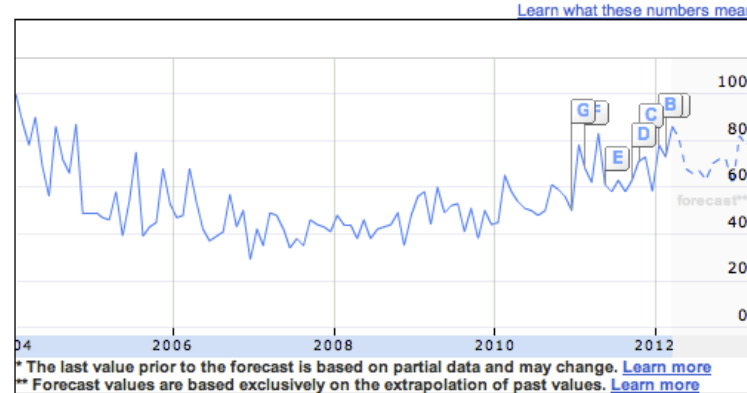
Categories: [Science \(10-25%\)](#), [Jobs & Education \(0-10%\)](#), [Law & Government \(0-10%\)](#), [more...](#)

Totals ?  
citizen science 56

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- An improvement to our geographical assignment was applied retroactively from 1/1/2011. [Learn more](#)

Interest over time

Forecast  News headlines



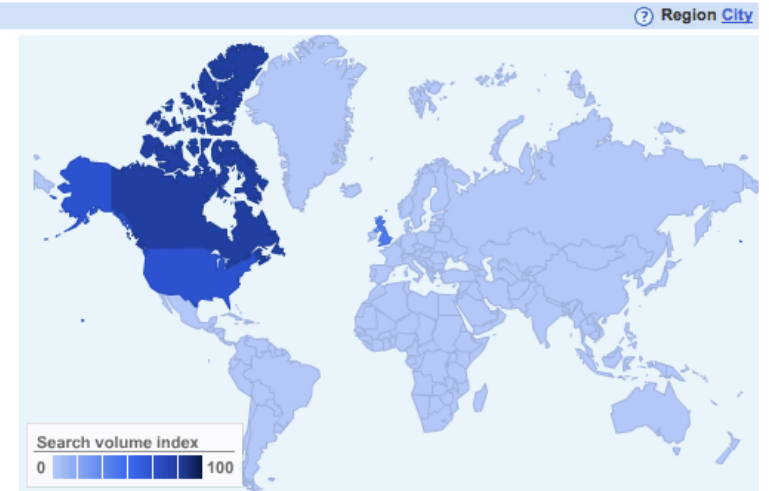
See worldwide top rising searches by [clearing the search terms](#)

- 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 ...](#)

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Regional interest

|                                   |     |
|-----------------------------------|-----|
| 1. <a href="#">Canada</a>         | 100 |
| 2. <a href="#">United States</a>  | 80  |
| 3. <a href="#">United Kingdom</a> | 49  |



Search terms

| Top searches                                |     | Rising searches                             |          |
|---|-----|---|----------|
| 1. <a href="#">citizen science projects</a> | 100 | 1. <a href="#">citizen science canada</a>   | Breakout |
| 2. <a href="#">citizen science project</a>  | 70  | 2. <a href="#">citizen science program</a>  | Breakout |
| 3. <a href="#">cornell citizen science</a>  | 50  | 3. <a href="#">citizen science project</a>  | Breakout |
| 4. <a href="#">citizen science canada</a>   | 50  | 4. <a href="#">citizen science projects</a> | Breakout |
| 5. <a href="#">citizen science program</a>  | 45  | 5. <a href="#">cornell citizen science</a>  | Breakout |



**Compare by**

- Search terms
- Locations
- Time Ranges

**Search terms**

Tip: Use the plus sign to indicate OR, (terms + squash)

All search terms  
+ Add search term

**Filter**

- Web Search
- Worldwide
- 2004 - present
- All Categories

Search

See what the world is searching for.

With Google Insights for Search, you can compare search volume patterns across specific regions, categories, time frames and properties. See examples of how you can use Google Insights for Search.

**Categories**

Narrow data to specific categories, like finance, health, and sports.  
Examples: Summer blockbuster movies in the USA in 2008, 2007, 2006 | Top Newspapers in the UK

**Seasonality**

Analyze demand for your business so you can budget and plan accordingly.  
Examples: digital camera in 2007, 2006... | apple in 2006 vs. 2007

**Geographic distribution**

Know where to find your customers. See how search volume is distributed across regions and cities.  
Examples: tickets in different US metro areas | pizza in Italy vs. the USA

**Properties**

See search patterns in other Google properties.  
Examples: Rising product searches in the USA (last 30 days) | News highlights from the last 7 days (USA)

**More examples**

- Top searches in France (last 30 days)
- mac os, windows vista
- traffic, tags, spam
- alibaba, globesources
- portland, buick, cadillac
- plasma tv, lcd tv
- anna nicole smith
- blue ray, hd dvd
- doctor who, battleship celiacica
- annika sorensen, michelle vie
- advertiser
- ronaldinho, beckham

The categorization taxonomy of Google Insights for Search has been updated during December 2011. [Learn more](#)

**Web Search Interest: crowdsource**

Worldwide, 2004 - present

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

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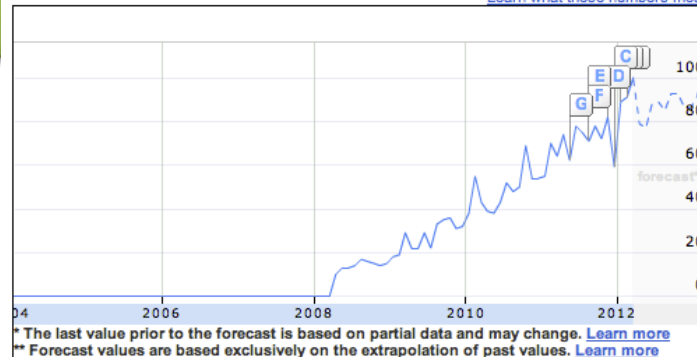
An improvement to our geographical assignment was applied retroactively from 1/1/2011. [Learn more](#)

| Totals      |    |
|-------------|----|
| crowdsource | 29 |

**Interest over time**

Forecast  News headlines

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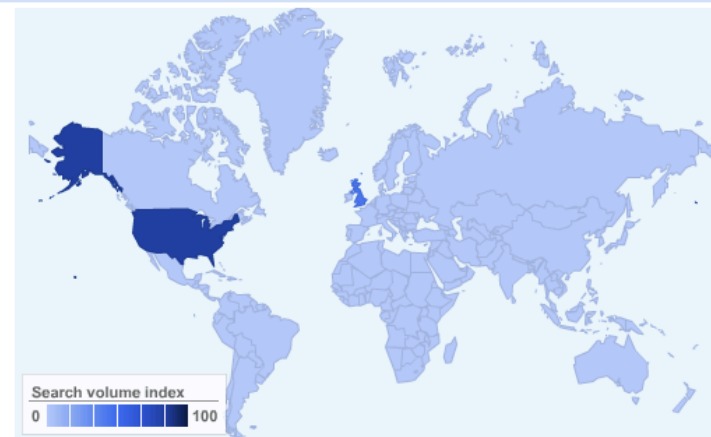
See worldwide top rising searches by clearing the search terms

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- B [CrowdSource, LLC Launches Write.com](#)
- C [Irreverent atheists crowdsource charitable giving](#)
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- 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. | <a href="#">United States</a>  | 100 |
| 2. | <a href="#">United Kingdom</a> | 52  |



[View change over time](#)

**Search terms**

**Top searches**

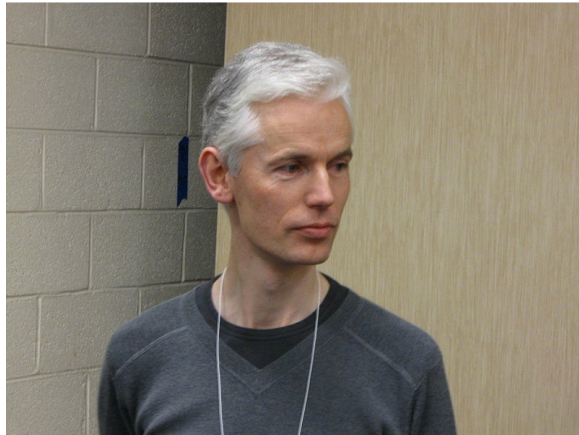
|    |   |     |
|----|---|-----|
| 1. | <a href="#">crowdsourcing</a>           | 100 |
| 2. | <a href="#">crowdsource design</a>      | 80  |
| 3. | <a href="#">crowdsource logo</a>        | 60  |
| 4. | <a href="#">crowd source</a>            | 40  |
| 5. | <a href="#">logo design crowdsource</a> | 35  |
| 6. | <a href="#">how to crowdsource</a>      | 25  |
| 7. | <a href="#">crowdsource funding</a>     | 25  |

**Rising searches**

|    |   |          |
|----|---|----------|
| 1. | <a href="#">crowd source</a>            | Breakout |
| 2. | <a href="#">crowdsource design</a>      | Breakout |
| 3. | <a href="#">crowdsource funding</a>     | Breakout |
| 4. | <a href="#">crowdsource logo</a>        | Breakout |
| 5. | <a href="#">crowdsourcing</a>           | Breakout |
| 6. | <a href="#">how to crowdsource</a>      | Breakout |
| 7. | <a href="#">logo design crowdsource</a> | Breakout |







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



## Gowers's Weblog

Mathematics related discussions

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[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



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# 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".<sup>[1]</sup>

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*×*n*×*n*×...×*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 **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, ..., *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  $W_3^2$  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 2*x*, 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<sup>8</sup> = 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]

- [1 Proof of Hales–Jewett theorem \(in a special case\)](#)
- [2 Connections with other theorems](#)
- [3 See also](#)
- [4 References](#)
- [5 External links](#)

## 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**.

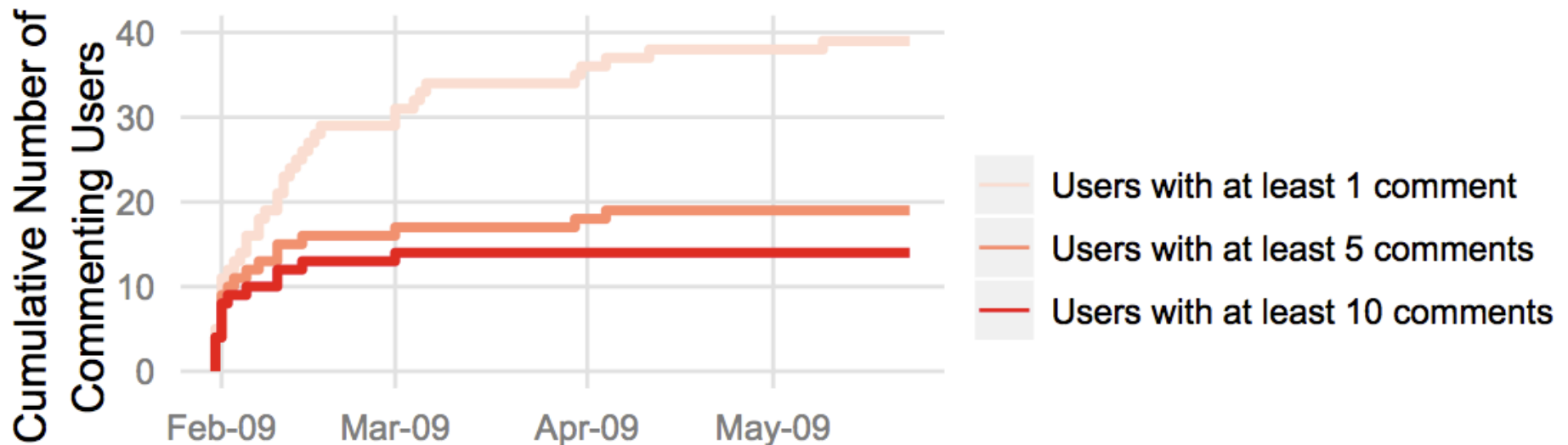
Each element of the **hypercube**  $W_3^8$  is a string of eight numbers from 1 to 3, e.g. 13211321 is an element of the **hypercube**. We are assuming that this **hypercube** is completely filled with "noughts" and "crosses". We shall use a **proof by contradiction** and assume that neither the set 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

<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 ”

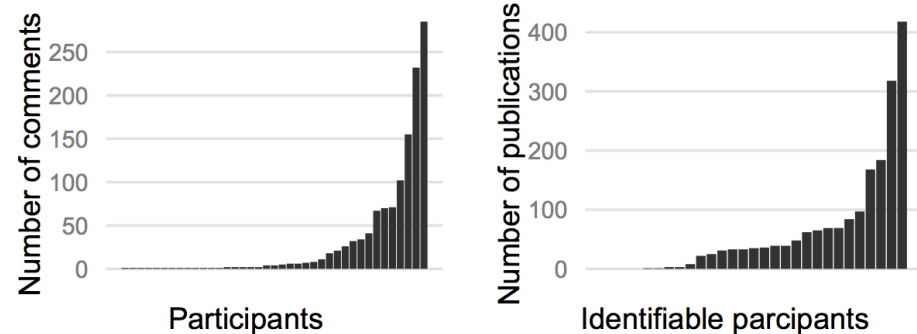
<http://gowers.wordpress.com/2009/01/27/is-massively-collaborative-mathematics-possible/>

- 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 recién llegados que aportan ideas frescas



<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 recién 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**



# 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  $\{1, \dots, k\}^n$  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 Szemerédi 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 Szemerédi'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 Szemerédi's theorem.

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| 2 | <a href="#">2011arXiv1105.2419D</a><br>Dodds, Pandelis; Kanellopoulos, Vassilis; Tyros, Konstantinos | 1.000 Dense subsets of products of finite trees                               | 05/2011 | <a href="#">A</a> <a href="#">X</a> <a href="#">R</a>                                     |
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| 5 | <a href="#">2010arXiv1003.2978C</a><br>Croot, Ernie; Sisask, Olof                                    | 1.000 A probabilistic technique for finding almost-periods of convolutions    | 03/2010 | <a href="#">A</a> <a href="#">X</a> <a href="#">R</a> <a href="#">C</a> <a href="#">U</a> |
| 6 | <a href="#">2009arXiv0912.1150P</a><br>Pór, Attila; Wood, David R.                                   | 1.000 On Visibility and Blockers  | 12/2009 | <a href="#">A</a> <a href="#">X</a> <a href="#">R</a> <a href="#">C</a> <a href="#">U</a> |

# 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 *density Hales–Jewett number*  $Sc_{\{n,k\}}$  is defined as the size of the largest subset of the cube  $[k]^n := \{1, \dots, k\}^n$  which contains no combinatorial line; similarly, the *Moser number*  $Sc'_{\{n,k\}}$  is the largest subset of the cube  $[k]^n$  which contains no geometric line. A deep theorem of Furstenberg and Katznelson shows that  $Sc_{\{n,k\}} = So(k^n)$  as  $n \rightarrow \infty$  (which implies a similar claim for  $Sc'_{\{n,k\}}$ ); 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  $Sc_{\{n,k\}}$  and  $Sc'_{\{n,k\}}$  for small  $n, k$ . For instance the sequence  $Sc_{\{n,3\}}$  for  $n=0, \dots, 6$  is  $1, 2, 6, 18, 52, 150, 450$ , while the sequence  $Sc'_{\{n,3\}}$  for  $n=0, \dots, 6$  is  $1, 2, 6, 16, 43, 124, 353$ . We also prove some results for higher  $k$ 's, showing for instance that an analogue of the LYM inequality (which relates to the  $k = 2$  case) does not hold for higher  $k$ 's, and also establishing the asymptotic lower bound  $Sc_{\{n,k\}} \geq k^n \exp(-O(\sqrt{\ell})) \log n$  where  $\ell$  is the largest integer such that  $2k > 2^{\ell}$ .

Comments: 49 pages. To appear, Szemerédi 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

## 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  $I_p$ ? 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](#).

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  $\ell$  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  $\ell$  going through  $P$  such that the resulting windmill uses each point of  $S$  as a pivot infinitely many times.

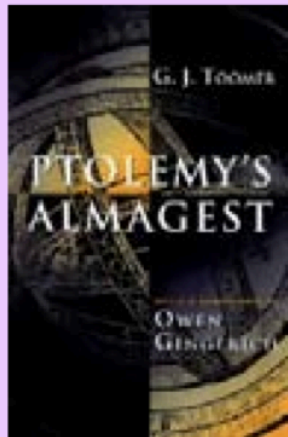
The comments to this post shall serve as the research thread for the project, in which participants are encouraged to post their thoughts and comments on the problem, even if (or especially if) they are only partially conclusive. Participants are also encouraged to visit the [discussion thread](#) for 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:

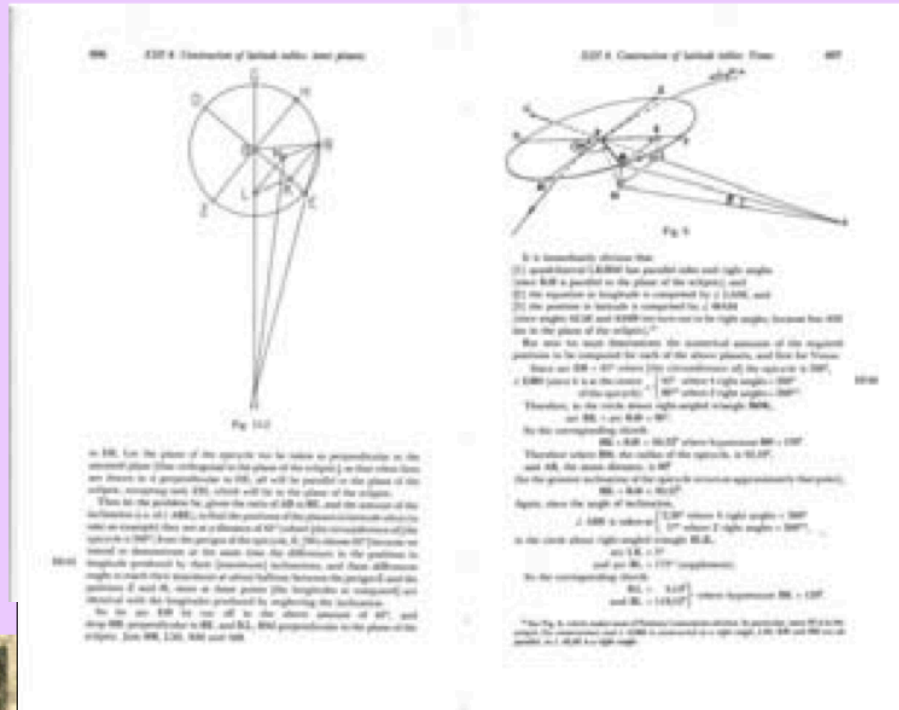
1. **All are welcome.** Everyone (regardless of mathematical level) is welcome to participate. Even very simple or “obvious” comments, or comments that help clarify a previous observation, can be valuable.
2. **No spoilers!** It is inevitable that solutions to this problem will become available on the 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.



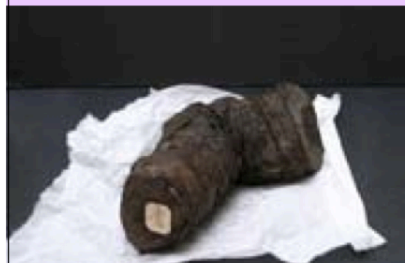


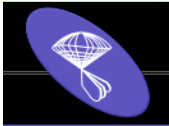


Best translation:  
G. J. Toomer, 1984 (paperback 1998)



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(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](#).

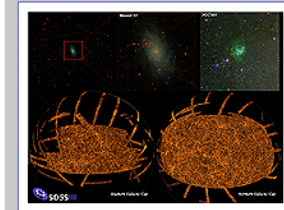
During its first phase of operations, 2000-2005, the SDSS imaged more than 8,000 square degrees of the sky in five optical bandpasses, and it obtained spectra of galaxies and quasars selected from 5,700 square degrees of that imaging. It also obtained repeated imaging (roughly 30 scans) of a 300 square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

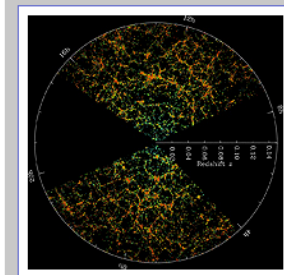
### Images of the SDSS (click for more information)



The Final Survey



The Whirlpool Galaxy (M51)



SDSS Galaxy Map

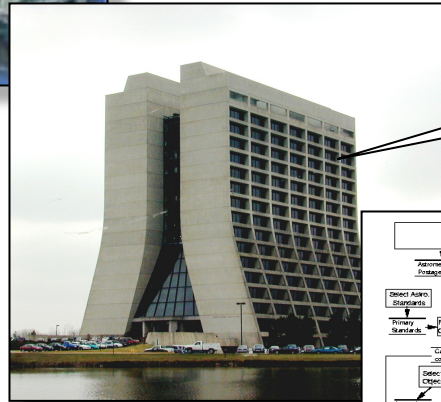
SDSS data have contributed to more than 2000 articles in refereed journals, with more than 70,000 citations. More than 70 PhD theses based on SDSS data were completed under the supervision of SDSS participants (and probably many more with public data).



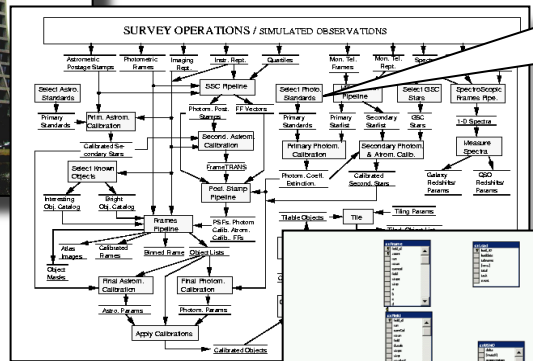
# Data Flow (Datos en varios niveles)



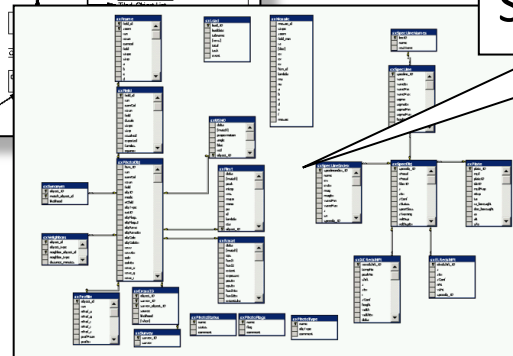
Pixel data collected by telescope



Sent to Fermilab for processing



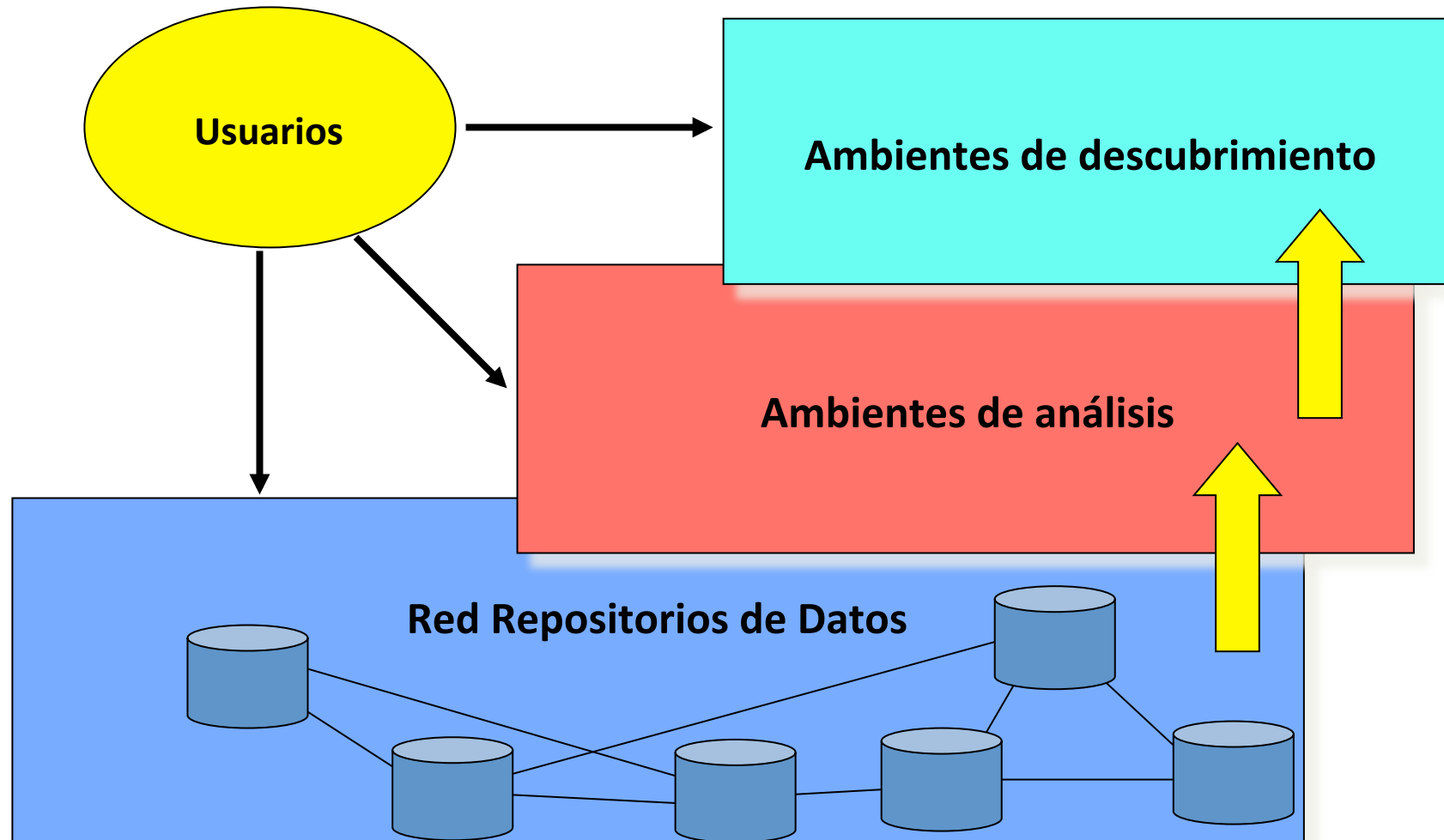
Beowulf Cluster produces catalog



Loaded in a SQL database



# VO: Arquitectura Conceptual



collaboration:'SDSS'

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### 1. The Sloan Digital Sky Survey: Technical Summary.

(2905) SDSS Collaboration (Donald G. York (Chicago U., Astron. Astrophys. Ctr.) *et al.*). Sep 2000. 23 pp.

astro-ph/0006396,FERMILAB-PUB-01-319-A.

Published in *Astron.J.* **120** (2000) 1579-1587

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### 2. Cosmological parameters from SDSS and WMAP.

(1777) SDSS Collaboration (Max Tegmark (Pennsylvania U. & MIT) *et al.*). Oct 2003.

astro-ph/0310723,FERMILAB-PUB-03-435-A.

Published in *Phys.Rev.* **D69** (2004) 103501

e-Print: [astro-ph/0310723](#)

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### 3. Detection of the baryon acoustic peak in the large-scale correlation function of SDSS luminous red galaxie

(1437) SDSS Collaboration (Daniel J. Eisenstein (Arizona U.) *et al.*). Jan 2005.

astro-ph/0501171,FERMILAB-PUB-05-057-A-CD.

Published in *Astrophys.J.* **633** (2005) 560-574

e-Print: [astro-ph/0501171](#)

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[Detailed record](#) - [Cited by 1437 records](#)

### 4. The Sloan Digital Sky Survey: Early Data Release.

(1270) SDSS Collaboration (Chris Stoughton (Fermilab) *et al.*). Jan 2002. 64 pp.

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Published in *Astron.J.* **123** (2002) 485-548

[References](#) | [BibTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [Harvmac](#) | [EndNote](#)

[Journal Server](#) - Astron.J.; [ADS Abstract Service](#)

[Detailed record](#) - [Cited by 1270 records](#)

### 5. The u'g'r'i'z' Standard star system.

(896) SDSS Collaboration (J Allyn Smith *et al.*). Feb 2002. 50 pp.

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Published in *Astron.J.* **123** (2002) 2121-2144

e-Print: [astro-ph/0201143](#)

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Known papers (10-49)

Less known papers (1-9)

Unknown papers (0)

collaboration:'WMAP'

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### 1. First year Wilkinson Microwave Anisotropy Probe (WMAP) observations: Determination of the cosmological parameters

(6336) WMAP Collaboration (D.N. Spergel *et al.*). Feb 2003. 20 pp.  
astro-ph/0302209.  
Published in *Astrophys.J.Suppl.* 148 (2003) 175-194  
e-Print: astro-ph/0302209

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### 2. Wilkinson Microwave Anisotropy Probe (WMAP) three year results: implications for cosmology

(4795) WMAP Collaboration (D.N. Spergel *et al.*). Mar 2006. 89 pp.  
astro-ph/0603449.  
Published in *Astrophys.J.Suppl.* 170 (2007) 377  
e-Print: astro-ph/0603449

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### 3. Five-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Cosmological Parameters

(3047) WMAP Collaboration (E. Komatsu (Texas U.) *et al.*). Mar 2008. 49 pp.  
Published in *Astrophys.J.Suppl.* 180 (2009) 330-376  
e-Print: arXiv:0803.0547 [astro-ph]

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### 4. First year Wilkinson Microwave Anisotropy Probe (WMAP) observations: Preliminary maps and basic results.

(3044) WMAP Collaboration (C.L. Bennett *et al.*). Feb 2003. 42 pp.  
astro-ph/0302207.  
Published in *Astrophys.J.Suppl.* 148 (2003) 1  
e-Print: astro-ph/0302207

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[Detailed record](#) - Cited by 3044 records

### 5. Seven-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Cosmological Interpretation.

(2173) WMAP Collaboration (E. Komatsu (Texas U.) *et al.*). Jan 2010. 48 pp.  
Published in *Astrophys.J.Suppl.* 192 (2011) 18  
e-Print: arXiv:1001.4538 [astro-ph.CO]

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## Going public

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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.

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.

In astrophysics, by contrast, observatories like NASA's Hubble Space Telescope are generally at the disposal



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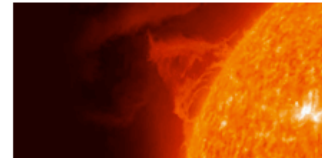
**How do galaxies form?**  
NASA's Hubble Space Telescope archive provides hundreds of thousands of galaxy images.

GALAXY ZOO



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We hope to study the lunar surface in unprecedented detail.

MOON ZOO



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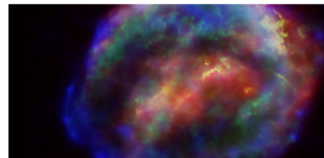
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**How do galaxies merge?**  
One important area of research in astronomy studies the role of interacting galaxies.

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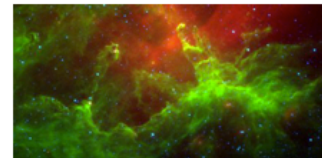
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10 January 2012 by [Chris](#), 2 Comments



Every January, a travelling circus of astronomers and their friends rolls into an American city. This travelling carnival, the winter meeting of the American Astronomical Society, brings together literally thousands of people, ostensibly to give talks about cutting edge research, but more importantly to meet, greet, gossip and collaborate. Eli Bressert (Milky Way Project) & [...]

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21 December 2011 by [admin](#), 2 Comments



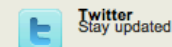
A Clerihew is a whimsical, four-line biographical poem invented by Edmund Clerihew Bentley. We had fun hearing your Haiku last week, so about some science- and Zooniverse-based Clerihews? One of the best known examples is: Sir Christopher Wren Said, "I am going to dine with some men. If anyone calls Say I am designing St. [...]

## Zooniverse Cocktail Hour

20 December 2011 by [Robert Simpson](#), 1 Comment



Our advent calendar gets really festive today with the publication of Zooniverse Cocktails. If you make any of



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### Quick Links to Other Zooniverse Project Blogs

[Galaxy Zoo](#), [IceHunters](#), [Moon Zoo](#), [Old Weather](#), [Planet Hunters](#), [Solar Storm Watch](#), [The Milky Way Project](#)

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### Twitter: The\_Zooniverse

[@EchoLilyMai](#) For the sweepstake, yes. Aliens might be available for all. 06:24:23 PM February 29, 2012 in reply to [EchoLilyMai](#)

RT [@GeertMcTwit](#): I thought [@the\\_zooniverse](#) had already reached the awesomest level of awesomeness, but the awesomeness is now epic: [http://t.co/e5EFaGVs](#) - it's citizen science for SETI 01:48:13 PM February 29, 2012

Along with [#TED](#) and the [@SETIInstitute](#) we've launched [@SETILive](#) [http://t.co/e5EFaGVs](#) - it's citizen science for SETI 01:48:13 PM February 29, 2012

Excited to be talking about [@the\\_zooniverse](#) at Public Participation in Scientific Research this August: [http://t.co/FXGuQ13L](#) (via [@arfon](#)) 02:03:38 AM February 15, 2012

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### Posts from Around the Zoo

#### Planet Hunters Blog: 2nd Planet Hunters Paper Submi

Way back in January I blogged about our announcement of two new candidates, confidently predicting that the paper would be out in the next few days. That didn't happen for all sorts of reasons, but it's now submitted to the Astronomical Journal. Rath...

#### Moon Zoo Blog: Schiller Crater

<http://blogs.zooniverse.org/>







## Welcome to Galaxy Zoo, where you can help astronomers explore the Universe

Galaxy Zoo: Hubble uses gorgeous imagery of hundreds of thousands of galaxies drawn from NASA's Hubble Space Telescope archive. To understand how these galaxies, and our own, formed we need your help to classify them according to their shapes — a task at which your brain is better than even the most advanced computer. If you're quick, you may even be the first person in history to see each of the galaxies you're asked to classify.

More than 250,000 people have taken part in Galaxy Zoo so far, producing a wealth of valuable data and sending telescopes on Earth and in space chasing after their discoveries. The images used in Galaxy Zoo: Hubble are more detailed and beautiful than ever, and will allow us to look deeper into the Universe than ever before. To begin exploring, click the 'How To Take Part' link above, or read [The Story So Far](#) to find out what Galaxy Zoo has achieved to date.

Thanks for your help, and happy classifying.

*The Galaxy Zoo team.*

### Classifier Log In

[Click here to log in](#)

- [Register](#)
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### Explore galaxies

Enter a search term

### Latest News

#### Galaxy Zoo classifications in SDSS Database

by Karen Masters - Jan 12, 2011

The latest release of data from the Sloan Digital Sky Survey happened yesterday (SDSS3 blog article about the release).

This ...

- » Voorwerpje paper submitted
- » 365 Days of Astronomy Podcast – Do Bars Kill Spirals?
- » More on our fake AGN
- » Galaxy Zoo classifications in SDSS Database



Kevin Schawinski



Chris Lintott



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.

## 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.

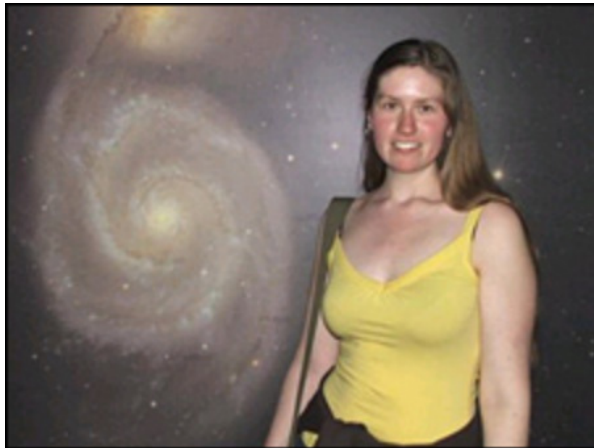
Each of the questions we ask is designed to get more useful information about the galaxies that lurk in the lma shapes of ellipticals contain information about their past, and many spiral galaxies have bars across their centres, our own Milky Way galaxy. How these bars formed, how long they exist, and what their connection is to galaxy evolution 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 more? How tightly wound are the spiral arms? Does the galaxy have a 'boxy' or a 'rounded' bulge? How many galaxies with 'irregular' morphologies? Answering these questions about every galaxy, one galaxy at a time, is essential if we want 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 galaxy shapes in Hubble data sets have noticed a greater number of irregular galaxies, and so we want to make a 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 detailed shape information for almost all the galaxies the Hubble Space Telescope has ever seen. Such a database is a 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 some objects.



Hanny Van Arkel

CONSTRUIAMOS FUTURO

### 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](#).

Scholar

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**[Galaxy Zoo: morphologies derived from visual inspection of galaxies from the Sloan Digital Sky Survey★](#)**[\[PDF\] from arxiv.org](#)

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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



# Gracias...

