

A Case for the Coordination of the e-Science Ecosystem

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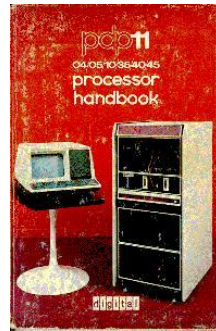
*Universidade Federal de Campina Grande
Departamento de Sistemas e Computação
Laboratório de Sistemas Distribuídos*

e-Science = Science supported by ICT



processing & storage

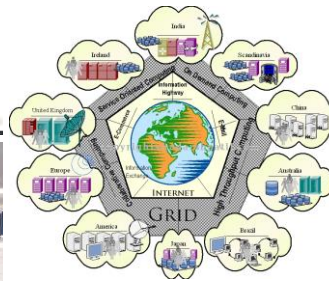
1940's-1970's



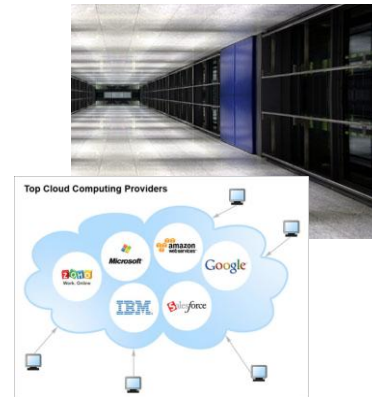
1960's-1980's



1980's-present

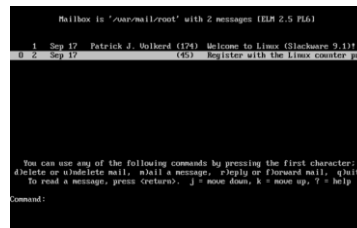


1990's-present



Mid 2000's-present

communication & cooperation



High Performance Scientific Computing in Clusters, Grid, and Cloud
Computing Systems, Montivideo, November 8th, 2012

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Big science



Large-scale forest fires are a major threat to the world's forests, which are the lungs of our planet.

[illegible]

Source: Popular Science, <http://www.popsci.com/>

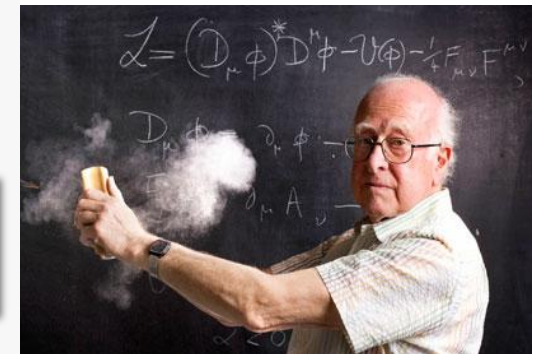
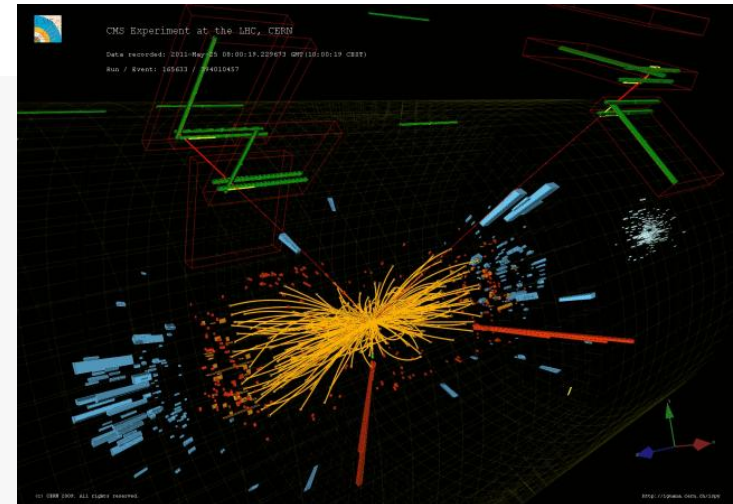
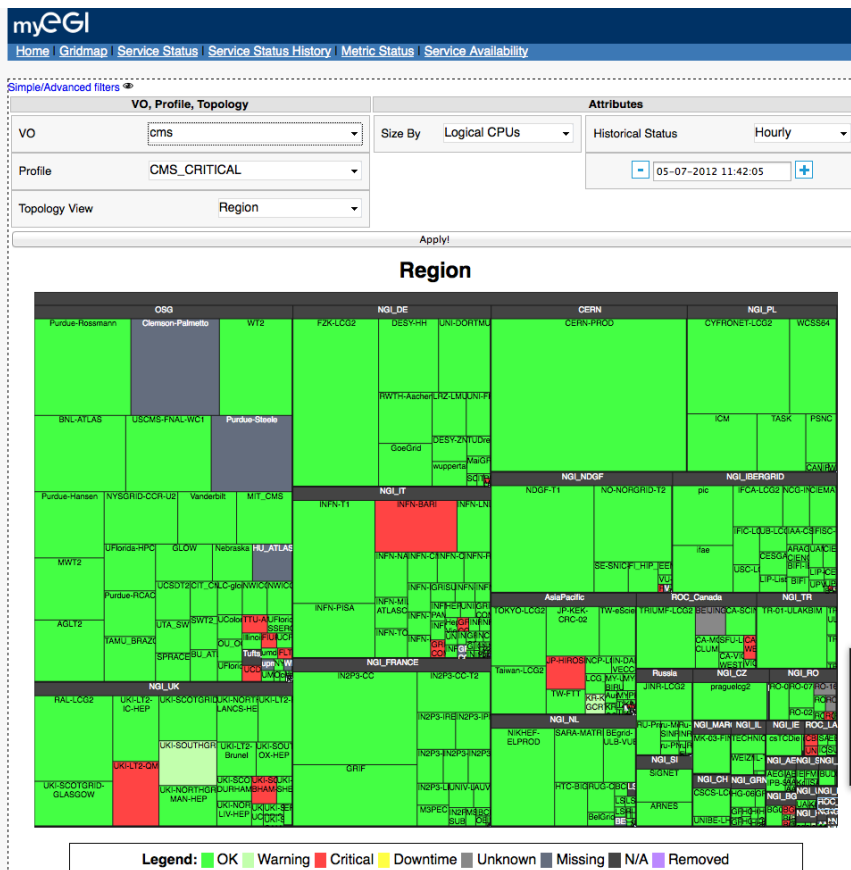
High Performance Scientific Computing in Clusters, Grid, and Cloud
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Success stories

- Higgs boson



ROC_IGALC

Logical CPUs: 207

UFRJ-IF	140
ULA-MERIDA	48
EELA-UNLP	10
UFCC-LSO	1
CEFEI-AJ	1

What about “small” science?

IEEE TRANSACTIONS ON COMPUTERS, VOL. 60, NO. 12, DECEMBER 2011

1759

9 CONCLUSION AND FUTURE DIRECTIONS

In this paper, a class of general utility functions are proposed under the UAM⁺ model to capture and characterize the interplay between computation and communication in DRTSs. A DDA technique is proposed to fully and effectively explore the interplay and help resource managers proceed toward utility accrual. Based on the DDA technique, a distributed resource scheduling algorithm called *IDRSA* is developed. *IDRSA* is constructed based on a two-level scheduling framework and it also incorporates a new data structure called the TIT. The TIT can effectively reduce the costs of schedulability tests for tasks and messages while the two-level scheduling framework can facilitate parallel processing for resource scheduling in DRTSs. Our extensive simulations show that *IDRSA* exhibits excellent performance, and it is even more effective when the load of computation is heavy and/or the interplay between computation and communication is tight.

Abstract—In D activities. The ti computations re inherently a key accrual model U is proposed to f *IDRSA*, which ir scheduling fram the cost of resou tree to effectivel *IDRSA*, especial

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s under the utility
adjustment (DDA)
gorithm called
is a two-level
so as to reduce
d testing interval
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ation is tight.

Big gap!

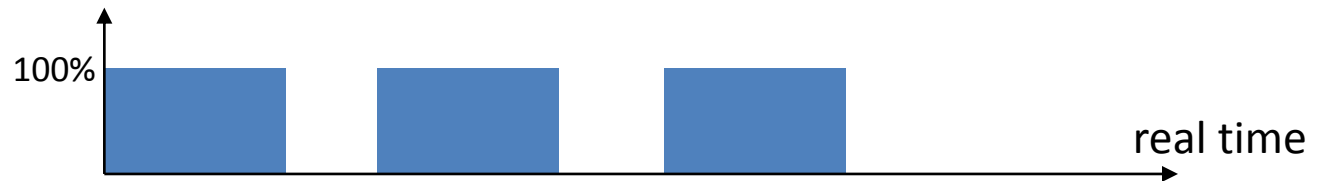
- How to “survive” without appropriate access to ICT?
- Not just lack of resources, but also lack of qualified scientists
 - e-Science requires a **change in mentality**
 - Access to computing resources needs to be widespread
 - if not to provide a fairer “battlefield”, **at least to support adequate training**

How can we reduce this gap?

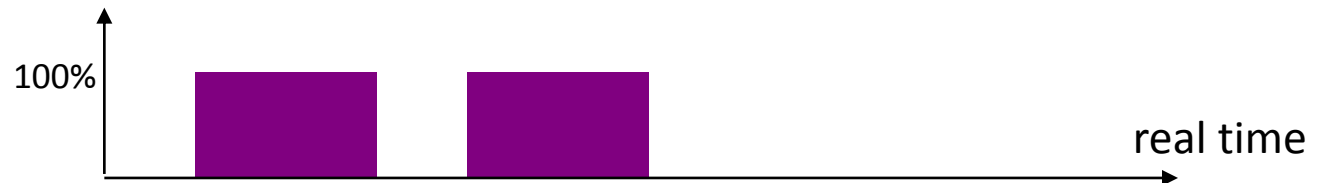
Leverage self-interest

- Peer-to-peer grids (and clouds!)

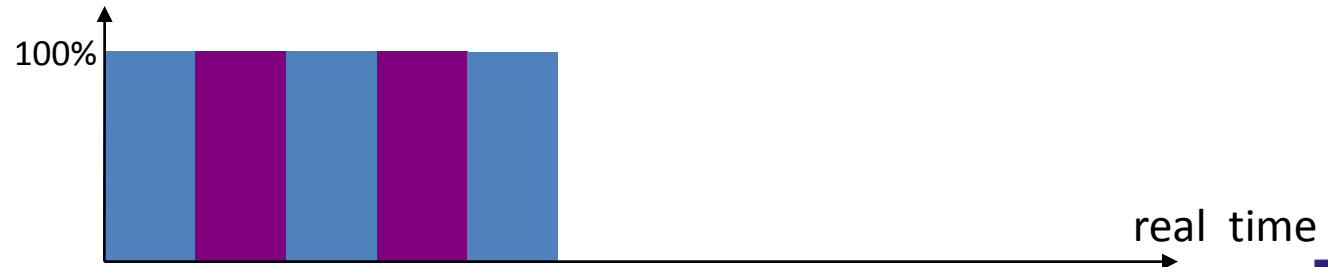
CPU utilization in Lab A



CPU utilization in Lab B

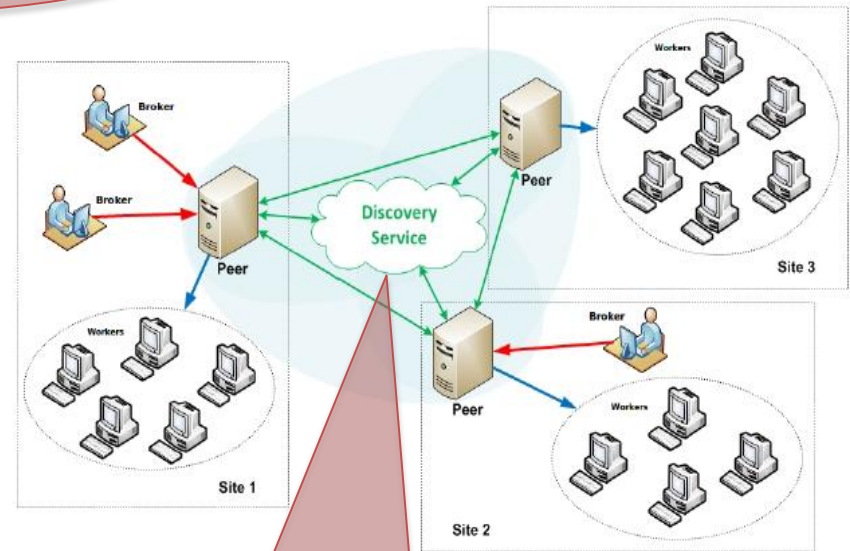


CPU utilization in the peer-to-peer grid formed by Lab A and Lab B



Leverage symbiosis

**This is a typical cluster
where BoT jobs are
hated!**



**... and this is a typical
opportunistic P2P grid
where BoT jobs are
loved!**

“Render unto Caesar the things which are Caesar's, and unto God the things that are God's” (Matthew, 22:21)

Table 1 Mean makespan for baseline scenario: Grids working independently

Grid type	Contention	Mean makespan (s)
Service	Low	67,882
Service	High	154,719
Opportunistic with NoF	Low	35,197
Opportunistic with NoF	High	66,559

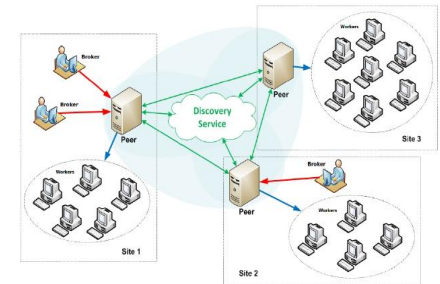
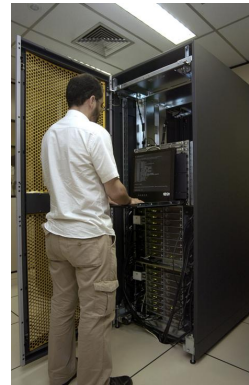


Table 5 Mean makespan for full interoperability with arbitration

Contention		Grid type			
Service	Opportunistic	Service		Opportunistic	
		Mean makespan (s)	Relative benefit	Mean makespan (s)	Relative benefit
Low	Low	43,234	1.57	36,332	0.97
Low	High	43,254	1.57	43,241	1.54
High	Low	44,268	3.50	36,955	0.95
High	High	44,595	3.47	45,145	1.47

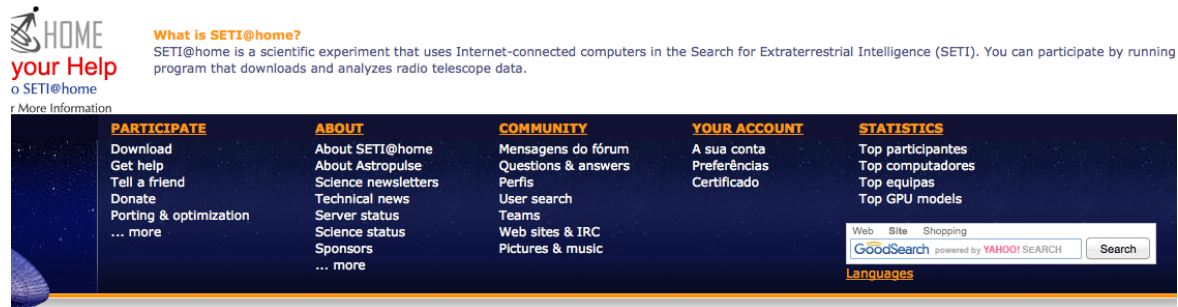
Francisco Vilar Brasileiro, Matheus Gaudencio, Rafael Silva, Alexandre Duarte, Diego Carvalho, Diego Scardaci, Leandro Neumann Ciuffo, Rafael Mayo, Herbert Hoeger, Michael Stanton, Raul Ramos, Roberto Barbera, Bernard Marechal, Philippe Gavillet: **Using a Simple Prioritisation Mechanism to Effectively Interoperate Service and Opportunistic Grids in the EELA-2 e-Infrastructure.** Journal of Grid Computing. 9(2): 241-257 (2011).

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Leverage altruism

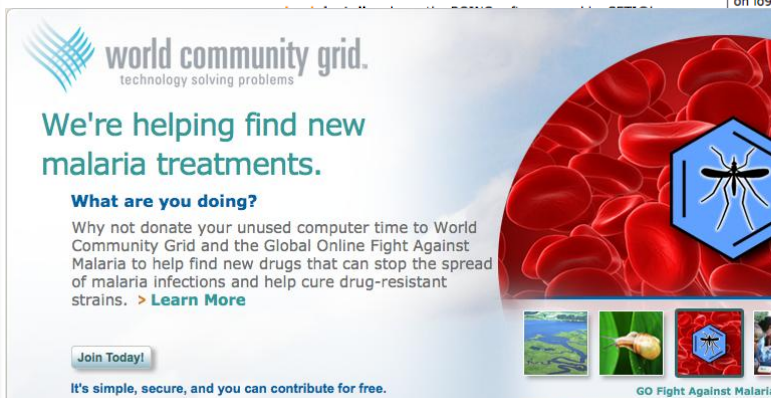


HOME
your Help
o SETI@home
r More information

What is SETI@home?
SETI@home is a scientific experiment that uses Internet-connected computers in the Search for Extraterrestrial Intelligence (SETI). You can participate by running program that downloads and analyzes radio telescope data.

PARTICIPATE	ABOUT	COMMUNITY	YOUR ACCOUNT	STATISTICS
Download Get help Tell a friend Donate Porting & optimization ... more	About SETI@home About Astropulse Science newsletters Technical news Server status Science status Sponsors ... more	Mensagens do fórum Questions & answers Perfis User search Teams Web sites & IRC Pictures & music	A sua conta Preferências Certificado	Top participantes Top computadores Top equipas Top GPU models

Web Site Shopping
GoodSearch powered by YAHOO! SEARCH Search
Languages



world community grid.
technology solving problems

We're helping find new malaria treatments.

What are you doing?
Why not donate your unused computer time to World Community Grid and the Global Online Fight Against Malaria to help find new drugs that can stop the spread of malaria infections and help cure drug-resistant strains. [Learn More](#)

Join Today!

It's simple, secure, and you can contribute for free.

GO Fight Against Malaria



ibercivis
Plataforma de computación ciudadana

Colabora en proyectos científicos y forma parte del mayor ordenador ciudadano

Mapa de Usuarios
Haz clic sobre el mapa para verlo en detalle

Ibercivis CienciaCiudadana Investigación Prensa y Divulgación Red Social Tu cuenta Premios Estadísticas

Vídeo Amiloide
La aplicación Amiloide del Proyecto Ibercivis presenta este vídeo sobre el proceso de Investigación y desarrollo de fármacos, las enfermedades neurodegenerativas y la necesidad de alta potencia de cálculo para realizar las simulaciones previas en ordenador.
[\[ver vídeo\]](#)

Destacamos
Colabora con la ciencia
La Sociedad, área de estudio del grupo de Redes Complejas del BIFI.
social.ibercivis.es

Únete a Ibercivis
Cualquier persona o colectivo (colegios, instituciones públicas...) puede unirse al proyecto de computación voluntaria. [\[Únete en solo cinco pasos\]](#)

HELP

What's New
Thank you World Community Grid members!

Who We Are
World Community Grid brings people together from across the globe to create the largest non-profit computing grid benefiting humanity. It does this by pooling surplus computer processing power. We believe that innovation combined with visionary

How You Can Help
Download and install secure, free software that captures your computer's spare power when it is on, but idle. You will then be a World Community Grid volunteer. It's that simple! Just click the "Join Today" button below.

Webcast Replay

- Organizadores
- Patrocinadores
- Colaboradores

- Contacto
- Privacidad

Scientific dissemination

- This is a key requirement for the success of volunteer computing infrastructures
 - Gather more resources
- Create society awareness about the scientific activity
 - Increase the interest of youngsters for the scientific career
 - Get explicit scientific contribution from the citizens
 - **Citizen science**

Where's Wally?



Citizen science projects

659,084 people taking part worldwide

Projects ▾ About us ▾ Sign in Register

ZOONIVERSE
REAL SCIENCE ONLINE





Take part in
Science Projects

Experiment in
Laboratory

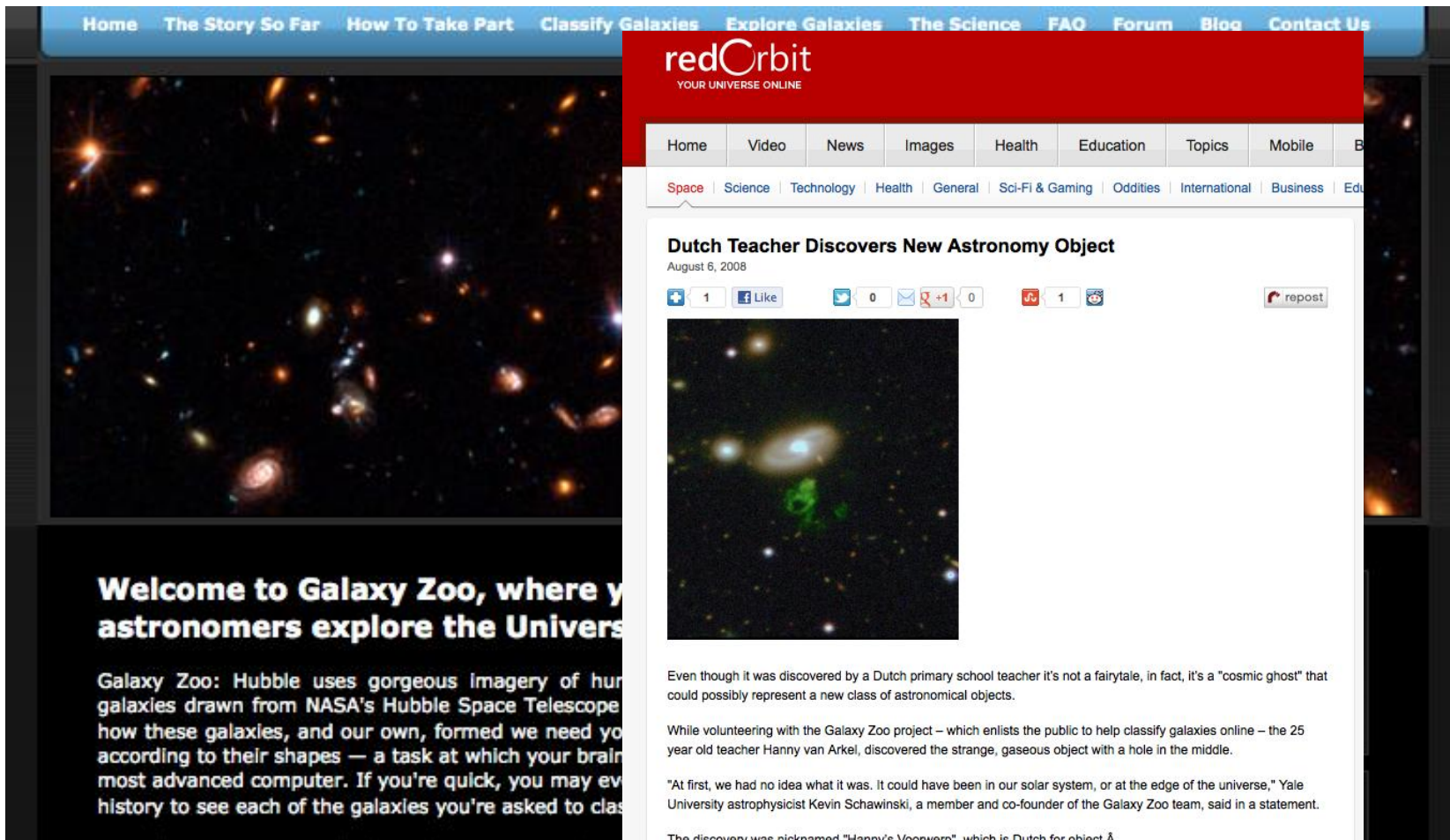
ancientlives.org

Discover the lives of Ancient Greeks

[View details](#)

Space	Climate	Humanities	Nature
			
How do galaxies form? NASA's Hubble Space Telescope archive provides hundreds of thousands of galaxy images. GALAXY ZOO	Model Earth's climate using wartime ship logs Help scientists recover worldwide weather observations made by Royal Navy ships. oldWeather	Study the lives of ancient Greeks The data gathered by Ancient Lives helps scholars study the Oxyrhynchus collection. ANCIENT LIVES	Hear Whales communicate You can help marine researchers understand what whales are saying WHALE GEN

Classifying galaxies



The screenshot displays the Galaxy Zoo website interface. On the left, a large image shows a dense field of galaxies. Below it, the text reads: "Welcome to Galaxy Zoo, where y astronomers explore the Univers". Further down, a paragraph states: "Galaxy Zoo: Hubble uses gorgeous Imagery of hur galaxies drawn from NASA's Hubble Space Telescope how these galaxies, and our own, formed we need yo according to their shapes — a task at which your brain most advanced computer. If you're quick, you may ev history to see each of the galaxies you're asked to clas".

On the right, the redOrbit logo is visible with the tagline "YOUR UNIVERSE ONLINE". Below the logo is a navigation bar with links: Home, Video, News, Images, Health, Education, Topics, Mobile, and B. A secondary navigation bar includes links for Space, Science, Technology, Health, General, Sci-Fi & Gaming, Oddities, International, Business, and Edu.

The main article is titled "Dutch Teacher Discovers New Astronomy Object" and is dated August 6, 2008. It features social media sharing buttons for Facebook (1 Like), Twitter (0), Email, Print (+1), and a repost button. Below the article title is a smaller image of a galaxy with a distinct greenish, irregular shape. The text of the article describes the discovery of a "cosmic ghost" by a Dutch primary school teacher, Hanny van Arkel, and mentions that it might be a new class of astronomical objects. It also notes that while volunteering with the Galaxy Zoo project, which enlists the public to help classify galaxies online, the 25-year-old teacher discovered this strange, gaseous object with a hole in the middle. A quote from Yale University astrophysicist Kevin Schawinski is included, stating that at first, they had no idea what it was, as it could have been in our solar system or at the edge of the universe. The discovery is nicknamed "Hanny's Voorwerp", which is Dutch for object.

Transcribing scientific data

The screenshot shows the 'Old Weather' website, which is part of the 'ZOONIVERSE' project. The header includes navigation links: HOME, VESSELS, TUTORIAL, TRANSCRIBE, ABOUT, BLOG, FORUM, and GET STARTED. The main content area features a map with a ship icon and a sidebar for 'HMS Caesar', showing it is 77% complete and has 252 volunteers following it. A 'Jump Aboard' button is present. Below the map, a red banner reads 'Old Weather: Our Weather's Past, the Climate's Future'. The 'Introduction' section explains the project's goal to recover WWI weather observations. The 'Project Statistics' section shows 23,443 volunteer transcribers, 762,180 pages done, and 234 ships complete. The footer includes three icons representing the project's themes: weather, transcription, and ship history.

Old Weather is a ZOONIVERSE project ...Just like THE MILKY WAY PROJECT

oldWeather

HOME VESSELS TUTORIAL TRANSCRIBE ABOUT BLOG FORUM GET STARTED

HMS Caesar
Active: Bermuda, West Indies
77% COMPLETE
lpcday is the Captain and 252 volunteers are following this vessel
Jump Aboard

Google

Dados cartográficos ©2011 Google - Termos de Uso

Old Weather: Our Weather's Past, the Climate's Future


Introduction
Help scientists recover worldwide weather observations made by Royal Navy ships around the time of World War I. These transcriptions will contribute to climate model projections and improve a database of weather extremes. Historians will use your work to track past ship movements and the stories of the people on board.

Project Statistics
Old Weather transcriptions so far

23,443 VOLUNTEER TRANSCRIBERS

762,180 PAGES DONE
234 SHIPS COMPLETE

Or just having plain fun!

**foldit**BETA
Solve Puzzles
for Science

02:05:04 GMT

[BLOG](#) [PUZZLES](#) [GROUPS](#) [PLAYERS](#) [RECIPES](#) [CONTESTS](#)
[FEEDBACK](#) [FORUM](#) [WIKI](#) [FAQ](#) [ABOUT](#) [CREDITS](#)

The Science Behind Foldit

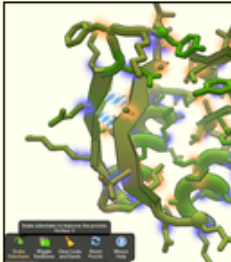
Foldit is a revolutionary new computer game enabling *you* to contribute to important scientific research. This page describes the science behind Foldit and how your playing can help.

Page Contents:

- [What is protein folding?](#)
- [Why is this game important?](#)
- [Foldit Scientific Publications](#)
- [News Articles about Foldit](#)
- [News Articles about Rosetta](#)
- [Rosetta@Home Screensaver](#)

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



GET STARTED: DOWNLOAD


Win Beta
Windows
XP/Vista/7


Mac Beta
Intel OSX
10.4 or later


Linux Beta
Linux

nature

International weekly journal of science

[Home](#) | [News & Comment](#) | [Research](#) | [Careers & Jobs](#) | [Current Issue](#) | [Archive](#) | [Audio & Video](#) | [For Authors](#)

[Archive](#) > [Volume 466](#) > [Issue 7307](#) > [Letters](#) > [Article](#)

NATURE | LETTER

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Predicting protein structures with a multiplayer online game

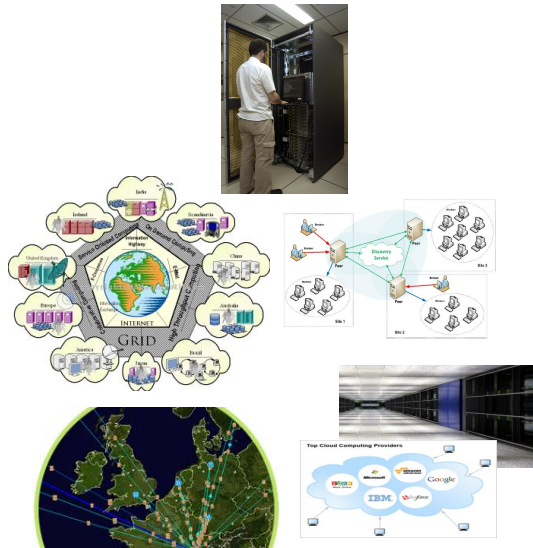
Seth Cooper, Firas Khatib, Adrien Treuille, Janos Barbero, Jeehyung Lee, Michael Beenen, Andrew Leaver-Fay, David Baker, Zoran Popović & Foldit players

Affiliations | Contributions | Corresponding authors

Nature **466**, 756–760 (05 August 2010) | doi:10.1038/nature09304
Received 22 January 2010 | Accepted 30 June 2010

In conclusion ...

- The e-Science ecosystem is rather broad and diverse



- ... and let's coordinate ourselves!

