

UK e-Science: A Vision from Outer Space

Lourdes Verdes-Montenegro

Instituto de Astrofísica de Andalucía (IAA-CSIC, Granada, Spain)

Outline



Outline

My e-Path



Outline

My e-Path

UK e-Science

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e-Astronomy

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e-Precedents

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2003: A “sociological” study of galaxies

HST image (NASA, ESA)

2003: A “sociological” study of galaxies

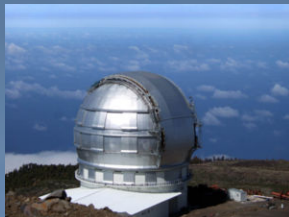
HST image (NASA, ESA)



2003: A “sociological” study of galaxies

- Objects in the Universe faint and complex
- Gas, stars, dust...
- Different physical conditions

Multiwavelength studies of large samples



2003: A “sociological” study of galaxies

- Objects in the Universe faint and complex
- Gas, stars, dust...
- Different physical conditions

Multiwavelength studies of large samples

1000 ISOLATED GALAXIES

AMIGA PROJECT

Analysis of Interstellar **M**edium of **I**solated **G**alaxies



NGC 7217

MAIN AIM:



NGC 1512 NASA, ESA, Dan Maoz

- To build & analyze a multi-wavelength data base
- Special emphasis on radioastronomy
- To serve as a reference sample



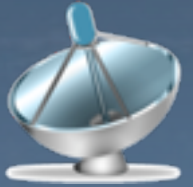
Archive/bibliographic search was a nightmare

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Archive/bibliographic search was a nightmare



The Virtual Observatory



Exploitation of astronomical archives:

Interoperability

- Astronomical archives built independently
- Querying to multiple databases painful

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Interoperability

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- Federation of astronomical databases with homogeneous access protocols
- Need to conform to specific data models

By the way... not such a new problem

By the way... not such a new problem

Liberté,
égalité,
fraternité



By the way... not such a new problem

Liberté,
égalité,
fraternité



and ... Metric System



JUNE 2002

IVOA International Virtual Observatory Alliance



JUNE 2002

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2001-2002



JUNE 2002

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2001-2002



2004

2001: earliest e-Science in UK?

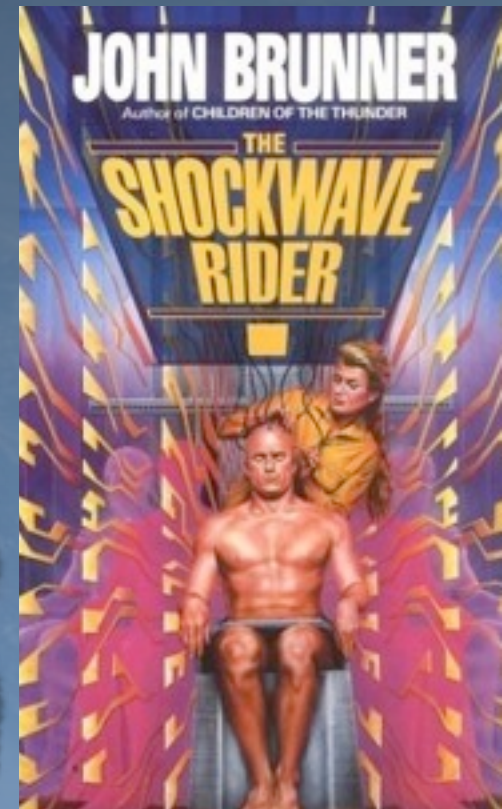
Created by John Taylor, the DG of the UK's Office of Science and Technology in 1999

2001: earliest e-Science in UK?

Created by John Taylor, the DG of the UK's Office of Science and Technology in 1999

But... earlier?

1975. The Shockwave Rider
Story of a future world **(2010)** tied together by a **universal data network**, filled with information overload and corporate domination, and nearly **everything is known about everybody**



2005

My e-Path

JORNADA e-CIENCIA EN ESPAÑA

6, 7 y 8 de julio | SANTIAGO DE COMPOSTELA



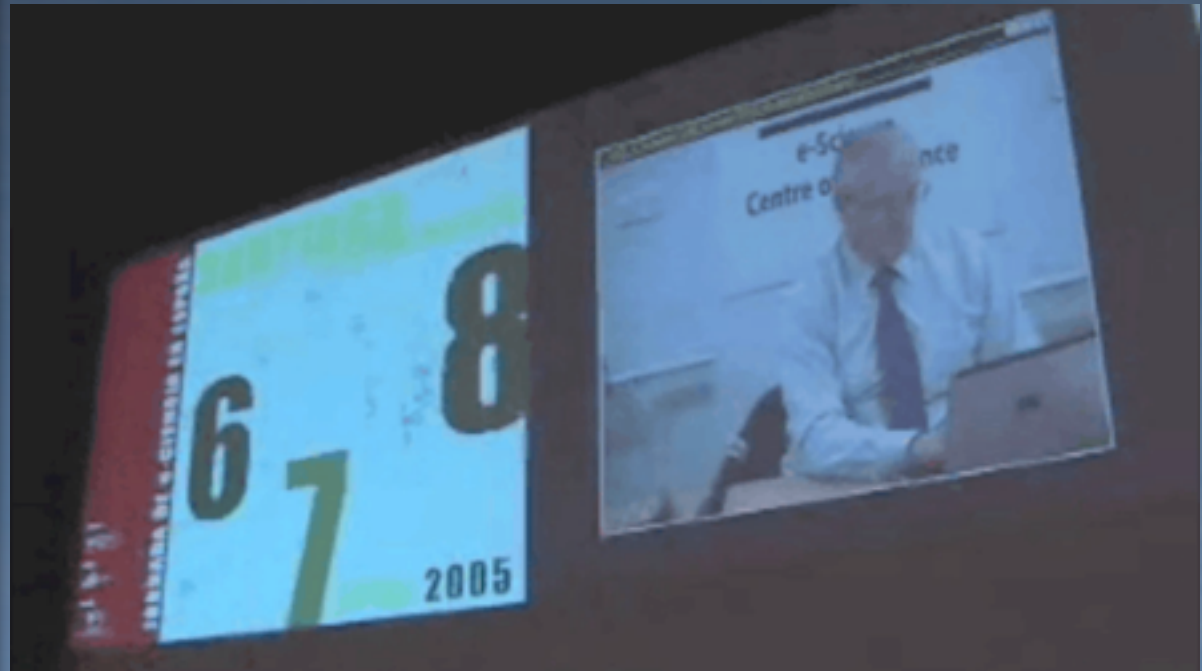
2005

JORNADA e-CIENCIA EN ESPAÑA

6, 7 y 8 de julio | SANTIAGO DE COMPOSTELA



My e-Path



2006-2007:

Applied for funds, got regional Excellence Project

- e-Science needs of Andalusian groups not yet coordinated
- From +70 participants in 15 research groups + industry to 75 groups in 3 years



- Pioneer regional + bottom-up approach

2010

III Reunión sobre e-Ciencia Andaluza

19-20 Enero 2010. Granada



Sesión Abierta al Público en el Parque de las Ciencias
 "La e-Ciencia en la Vida Diaria", 19 Enero 13:30h.

SOC:

- Fernando Carrero (UGR)
- Emilio García (IAA-CSIC)
- Rafael Garrido (IAA-CSIC)
- Enrique Pérez (IAA-CSIC)
- Ana Rajón (IAA-CSIC)
- Antonio Rada-Palvi (CATON)
- Susana Sánchez (IAA-CSIC)

LOC:

- Chantal Poppele (IAA-CSIC)
- Vicente Espigares (IAA-CSIC)
- Ana Rajón (IAA-CSIC)
- Manuel Risco (Parque de las Ciencias)
- José Salazar (IAA-CSIC)
- Susana Sánchez (IAA-CSIC)

Chairperson:

- Luisa María Montenegro (IAA-CSIC)

- Anne Treethen**
Oxford e-Research Centre (U. Oxford, Reino Unido)
- Guy Wormser**
Université des Gênes (CNRS, Francia)
- Alyssa Goodman**
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- Tony Hey**
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- Vicente Hernández**
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<http://e-ca.iaa.es/IIIReunion>



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2010

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2007

- **Spanish Network for e-Science** supported by Spanish Ministry of Science & Education
- > 900 researchers, 97 groups, 57 institutions
- Coordinated by Vicente Hernández García
- Main mandate: to set up a National Grid Initiative

2008

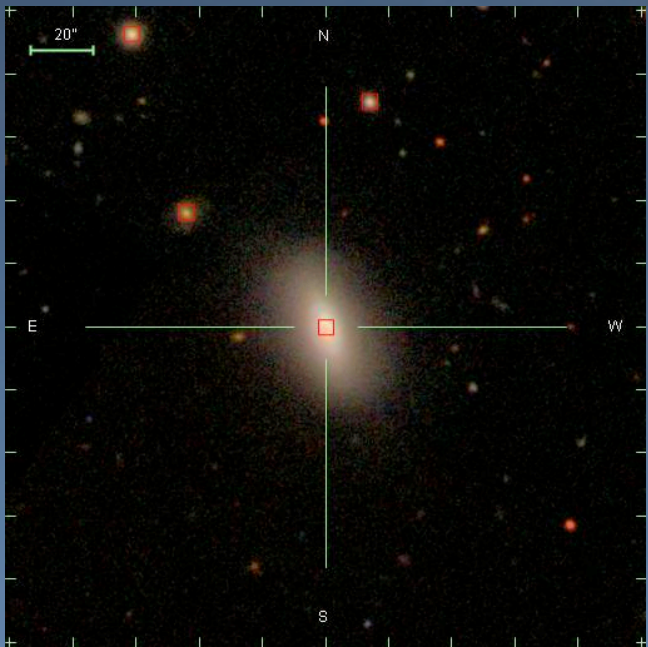
- **GRID - CSIC**

My e-Path



SLGRID: Starlight code for spectral synthesis running in GRID

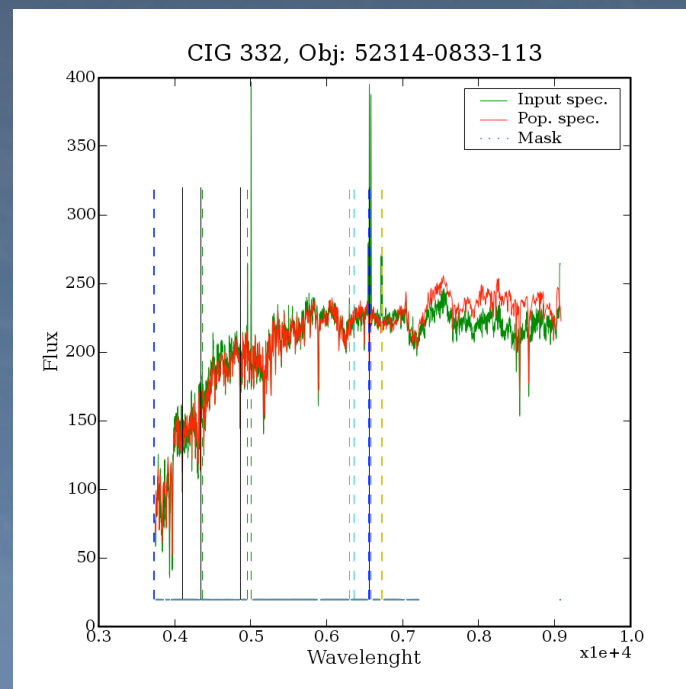
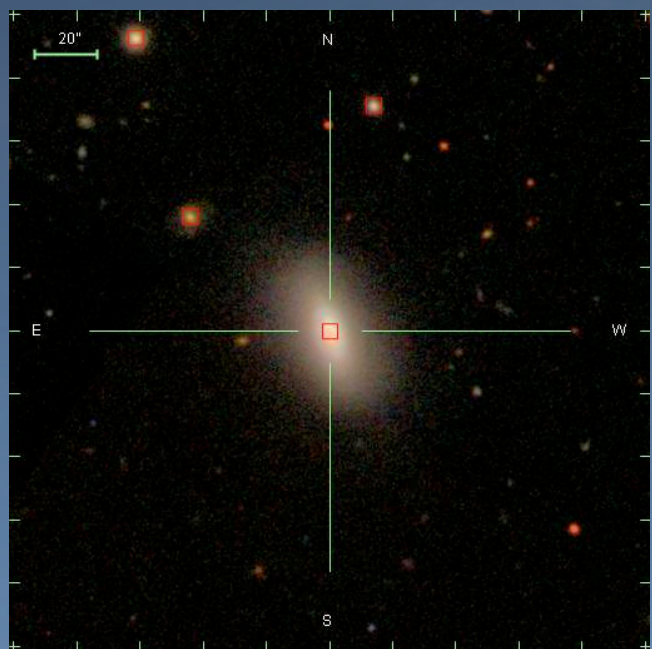
Aim: Search for supermassive BHs in AMIGA galaxies



Starlight (Cid-Fernandes et al. 2005; <http://www.starlight.ufsc.br/>)

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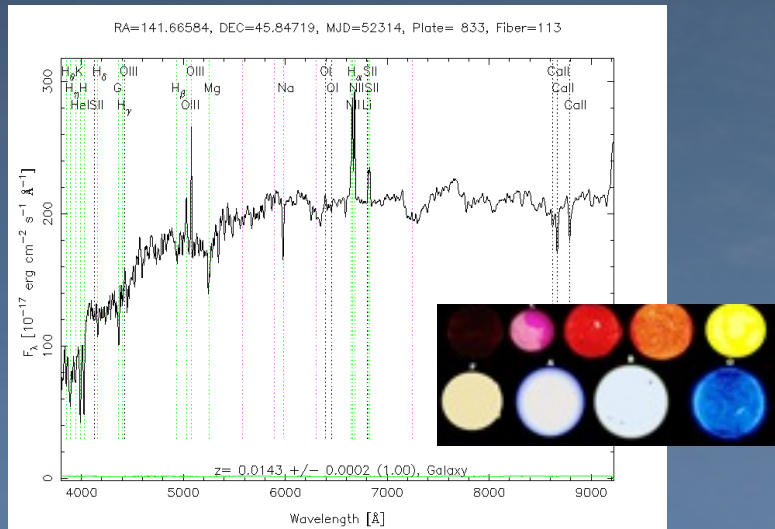
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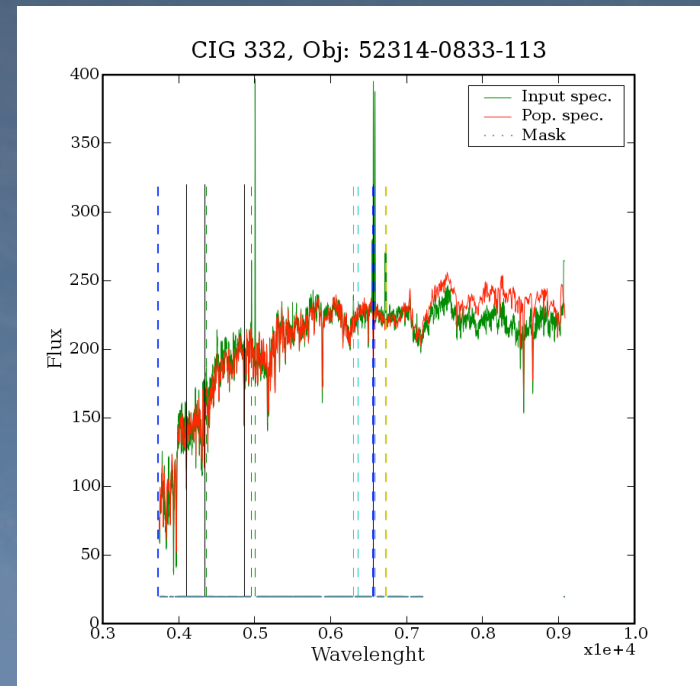
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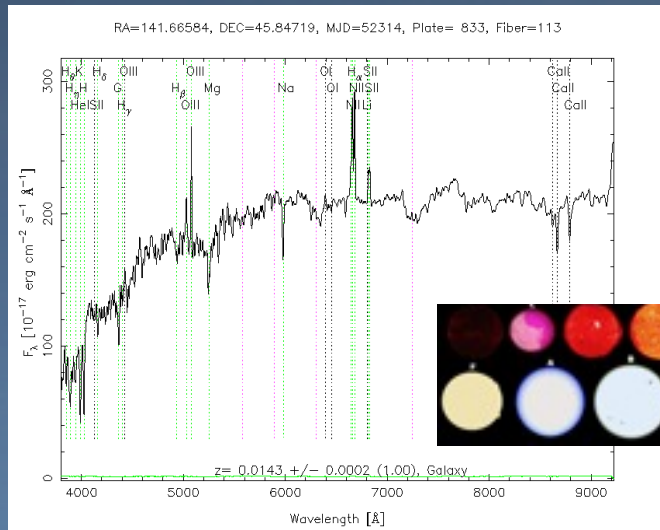


Database of stellar populations

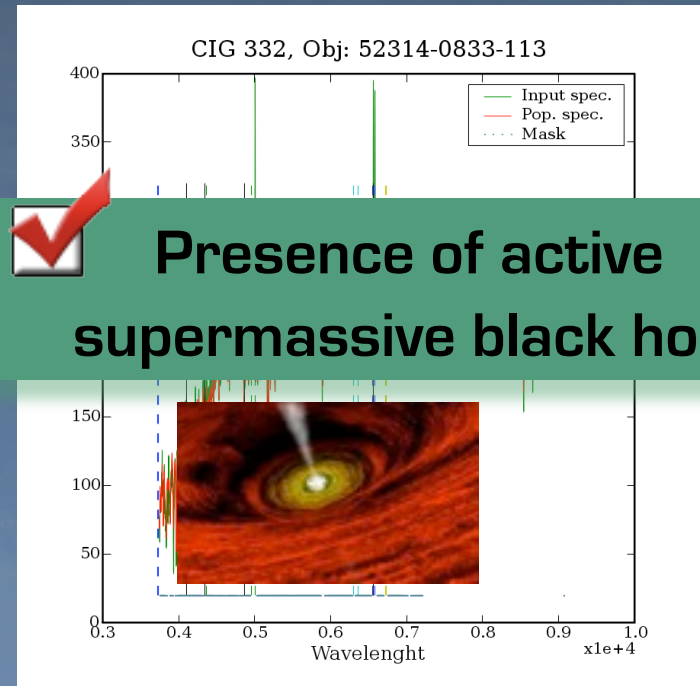


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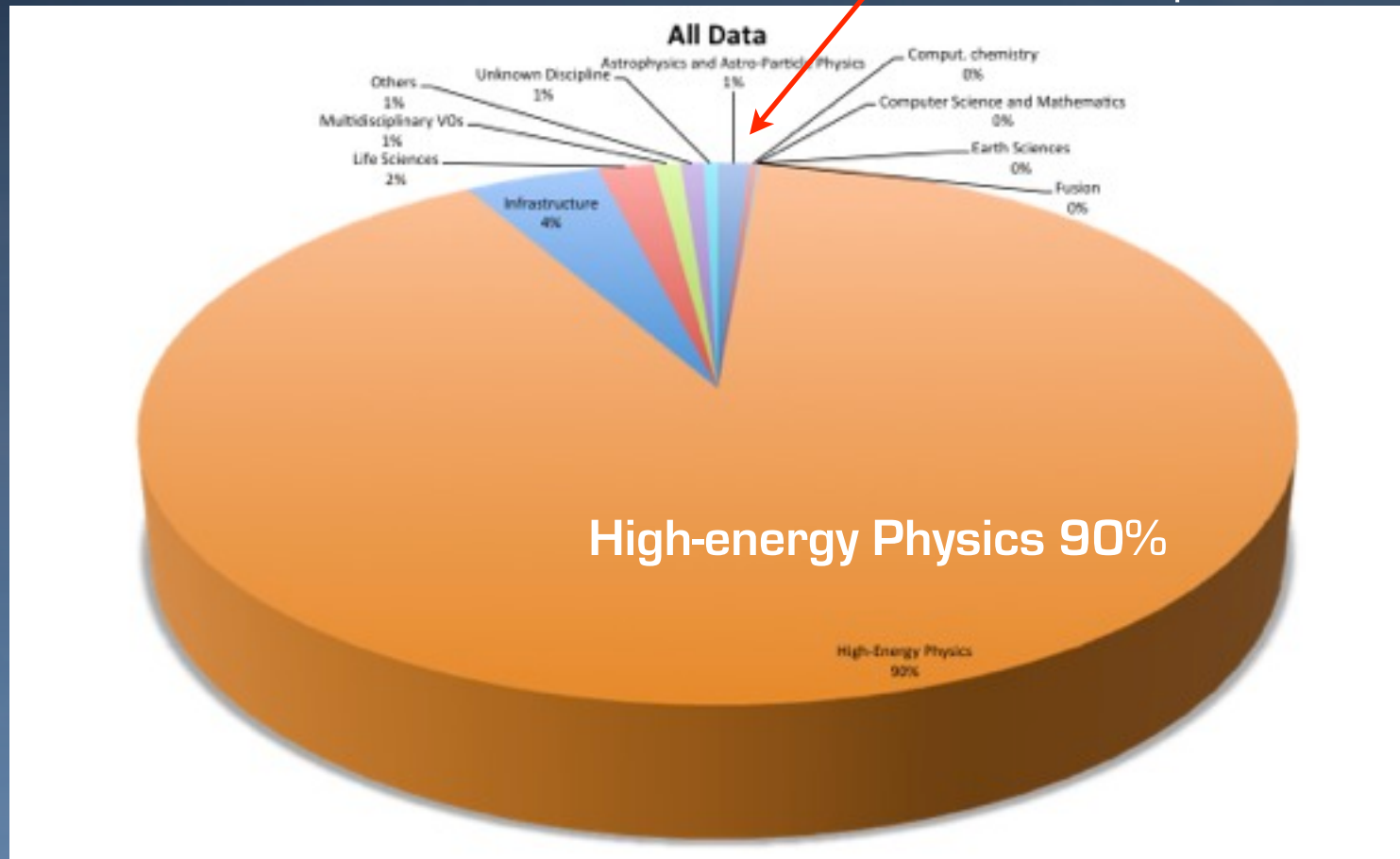


Database of stellar populations



Use of European Grid Infrastructure

Astrophysics &
Astroparticle Physics 1%

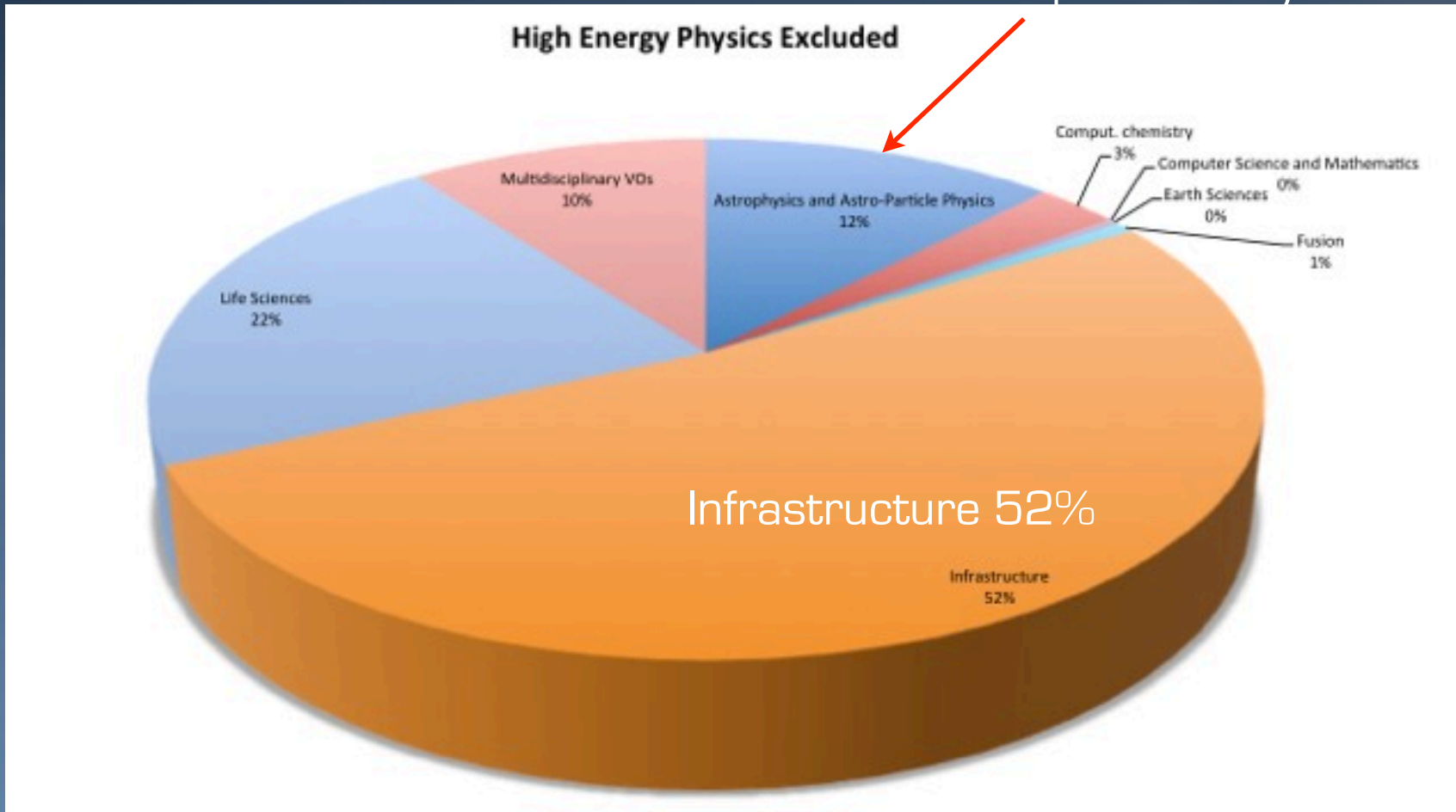


Job submissions: June 2010 - May 2011

Obtained using EGI statistics tool <http://accounting.egi.eu/>

Use of European Grid Infrastructure

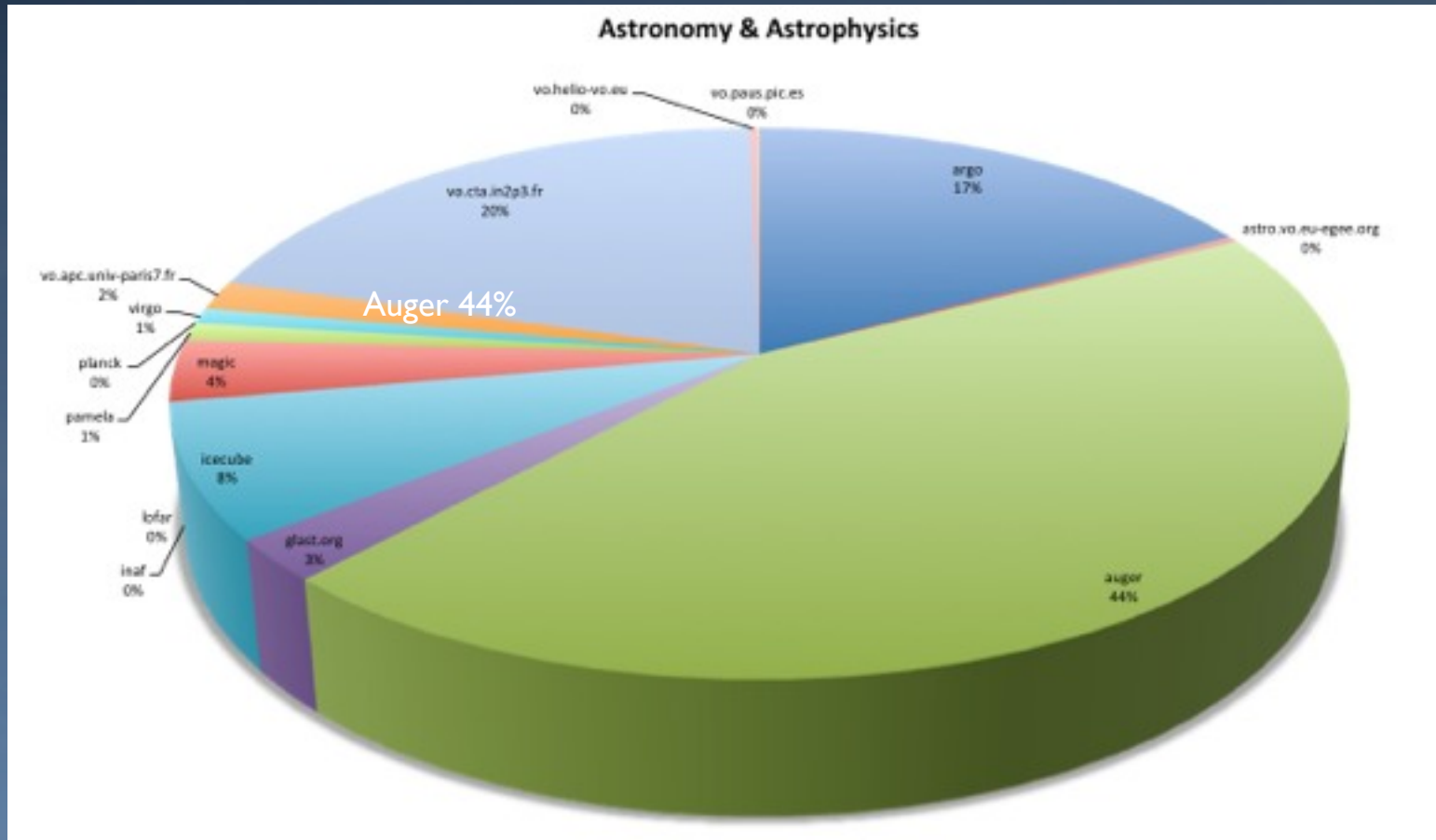
Astrophysics &
Astroparticle Physics 14%



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European e-infrastructure not used much by the A&A community



Numerical simulations of galaxies

- **AMIGA is about galaxy evolution and environment**
- **Numerical simulations help to identify features produced by interactions**
- **Particles representing gas+stars+etc**
 - **Evolving with time**
 - **Under physical laws**

My e-Path

GRID computing in Astronomy



GRID computing in Astronomy





The Antennae, KPNO

Bob and Bill Twardy/Adam Block/NOAO/AURA/NSF

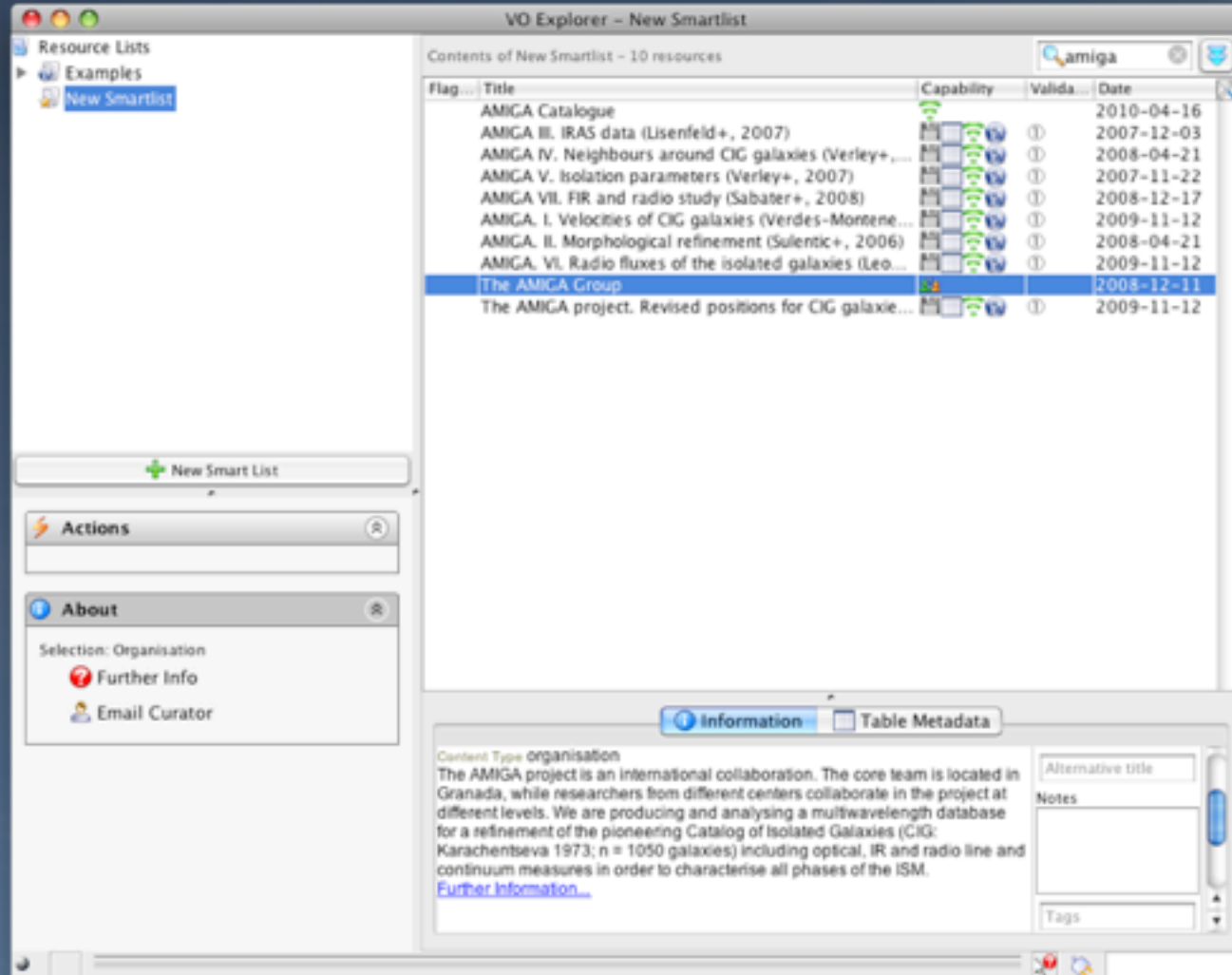


The Antennae, KPNO

Bob and Bill Twardy/Adam Block/NOAO/AURA/NSF

2006:
From publication...

VO Desktop Astrogrid



The screenshot shows the VO Explorer interface for a 'New Smartlist'. The main window displays a table of 10 resources. The selected resource is 'The AMIGA Group', which is highlighted in blue. Below the table, there is an 'Information' tab selected, showing details about the AMIGA project, including its location in Granada and its purpose of refining the Catalog of Isolated Galaxies (CIG).

Flag...	Title	Capability	Valida...	Date
	AMIGA Catalogue			2010-04-16
	AMIGA III. IRAS data (Lisenfeld+, 2007)		①	2007-12-03
	AMIGA IV. Neighbours around CIG galaxies (Verley+, ...		①	2008-04-21
	AMIGA V. Isolation parameters (Verley+, 2007)		①	2007-11-22
	AMIGA VII. FIR and radio study (Sabater+, 2008)		①	2008-12-17
	AMIGA. I. Velocities of CIG galaxies (Verdes-Montene...		①	2009-11-12
	AMIGA. II. Morphological refinement (Sulentic+, 2006)		①	2008-04-21
	AMIGA. VI. Radio fluxes of the isolated galaxies (Leo...		①	2009-11-12
	The AMIGA Group			2008-12-11
	The AMIGA project. Revised positions for CIG galaxie...		①	2009-11-12

Information | Table Metadata

Content Type organisation
The AMIGA project is an international collaboration. The core team is located in Granada, while researchers from different centers collaborate in the project at different levels. We are producing and analysing a multiwavelength database for a refinement of the pioneering Catalog of Isolated Galaxies (CIG: Karachentseva 1973; n = 1050 galaxies) including optical, IR and radio line and continuum measures in order to characterise all phases of the ISM.
[Further information...](#)

Alternative title
Notes
Tags

2006:

From publication... **to the design of Virtual Observatory standards** for radioastronomy

**MOST VO EFFORTS SO FAR IN
OPTICAL ASTRONOMY**



2006:

From publication... **to design of VO standards**
for radioastronomy

- 1st VO compliant data model for radio
- Implemented at IRAM-30m, one of today's largest and most sensitive mm telescopes



2006:

From publication... **to design of VO standards**
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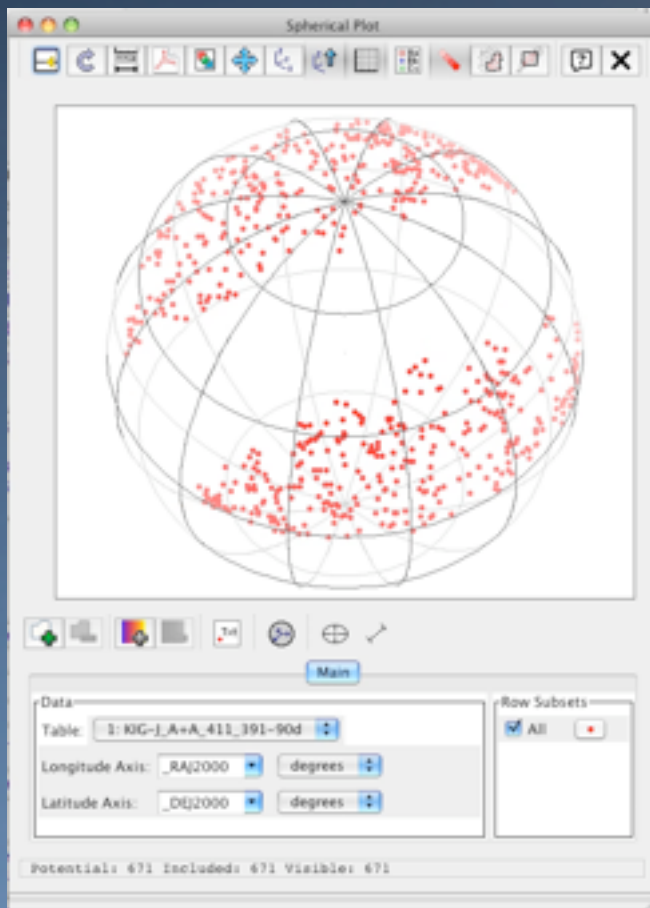
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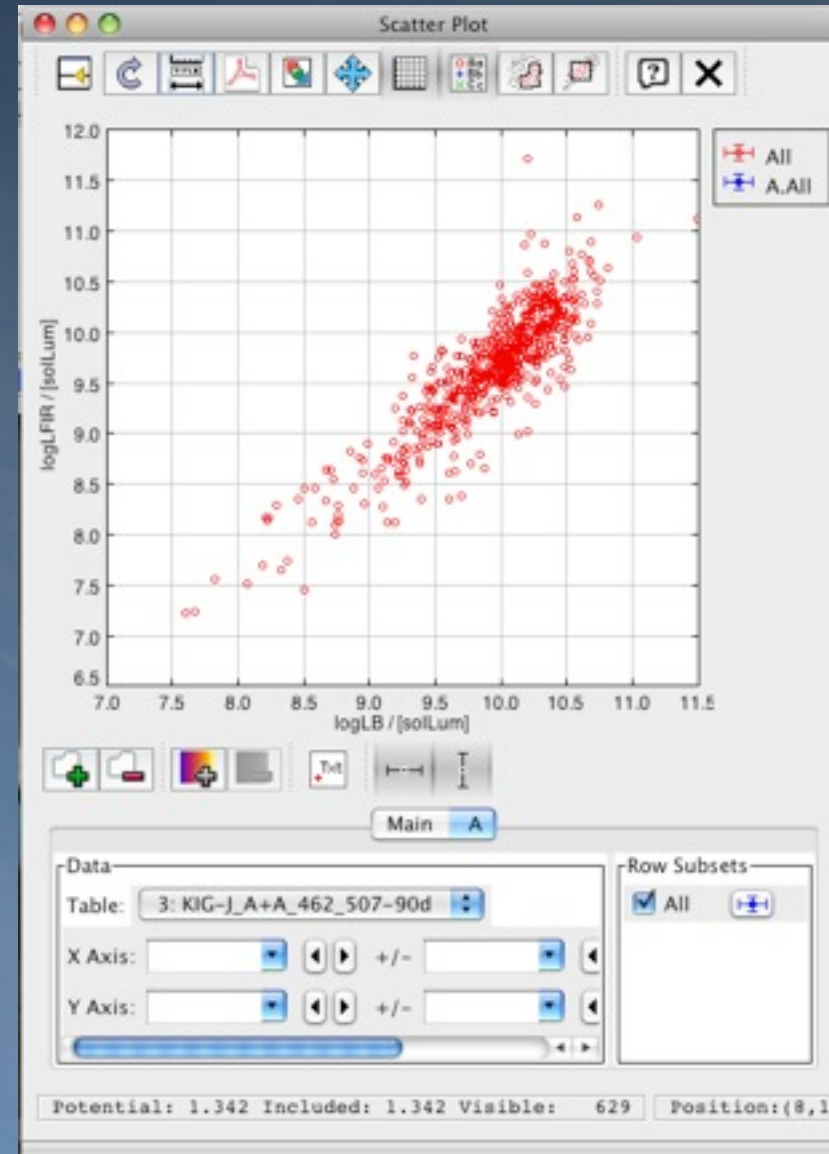
PhD 2009



Users of tools



TOPCAT
Astrogrid



PathGRID: VO Tools used beyond Astronomy!

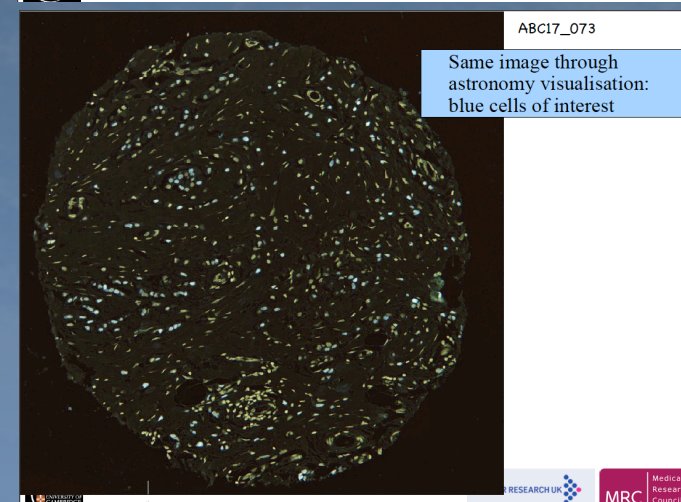
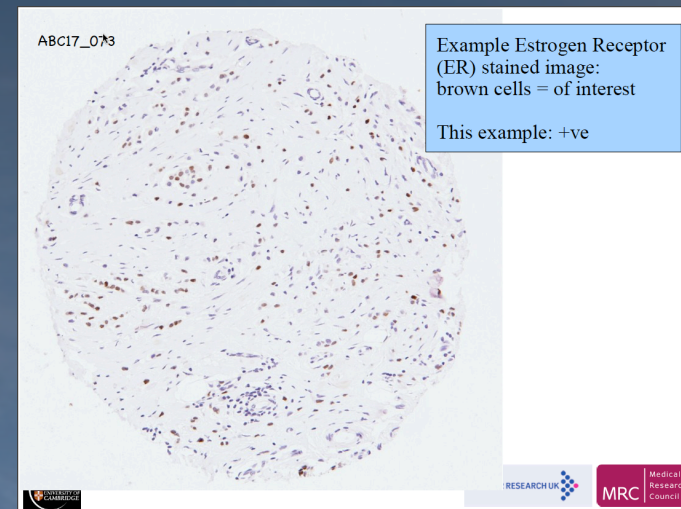
Analysis of Tissue Micro Array histopathology image data

AstroGrid:

- image analysis pipeline
- graphical workflows via Astro-Taverna
- scripting via Python

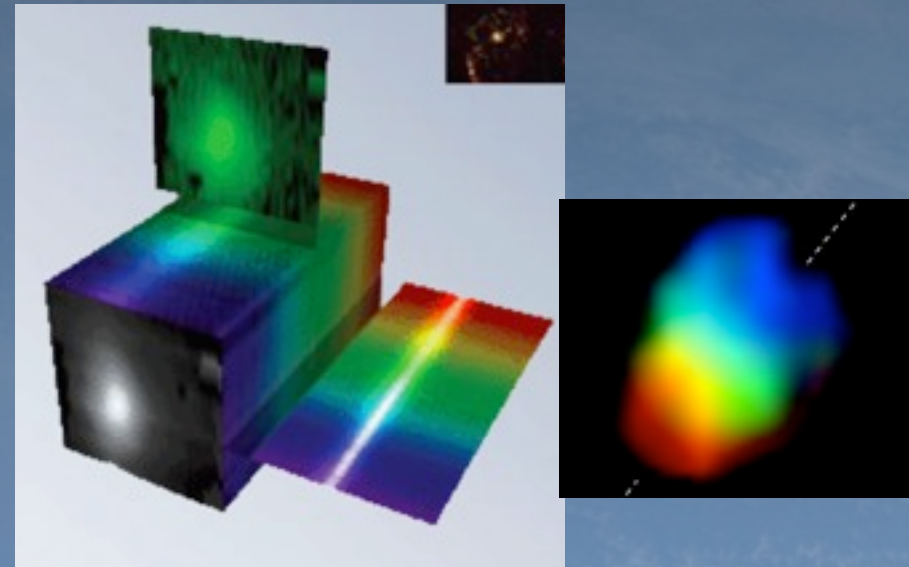
From Nic's Walton talk at UK All hands 2009

My e-Path



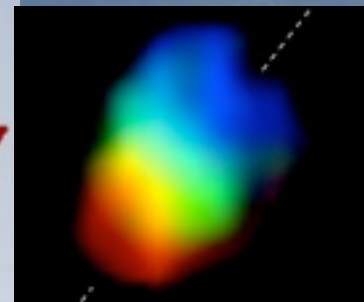
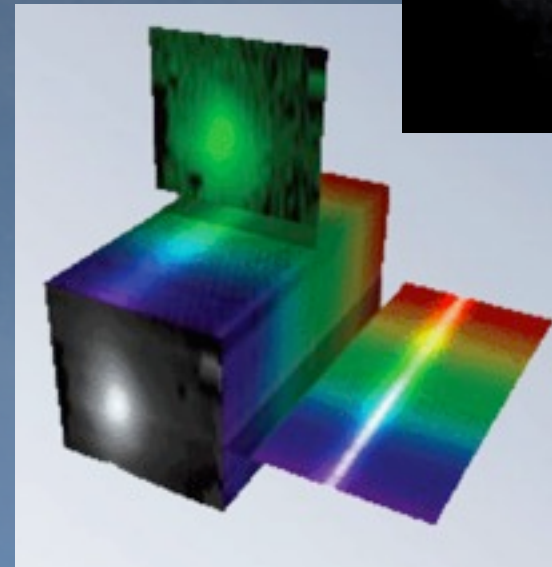
2009:

- Astronomical data frequently 3D
 - No VO standards for 3D data
 - No VO tools for 3D data
-
- Kinematical modeling tools for cubes being integrated in the VO
-
- 3D data services



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Astronomical data growing exponentially

- Public data (after short proprietary period)
- Large area surveys: full sky

Astronomical data growing exponentially

- Public data (after short proprietary period)
- Large area surveys: full sky
- New generation of radiointerferometers

will culminate with SKA

1000 -1500 antennas x15m in 5km

1000 -1500 antennas x15m up to 3000 km



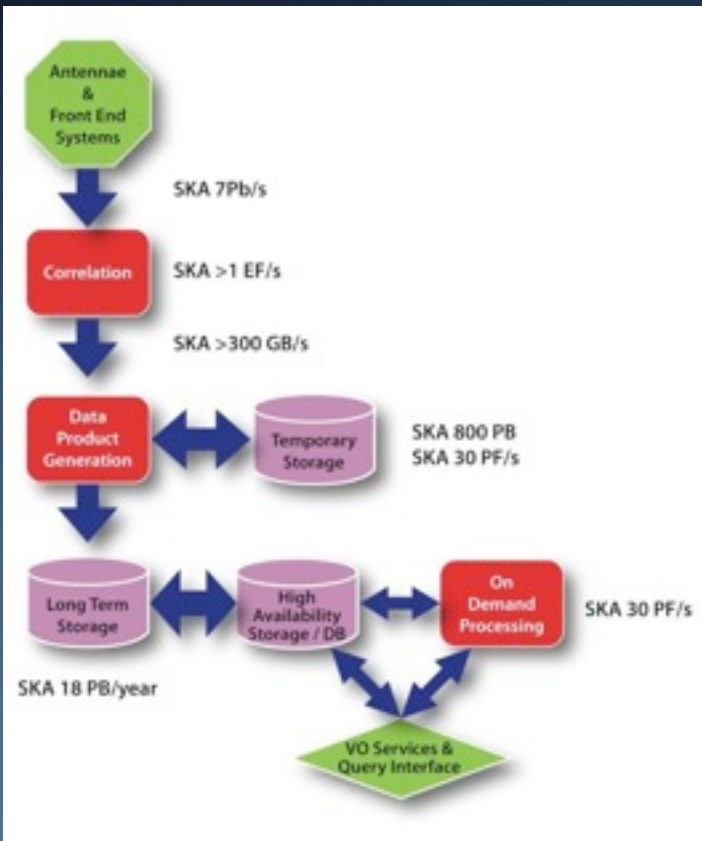
VLA, USA

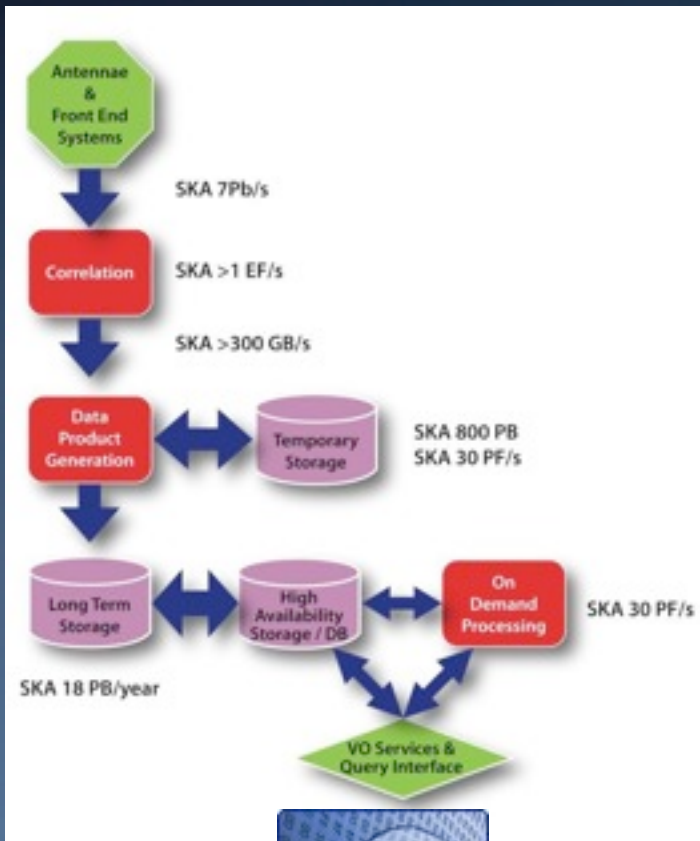


- Processing needs = 10^9 top range PCs
- 1 day = annual data product of all mankind



- Aperture arrays = 250 times the current Global Internet traffic
- Typical survey
1000 cubes = 5 days
read time @ 10GB/sec



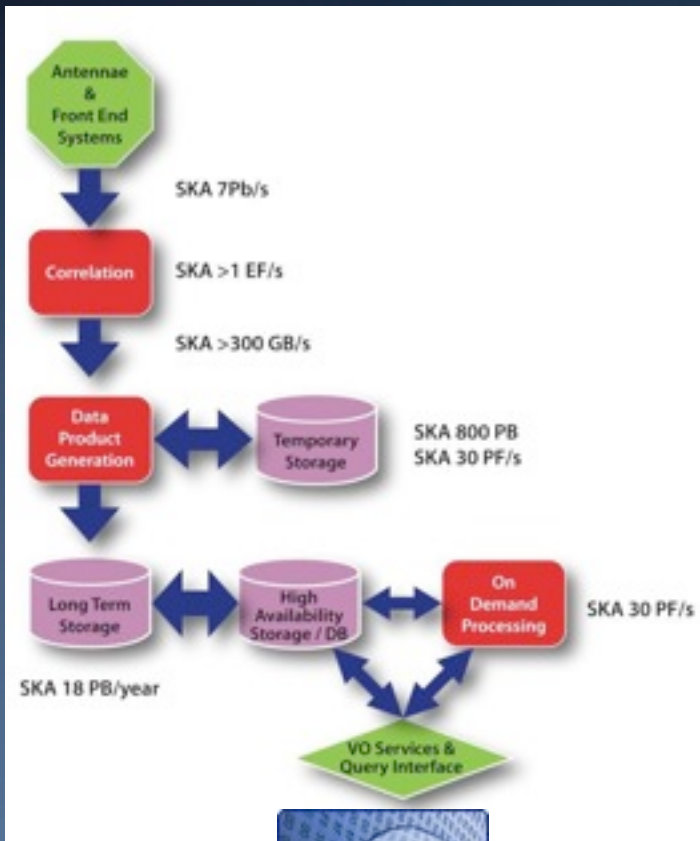


**BUT A NEW CHALLENGE
STARTS HERE**

Extraction of scientifically relevant information from huge data volumes

- Visualization of enormous catalogs into multiD parameter spaces
- Efficient packaging of scientific methodology
- Collaborative science

Transfer of knowledge to society



BUT A NEW CHALLENGE
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Extraction of scientifically relevant information from huge data volumes

- Visualization

A disruptive change in the methodology required

Efficient packaging of scientific methodology

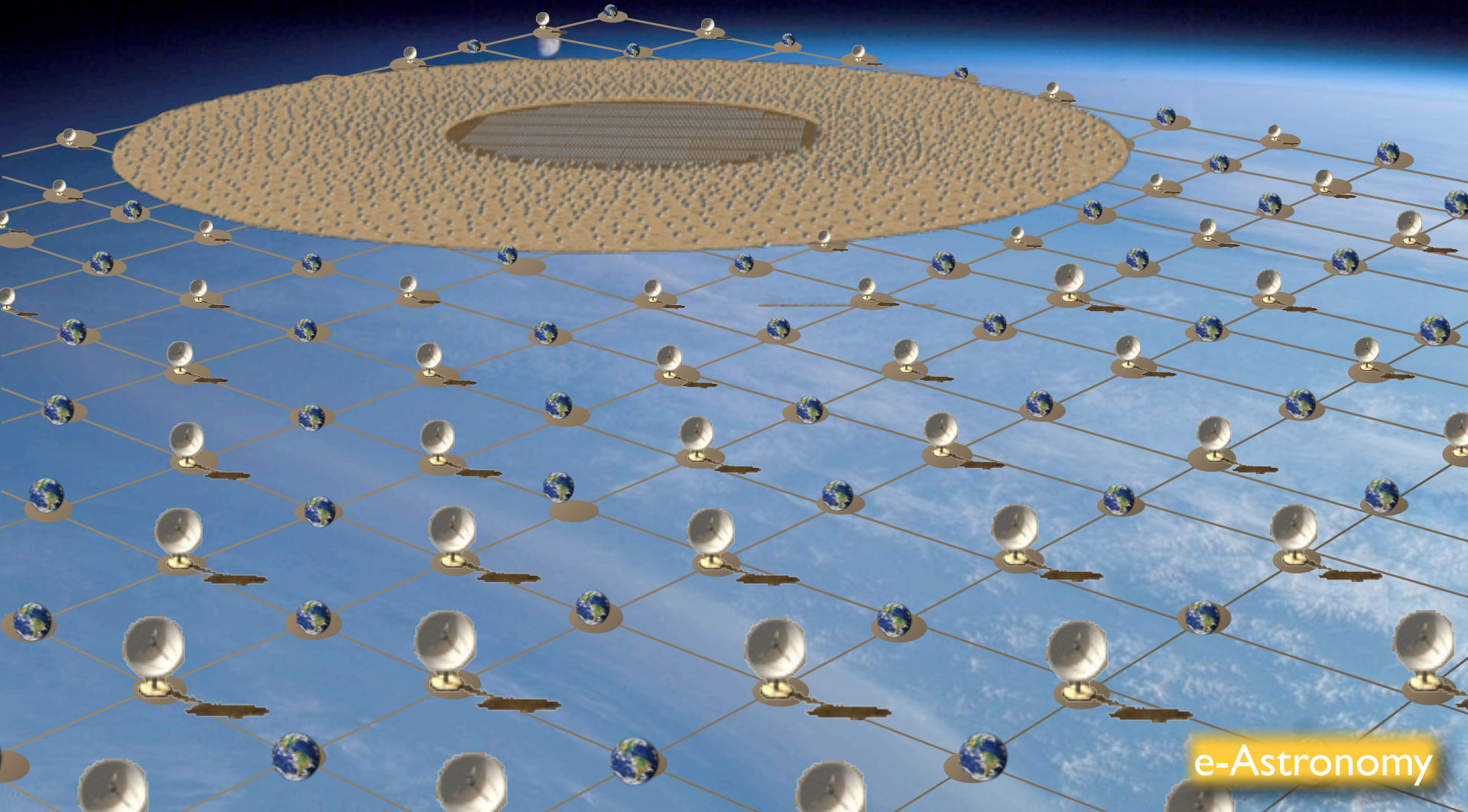
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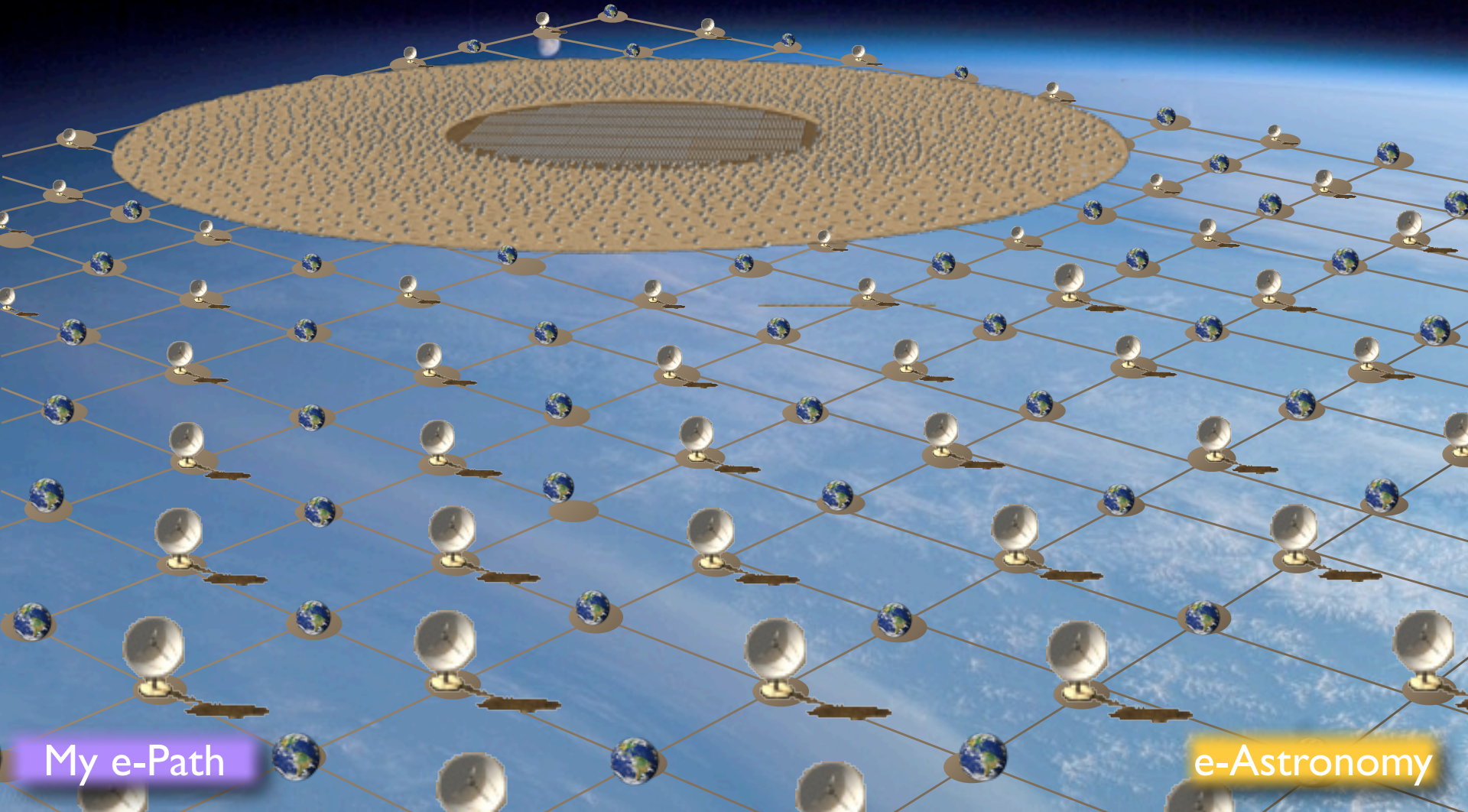
BUT A NEW CHALLENGE
STARTS HERE

An e-Science solution for the SKA



e-Astronomy

An e-Science solution for the SKA



My e-Path

e-Astronomy

R Dimensions

- Repeatable and reproducible
- Replayable, refreshable and roll-backable
- Reusable and Reliable
- Retrievable and referenceable
- Repurposeable

R Dimensions

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Scientific workflows, collaborative tools

Publication beyond the PDF, preservation

Workflows for ever Project (started December 2010)

Advanced Workflow Preservation Technologies for Enhanced Science

Funded under FP7 ICT-2009-6

Participants:

iSOCO (PI), UPMadrid, U. Manchester, Poznan PSNC,
U. Oxford, Leiden U. Medical Center, IAA-CSIC

Development of standards for workflow preservation,
which will enable workflow' **Rs dimensions**

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Use cases: Astronomy and Biomedicine



Wf4ever: Preservation of Scientific Workflows

- **Research Object:**

packages workflow descriptions, provenance of their executions, and links to all the related resources

- Models for workflow abstraction → **classification, indexing**
- Strategies for **sharing and reusing** workflows or fragments (from different sources)
- Mechanisms for personalized workflow **recommendation**
- Methods and tools to proactively **evaluate** workflow information quality

Cross-fertilization

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Cross-fertilization



Key issues in Wf4ever:

Provenance

Needs to track it for data, services, tools

Semantic Web

“I have a dream for the Web [in which computers] become **capable of analyzing all the data on the Web** – the content, links, and transactions between people and computers. A ‘Semantic Web’, which should make this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be **handled by machines talking to machines.**”

– Tim Berners-Lee, 1999

Linked data

- **Provenance: 1986** (Becker & John M. Chambers, cf Luc Moreau)
- **Semantic Web: 2001** (Berners-Lee, Scientific American)
- **Linked data: 2006**

And before in UK?

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- **Semantic Web: 2001** (Berners-Lee, Scientific American)
- **Linked data: 2006**

And before in UK?



Heuristic ALgorithmic
computer ... 9000

Arthur C. Clarke (1964)

2001, A Space Odyssey

- Experience-based techniques
- For problem solving, learning, and discovery
- Where an exhaustive search is impractical

Still we are necessary...



Where are we now?

- **Scientific workflows:**

Social and life sciences, engineering, chemistry, music, etc: intensive use

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Astronomy

Helio project on-going

Virtual Observatory for solar physics

Data access + sharing + description of the knowledge in the field (via ontologies), and their processes (via workflows)

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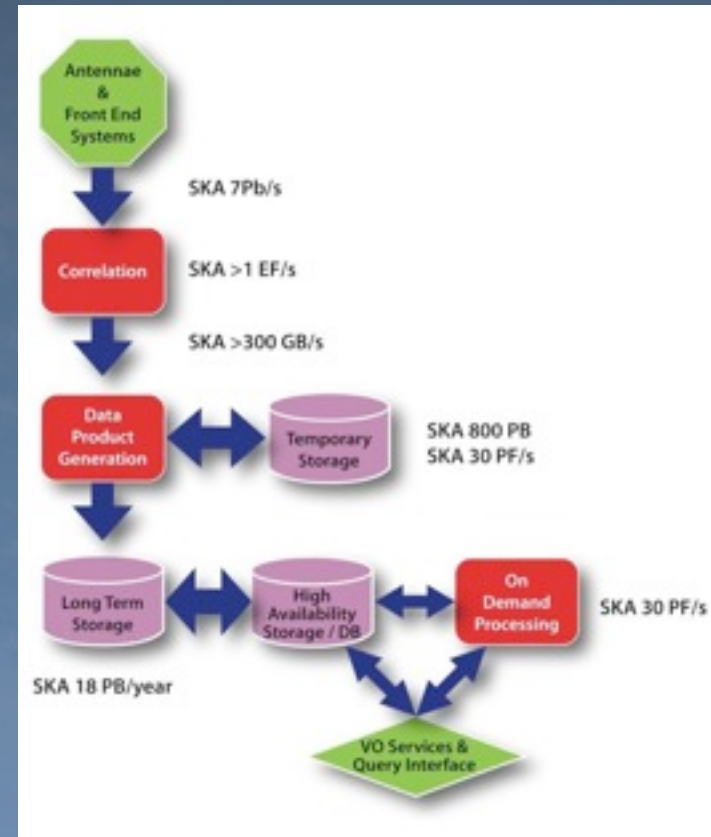
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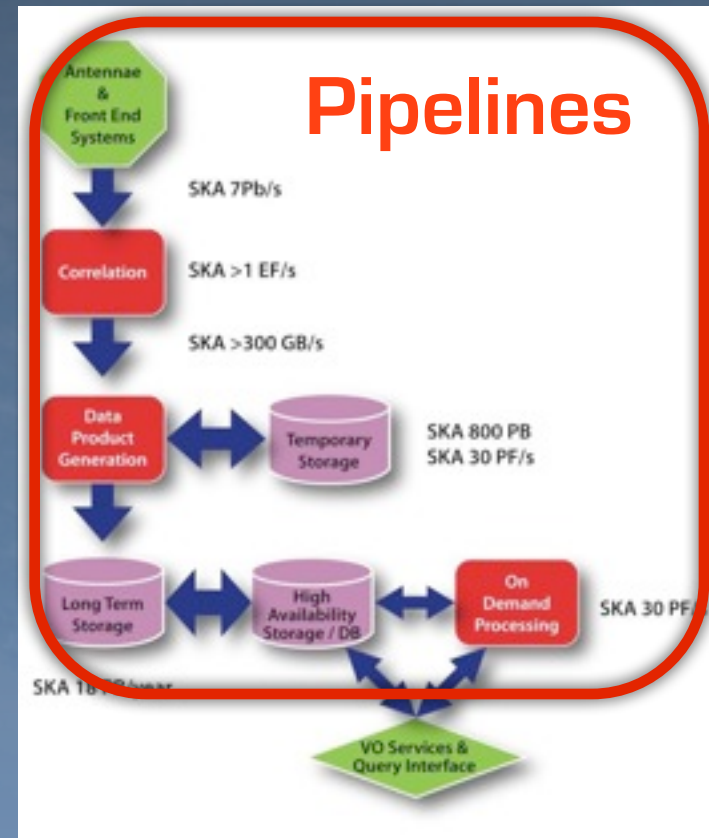
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Where are we now?

- Building tools: TAVERNA

Modularity + capability to encapsulate methodologies, allow scientists

Integrated with ...

-  **my experiment**
Workflow repository – social networking and workflow sharing environment for scientists
-  **BioCatalogue**
Service catalogue – curated catalogue of Web services for Life Sciences
-  **m@by**
Interoperable biological data hosts and analytical services
-  **bio::mart**
Robust data integration system for large scale data querying
-  **WSO2**
Web services wrapping existing command-line analysis programs (such as EMBOSS sequence analysis)
-  **R**
Software for statistical computing and graphics

Where are we now?

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Modularity + capability to encapsulate methodologies, allow scientists

to reuse and share them

myExperiment

(<http://www.myexperiment.org/>)

Integrated with ...

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Web services wrapping existing command-line analysis programs (such as EMBOSS sequence analysis)
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Software for statistical computing and graphics

All

Workflows

Search filter terms

Filter by type

- Taverna 1 557
- Taverna 2 522
- RapidMiner 112
- Bioclipse Scri... 29
- GWorkflowDL 24
- LONI Pipeline 20
- Kepler 17
- BioExtract Ser... 13
- Trident (Packa... 10
- Chemistry Plan 7

Filter by tag

- example 178
- mygrid 103
- localworker 99
- bioinformatics 89
- benchmarks 77
- cheminformatics 65
- protein 60
- ebi 56
- BLAST 49
- pathway 47

« previous **1** [2](#) [3](#) ... [137](#) next »

Sort by: Rank

Showing 1367 results. Use the filters on the left and the search box below to refine the results.

Taverna 2

Pathways and Gene annotations for QTL region - Mouse (v6)

View

Download (v6)

Original Uploader

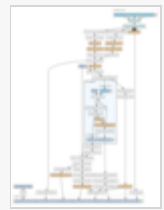


Paul Fisher

Created: 19/11/09 @ 18:18:52 | Last updated: 05/04/11 @ 10:59:25

Credits: Paul Fisher

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This workflow searches for genes which reside in a QTL (Quantitative Trait Loci) region in the mouse, *Mus musculus*. The workflow requires an input of: a chromosome name or number; a QTL start base pair position; QTL end base pair position. Data is then extracted from BioMart to annotate each of the genes found in this region. The Entrez and UniProt identifiers are then sent to KEGG to obtain KEGG gene identifiers. The KEGG gene identifiers are then used to search for pathways in the KEGG path...

Rating: 4.5 / 5 (2 ratings) | Versions: 6 | Reviews: 0 | Comments: 4 | Citations: 1

Viewed: 1916 times | Downloaded: 400 times

Tags (13):

New/Upload

Workflow

Log in / Register

Username or Email:

Password:

Remember me:

OR

Use OpenID:

(eg: name.myopenid.com)

Need an account?
[Click here to register](#)

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Popular Tags

25 tags

[\[All Tags\]](#)

[benchmarks](#) | [bio2rdf](#) |

[bioinformatics](#) | [BLAST](#) |

[cheminformatics](#) | [data](#)

[integration](#) | [ebi](#) | [example](#) |

Filter by tag

<input type="checkbox"/> example	178
<input type="checkbox"/> mygrid	103
<input type="checkbox"/> localworker	99
<input type="checkbox"/> bioinformatics	89
<input type="checkbox"/> benchmarks	77
<input type="checkbox"/> cheminformatics	65
<input type="checkbox"/> protein	60
<input type="checkbox"/> ebi	56
<input type="checkbox"/> BLAST	49
<input type="checkbox"/> pathway	47

Filter by user

<input type="checkbox"/> Alan Williams	210
<input type="checkbox"/> Paul Fisher	89
<input type="checkbox"/> Antoon Goderis	82
<input type="checkbox"/> Peter Li	64
<input type="checkbox"/> Hamish McWil...	52
<input type="checkbox"/> Francois Belleau	43
<input type="checkbox"/> Franck Tanoh	27
<input type="checkbox"/> Andreas Hohe...	26
<input type="checkbox"/> Anja Le Blanc	25
<input type="checkbox"/> Egon Willigha...	24

Filter by licence

<input type="checkbox"/> by-sa	895
<input type="checkbox"/> by	273
<input type="checkbox"/> by-nd	188
<input type="checkbox"/> GPL	7
<input type="checkbox"/> CC0	3
<input type="checkbox"/> LGPL	1

Filter by group

<input type="checkbox"/> myGrid	214
<input type="checkbox"/> SabrOndexPr...	32
<input type="checkbox"/> helio	26
<input type="checkbox"/> MediGRID	22
<input type="checkbox"/> TextGrid	21
<input type="checkbox"/> BauVOGrid	20
<input type="checkbox"/> CDK-Taverna	18

Fisher



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Tags (13):

[data-driven](#) | [disease](#) | [genotype](#) | [kegg](#) | [mouse](#) | [nbiconworkflows](#) | [pathway](#) | [pathway-driven](#) | [pathways](#) | [phenotype](#) | [qtl](#) | [shim](#) | [subworkflow](#)

Taverna 1



BioAID_DiseaseDiscovery_RatHumanMouseUniprotFilter

(v4)

Created: 15/12/08 @ 20:46:09 | **Last updated:** 26/01/11 @ 14:43:31

Credits: Marco Roos AID

License: Creative Commons Attribution-Share Alike 3.0 Unported License



Marco Roos



This workflow finds disease relevant to the query string via the following steps: 1. A user query: a list of terms or boolean query - look at the Apache Lucene project for all details. E.g.: (EZHZ OR "Enhancer of Zeste" +(mutation chromatin) - clinical); consider adding 'ProteinSynonymsToQuery' in front of the input if your query is a protein. 2. Retrieve documents: finds 'maximumNumberOfHits' relevant documents (abstract+title) based on query (the AIDA service inside is based on Apache's Luce...

Rating: 4.0 / 5 (2 ratings) | **Versions:** 4 | **Reviews:** 0 | **Comments:** 2 | **Citations:** 0

Viewed: 3390 times | **Downloaded:** 483 times

Tags (9):

[AIDA](#) | [BioAID](#) | [biorange_nl](#) | [disease](#) | [pkna](#) | [protein](#) | [text_mining](#) | [text_mining_network](#) | [VL-e](#)

Taverna 1



EBI InterProScan (v3)

View

Download (v4)

View

[Click here to register](#)

UK e-Science

Popular Tags

25 tags

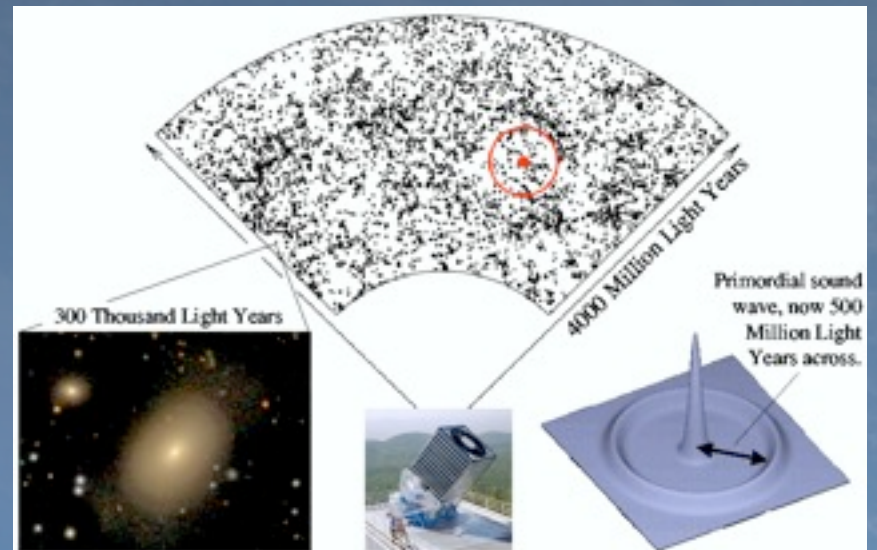
[\[All Tags\]](#)

[benchmarks](#) | [bio2rdf](#) | [bioinformatics](#) | [BLAST](#) | [cheminformatics](#) | [data integration](#) | [ebi](#) | [example](#) | [gene](#) | [graph](#) | [impact](#) | [kegg](#) | [Kegg Pathways](#) | [localworker](#) | [mygrid](#) | [ondex](#) | [pathway](#) | [pathways](#) | [phenotype](#) | [protein](#) | [pubmed](#) | [sequence](#) | [taverna](#) | [text mining](#) | [workflow](#)

Astronomy is ready: **lifecycle is digital**

Submission of proposals

- Pipelines for automated data reduction:
Science Ready Data
- Access policy:
often public after a
short period

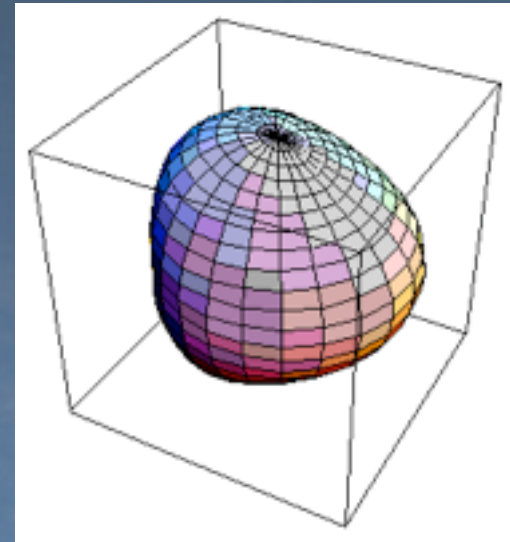


- Intensive use of databases

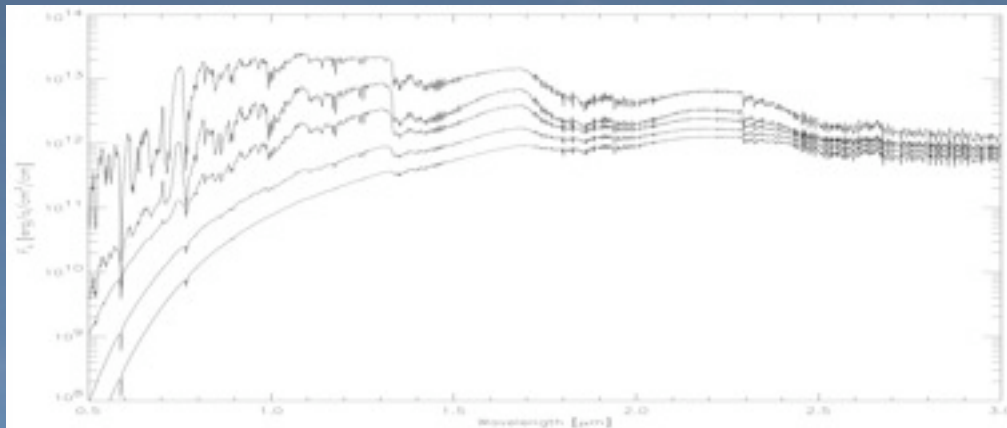
Numerical simulations



Stellar models



Astronomical Libraries



PDF publication: Bibliographical archives

- VizieR provides interlinking to Bibliographic Archives

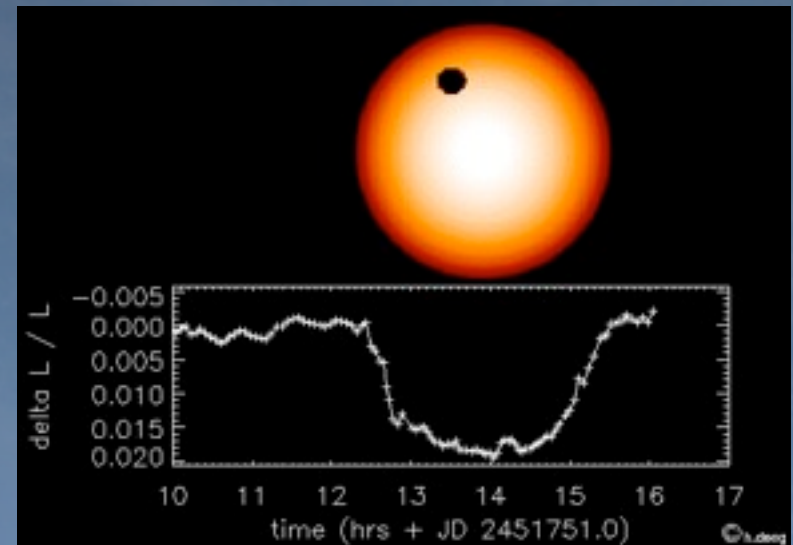
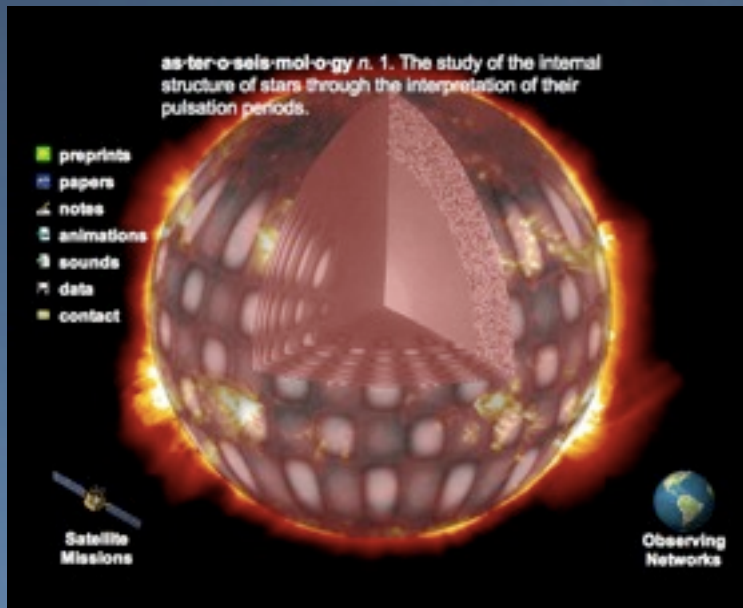


30000 queries/day on average in 2006

- ADS provides interlinking to Astronomical Objects DB

- Long term history with GRID of Instruments

To avoid gaps in time domain observations:
asteroseismology & search for exoplanets



- Long term history with GRID of Instruments

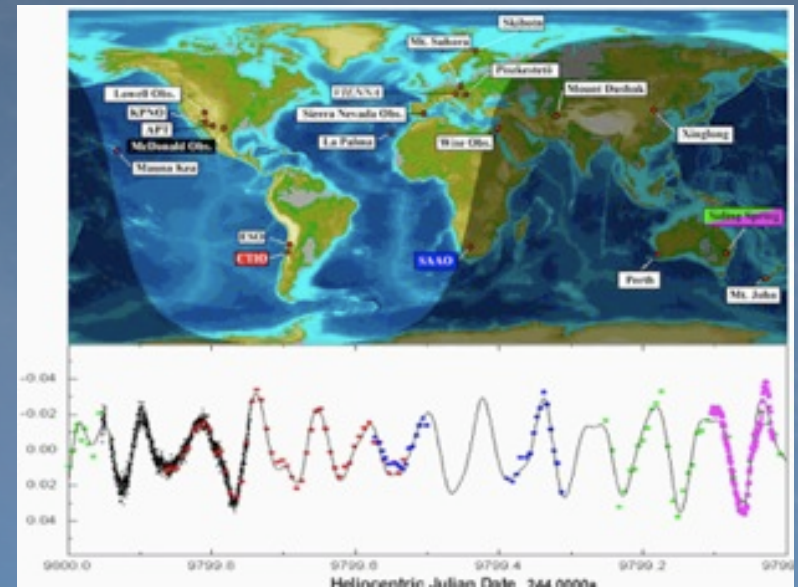
To avoid gaps in time domain observations:

asteroseismology & search for exoplanets

Coordinated observations: a telescope network

The Delta Scuti Network (DSN)

The Delta Scuti Network (DSN) is a collaboration of astronomers from all around the globe who observe and study short period variable stars. It was founded by Michel Breger at the University of Texas (McDonald Observatory) and at the University of Vienna (Institute of Astronomy) in 1983 with the goal to improve the frequency solutions of multiperiodic Delta Scuti stars.



How should e-Science return to citizens?



How should e-Science return to citizens?

- Improving life by doing **better** science and bringing it **faster** to the society
- Delivering information
- Make them **aware** of scientific methodology
- Make them **part** of the scientific methodology



Delivering information

- **Linked Government data**

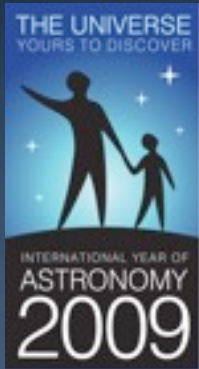
The screenshot shows the homepage of data.gov.uk. At the top left is the HM Government logo. The top right corner displays the URL 'data.gov.uk'. A dark navigation bar contains links for Home, Blog, Data, SPARQL, Apps, Ideas, Forum, Wiki, Resources, and About. A search bar is located on the right side of the navigation bar. The main content area features a large blue graphic of three interconnected spheres, symbolizing linked data. The text reads: 'Unlocking innovation', 'Working with UK Public Sector information and data'. Below this, a yellow horizontal line is followed by a paragraph: 'Advised by Sir Tim Berners-Lee and Professor Nigel Shadbolt and others, government is opening up data for reuse. This site seeks to give a way into the wealth of government data and is under constant development. We want to work with you to make it better.' Another paragraph follows: 'We're very aware that there are more people like you outside of government who have the skills and abilities to make wonderful things out of public data. These are our first steps in building a'. On the right side, there are several buttons: 'Subscribe by RSS' with an RSS icon, 'Community Log In / Sign up', 'Local Data Panel', and 'What is the Semantic Web?' with a small 3D cube icon.

“Information should be in the public domain unless there is a good reason not to - not the other way around.” T. Berners-Lee

Make them **aware** of scientific methodology



Make them **aware** of scientific methodology



International Year of Astronomy: 800 students measure the Earth's radius



On 26 March, 800 students throughout Spain took part in the same experiment: they repeated the experiment that Eratosthenes performed in 240 BC to measure the Earth's radius.



Global collaboration is the clue!

Make them **part** of the scientific methodology

1900

- Frank Chapman (Ntl Audubon S) ornithologist
- Counting birds on Xmas instead of killing them!
- 27 observers, 25 places (USA & Canada)

Make them **part** of the scientific methodology

1900

- Frank Chapman (Ntl Audubon S) ornithologist
- Counting birds on Xmas instead of killing them!
- 27 observers, 25 places (USA & Canada)
- Still continuing



eBIRD

eBird

Home About eBird Submit Observations View and Explore Data My eBird

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About eBird

Global tools for birders, critical data for science

- Record the birds you see
- Keep track of your bird lists
- Explore dynamic maps and graphs
- Share your sightings and join the eBird community
- Contribute to science and conservation

Overview
A real-time, online checklist program, eBird has revolutionized the way that the birding community reports and accesses information about birds.

[Register Now!](#)

About eBird

- [Why should I eBird?](#)
- [What is My eBird?](#)
- [What data are appropriate?](#)
- [How can I make my checklists more valuable?](#)
- [Improving your eBird reporting skills](#)
- [How will scientists use your observations?](#)
- [Uploading your records](#)
- [eBird Tutorial](#)
- [eBird Regional Portals](#)
- [eBird Data Quality](#)
- [Hotspots](#)
- [eBird Taxonomy](#)
- [Frequently Asked Questions](#)
- [Data Privacy Issues](#)

2000: Nature's Calendar Survey

The nature's calendar survey Search

WOODLAND TRUST

Home Get started Results Maps **Wildlife** About

When it flowers yarrow is a food source for the speckled wood and small skipper butterflies

Calendars
Fact files
Recording autumn trees
Should I record my sick horse chestnut?

Wildlife
The plants and animals we survey each year

- Wildlife fact files
- Seasonal events
- FREE wildlife fact packs
- Download a recording form

register
get your free starter pack

record
enter your sightings

Visit Wood.org.uk

find a wood near you

join the discussion on facebook

CEH Centre for Ecology & Hydrology

2000: Nature's Calendar Survey

The screenshot shows the homepage of the 'The nature's calendar survey' website. At the top, there is a navigation bar with links for Home, Get started, Results, Maps, Wildlife, and About. Below the navigation bar, a banner features a row of images: a blue butterfly, a brown butterfly, a white flower, a blue jay, a tree, and a portrait of a man. A search bar is located on the right side of the banner.

The main content area is divided into two columns. The left column contains a sidebar with links for 'Calendars', 'Fact files', 'Recording autumn trees', and 'Should I record my sick horse chestnut?'. The right column contains a vertical list of links: 'FREE wildlife packs', 'bluebell quiz', 'register', 'record', and 'find a wood near you'. The 'register' and 'record' links are accompanied by small icons of a calendar and a checklist, respectively.

The central content area features a large image of white daisies under a blue sky. Below this image, the text reads 'Wildlife' and 'The plants and animals we survey each year'. A list of bullet points includes 'Wildlife fact files', 'Seasonal events', 'FREE wildlife fact packs', and 'Download a recording form'. To the right of this text is a large image of a butterfly. At the bottom of the central area, there is a search bar and a link to 'Visit Wood.org.uk'.

The footer of the page includes the Woodland Trust logo and the Centre for Ecology & Hydrology logo.

- 50.000 people across UK
- Phenology: times of recurring natural phenomena
- Woodland Trust + Centre for Ecology & Hydrology



A review of spring 2010 – Richard Smithers and Tim Sparks

Readers may remember media interest in the weather during early spring 2010 because January and February were the coldest for 30 years. Unsurprisingly some spring events expected at this time of year, such as blackthorn flowering, were consequently late.

However, monthly temperatures in March and April were above average and as a result some events expected in these months were relatively early; for instance butterfly emergence and leafing in some trees. Overall, mean

February-April temperatures were still warmer than both 2001 and 2006.

Some species showed rather unexpected responses, which are detailed below.

Weather

Monthly spring temperatures have been quite variable over the last five years (see Figure 1). Spring 2010 got off to a chilly start with the coldest

January since 1987 and coldest February since 1991. Average temperatures for January-February were 1.7°C below the 30-year average (1961-90). Both months saw heavy snowfalls



Events

In spring 2010, colder temperatures until mid-March resulted in subsequent events being later than our baseline year of 2001 (the year spring temperatures were very close to the 1961-1990 30-year average). However, warmer temperatures in the second half of March appear to have reversed the situation for events from early April onwards.

Events that on average occurred later than in 2001 were:

- **Lesser celandine first flower** on 20 April, five days late and 17 days later than 2009
- **Hawthorn budburst** on 27 March, 4 days late and 16 days later than 2009



- **Hawthorn first leaf** on 6 April, 3 days late and 15 days later than 2009

2009: Twitter Meteor Watch





- 3 nights around the peak of the Perseid meteor shower
 - > 20,000 people on Twitter
- New media for the new generation.







GALAXY ZOO: NEXT TALK!

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Are there any drawbacks...?



KIERON O'HARA AND NIGEL SHADBOLT

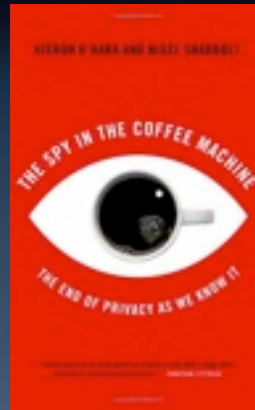
UK e-Science

THE SPY IN THE COFFEE MACHINE

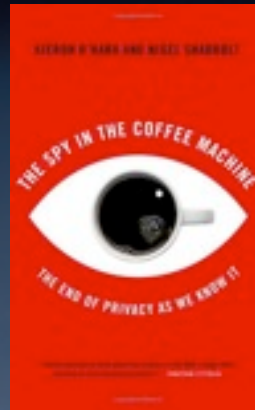


THE END OF PRIVACY AS WE KNOW IT

"Invites everyone to think about how to preserve the Web's magic while
avoiding its most unsettling prospects." JONATHAN ZITTRAIN



Eagle eye, 2008. D. J. Caruso



Eagle eye, 2008. D. J. Caruso

NET NEUTRALITY

“Threats to the Internet, such as companies or governments that interfere with or snoop on Internet traffic, compromise **basic human network rights.**”

Berners-Lee

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“Threats to the Internet, such as companies or governments that interfere with or snoop on Internet traffic, compromise **basic human network rights.**”

Berners-Lee

DE-CENTRALIZATION OF SCIENCE

THANK YOU

AND BY THANK YOU

...I MEAN

AND BY THANK YOU

...I MEAN

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FOR MAKING ALL
THESE HAPPEN**

AND BY THANK YOU

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