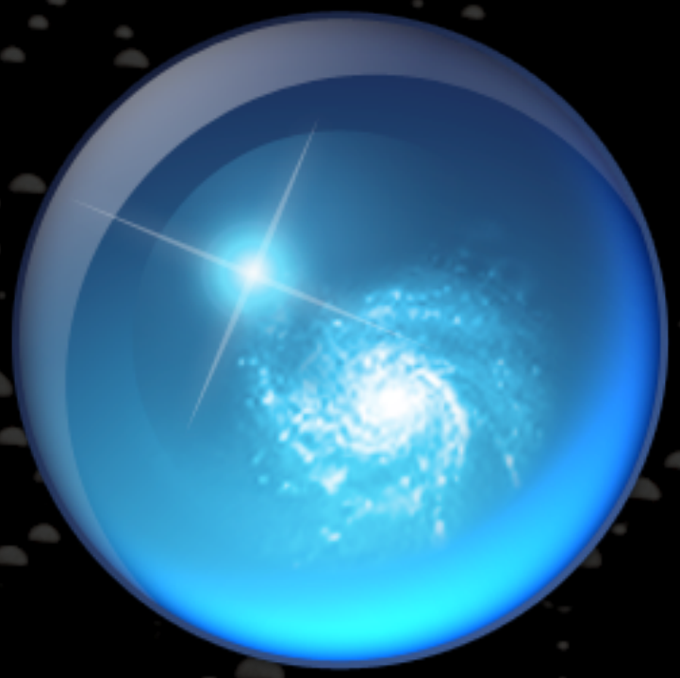


WorldWide Telescope

in “Real” Research and Education

Alyssa Goodman, Gus Muench, Alberto Pepe, and Patricia Udomprasert
(Harvard-Smithsonian Center for Astrophysics)
and Jonathan Fay and Curtis Wong (Microsoft Research)

Jim Gray (& Alex Szalay) had it right (in 2004)

The World Wide Telescope an Archetype for Online-Science

Jim Gray (Microsoft)

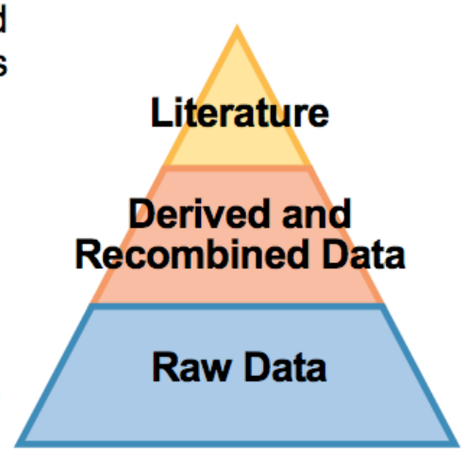
Alex Szalay (Johns Hopkins University)

Microsoft Academic Days in Silicon Valley

http://research.microsoft.com/~gray/talks

All Scientific Data Online

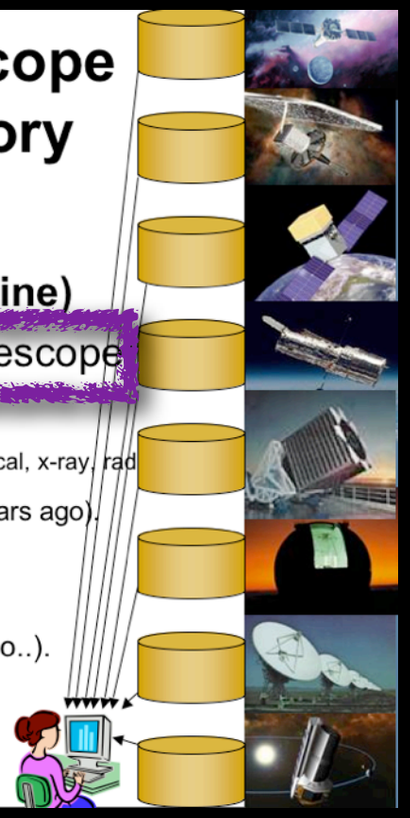
- Many disciplines overlap and use data from other sciences
- Internet can unify all literature and data
- Go from literature to computation to data back to literature
- Information at your fingertips for everyone-everywhere
- Increase Scientific Information Velocity
- Huge increase in Science Productivity



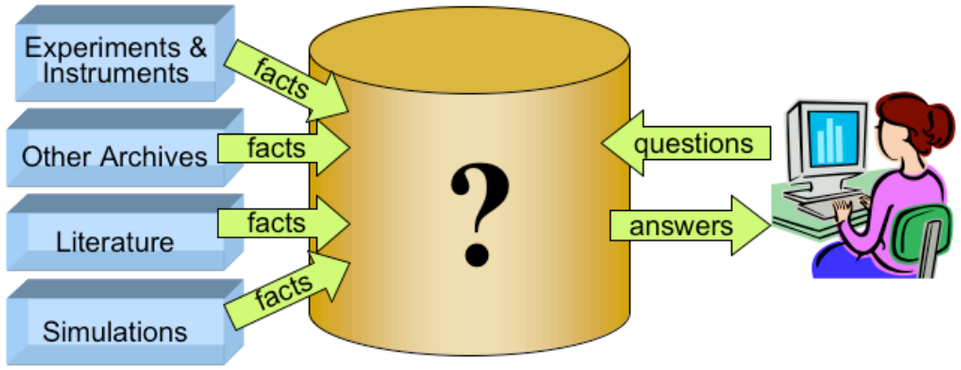
World Wide Telescope Virtual Observatory

http://www.ivoa.net/

- Premise:
  Most data is (or could be online)
- The Internet is the world's best telescope:
  - It has data on every part of the sky
  - In every measured spectral band: optical, x-ray, rad
  - As deep as the best instruments (2 years ago).
  - It is up when you are up.
    The "seeing" is always great
    (no working at night, no clouds no moons no..).
  - It's a smart telescope:
    links objects and data to literature on them.



The Big Picture



The Big Problems

- Data ingest
- Managing a petabyte
- Common schema
- How to organize it?
- How to *re*organize it
- How to coexist with others
- Query and Vis tools
- Support/training
- Performance
  - Execute queries in a minute
  - Batch query scheduling

2007

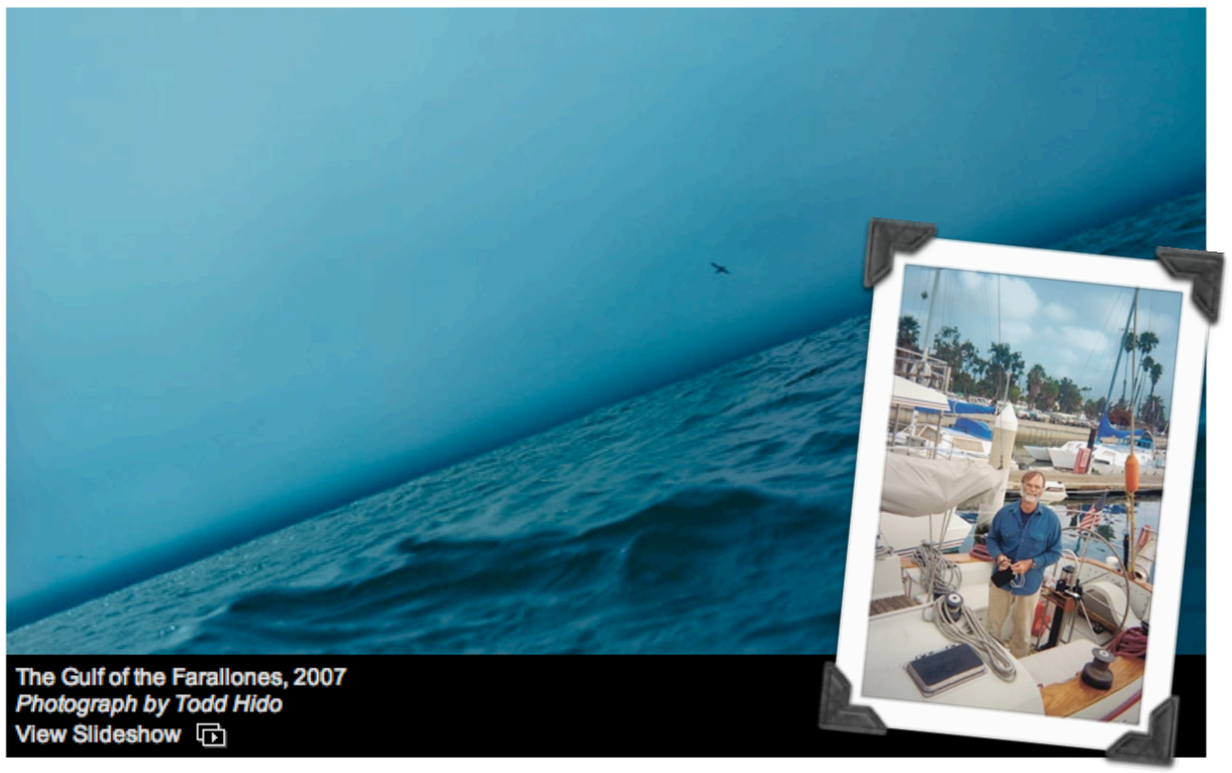
2008

WIRED MAGAZINE: ISSUE 15.08

TECH BIZ : PEOPLE

Inside the High Tech Hunt for a Missing Silicon Valley Legend

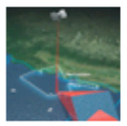
Steve Silberman 07.24.07



The Gulf of the Farallones, 2007
Photograph by Todd Hido
View Slideshow

FEATURE

Anatomy of an Accident



Lost at Sea

It looked like a fine day for a sail. On Sunday, January 28, 2007, Microsoft researcher Jim Gray woke up on his boat, a red 40-foot fiberglass cruiser called *Tenacious*. The water in Gashouse Cove, a cozy marina in San Francisco Bay, was nearly flat. The 63-year-old programmer phoned his wife, Donna Carnes, who was on an annual vacation with friends in Wisconsin. He said he was heading out to the Farallon Islands, a wildlife refuge 27 miles offshore, to scatter the ashes of his mother, Ann, who died in October.

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PRESS RELEASES

SHARE

How Microsoft's WorldWide Telescope will change the world

Commentary
By David J. Eicher — Published: May 13, 2008

A century ago, young people grew up in lockstep with nature, mostly in rural settings with the smell of the countryside around them and the twinkle of countless stars above. Now, young Americans largely are separated from nature and science, often bound by cities or otherwise light-polluted skies that inhibit them from appreciating the universe that surrounds them. The electric excitement of youth turns not to reality, but to the artificial worlds of the Internet and video games.

Key facts about WorldWide Telescope:

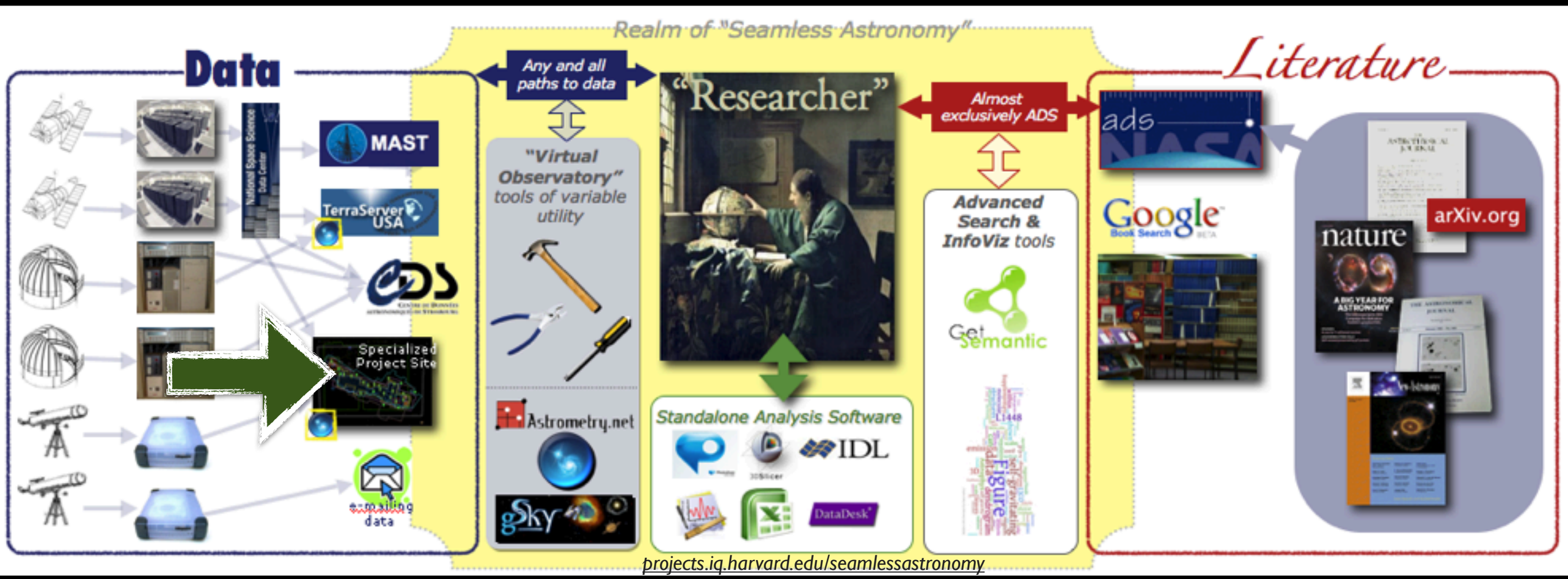
- WorldWide Telescope is a free, public, beta program
- Download the program at www.WorldWideTelescope.org
- WWT runs only on Windows-equipped computers
- *Astronomy* magazine is one of the first communities within WorldWide Telescope

The result is an American science education crisis. Job growth, economic power, technology, and world leadership in innovation all rest squarely on science and engineering. Other nations have surpassed the United States in inspiring schoolchildren to care about science, by presenting science and engineering as meaningful, exciting career choices for high school and college students.

Research

COMPLETE • SAMP • ADS Labs & All Sky Survey

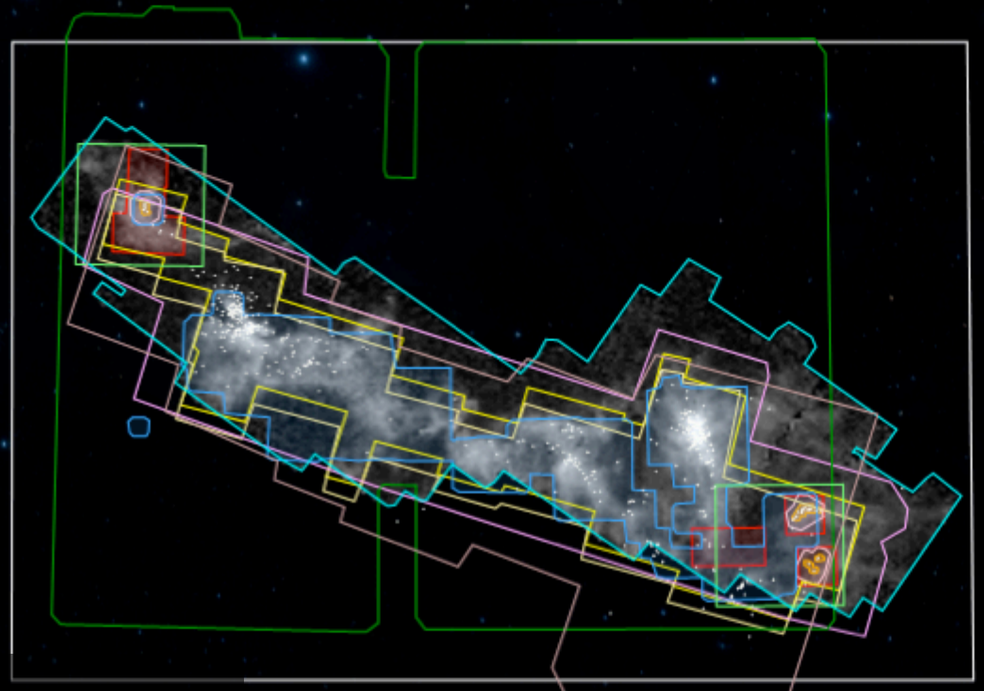
WWT as part of "Seamless Astronomy"



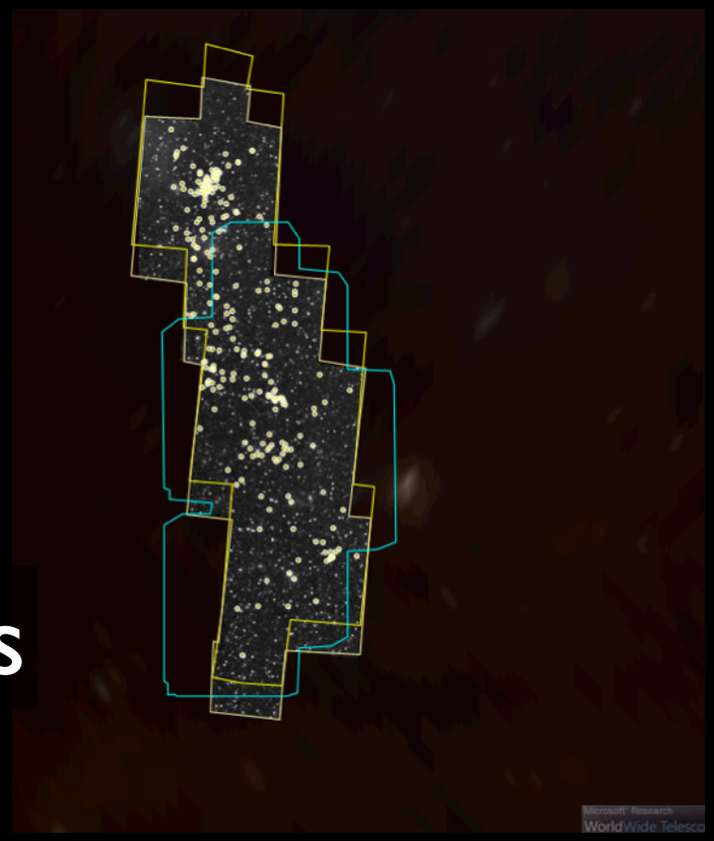
projects.iq.harvard.edu/seamlessastronomy

Alberto Accomazzi, Douglas Burke, Raffaele D'Abrusco, Rahul Davé, Alyssa Goodman, Christopher Erdmann, Pepi Fabbiano, Jay Luker, Gus Muench, Michael Kurtz & Alberto Pepe, Arnold Rots (Harvard-Smithsonian CfA); Eli Bressert (U. Exeter); Tim Clark (Massachusetts General Hospital/Harvard Medical School); Mercé Crosas (Harvard Institute for Quantitative Social Science; Chris Borgman (UCLA); Alberto Conti (STScI); Jonathan Fay & Curtis Wong (Microsoft Research)

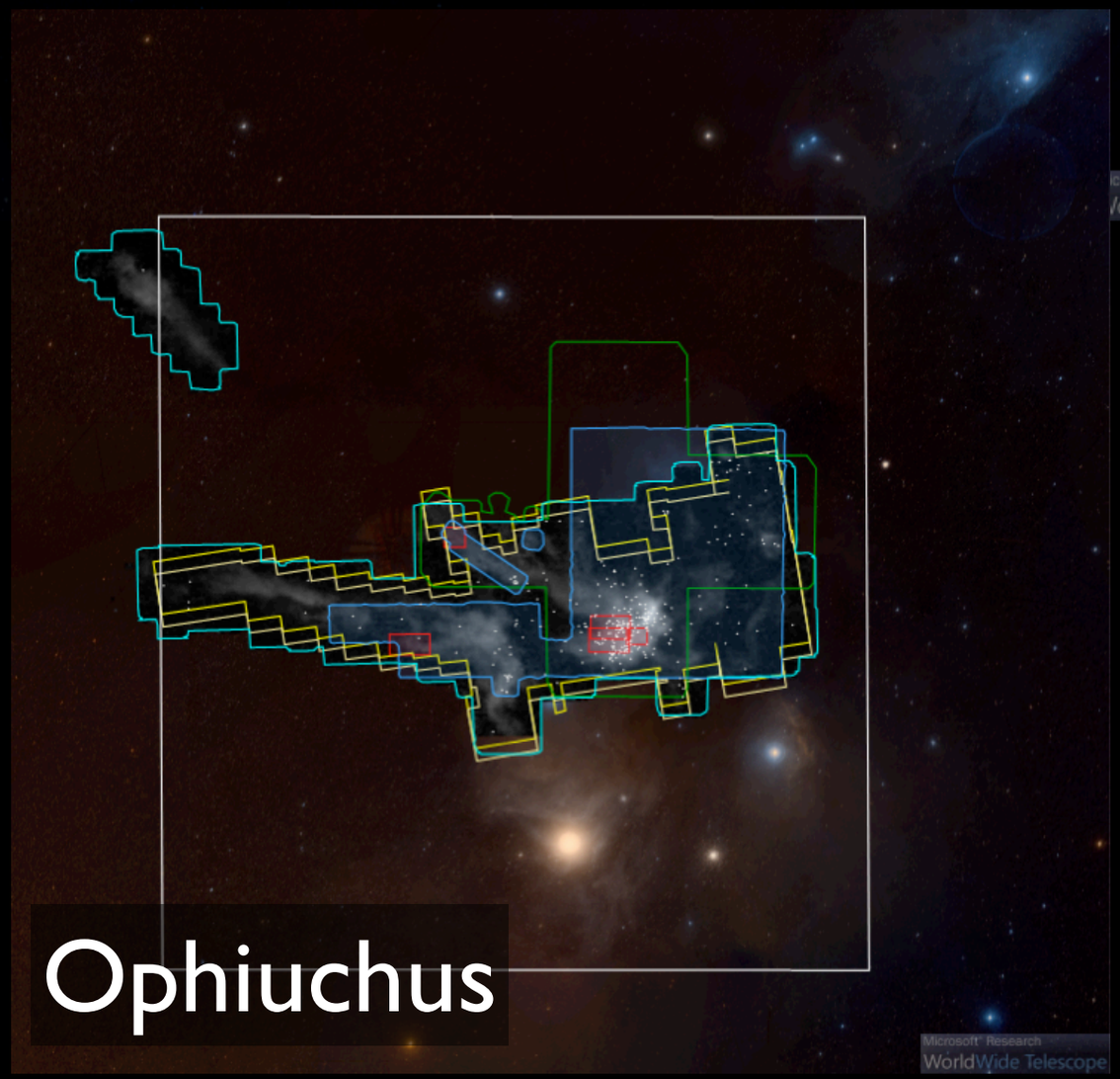
Smithsonian · Microsoft Research · NASA · NSF



Perseus



Serpens



Ophiuchus

COMPLETE

The **CO**ordinated **M**olecular **P**robe **L**ine **E**xtinction **T**hermal **E**mission Survey of Star-Forming Regions

www.cfa.harvard.edu/COMPLETE

tinyurl.com/completepapers

Literature

WIKIPEDIA
The Free Encyclopedia

AstroBetter

Blogs, Wikis, etc.

Data

"Registries"

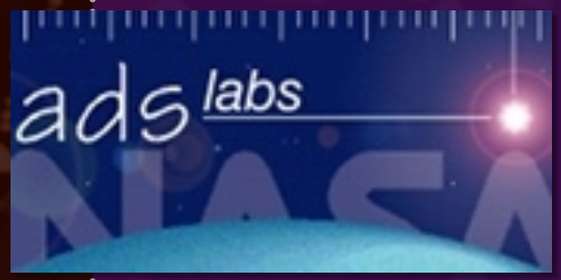
DataScope

Disclaimer:*This slide shows key excerpts from within the astronomy community & excludes more general s/w that is used, such as Papers, Zotero, Mendeley, EndNote, graphing & statistics packages, data handling software, search engines, etc.*

Literature

Blogs, Wikis, etc.

"Seamless Astronomy" (Tools)



WorldWide Telescope

TOPCAT

ds9

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Literature

WIKIPEDIA
The Free Encyclopedia

AstroBetter

Blogs, Wikis, etc.

"Seamless Astronomy" (Tools)

ads labs

WorldWide Telescope

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Data

VizieR

ALADIN

SIMBAD

Astro Grid

VAO

IVOA

EURO VO AIDA Astronomical Infrastructure for Data Access

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WorldWide Telescope

VizieR

SIMBAD

ALADIN

Astrometry.net

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TOPCAT

SAMP

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Astro Grid

VAO

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Blogs, Wikis, etc.

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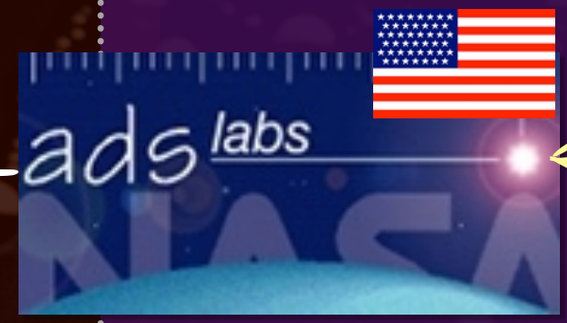
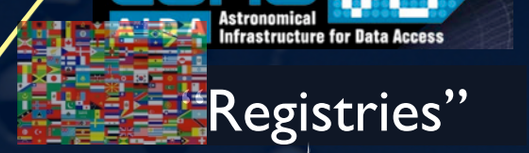
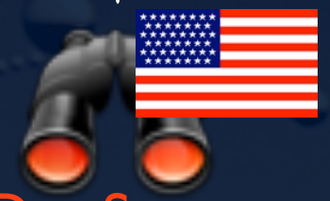


WorldWide Telescope



Blogs, Wikis, etc.

SAMP



DataScope

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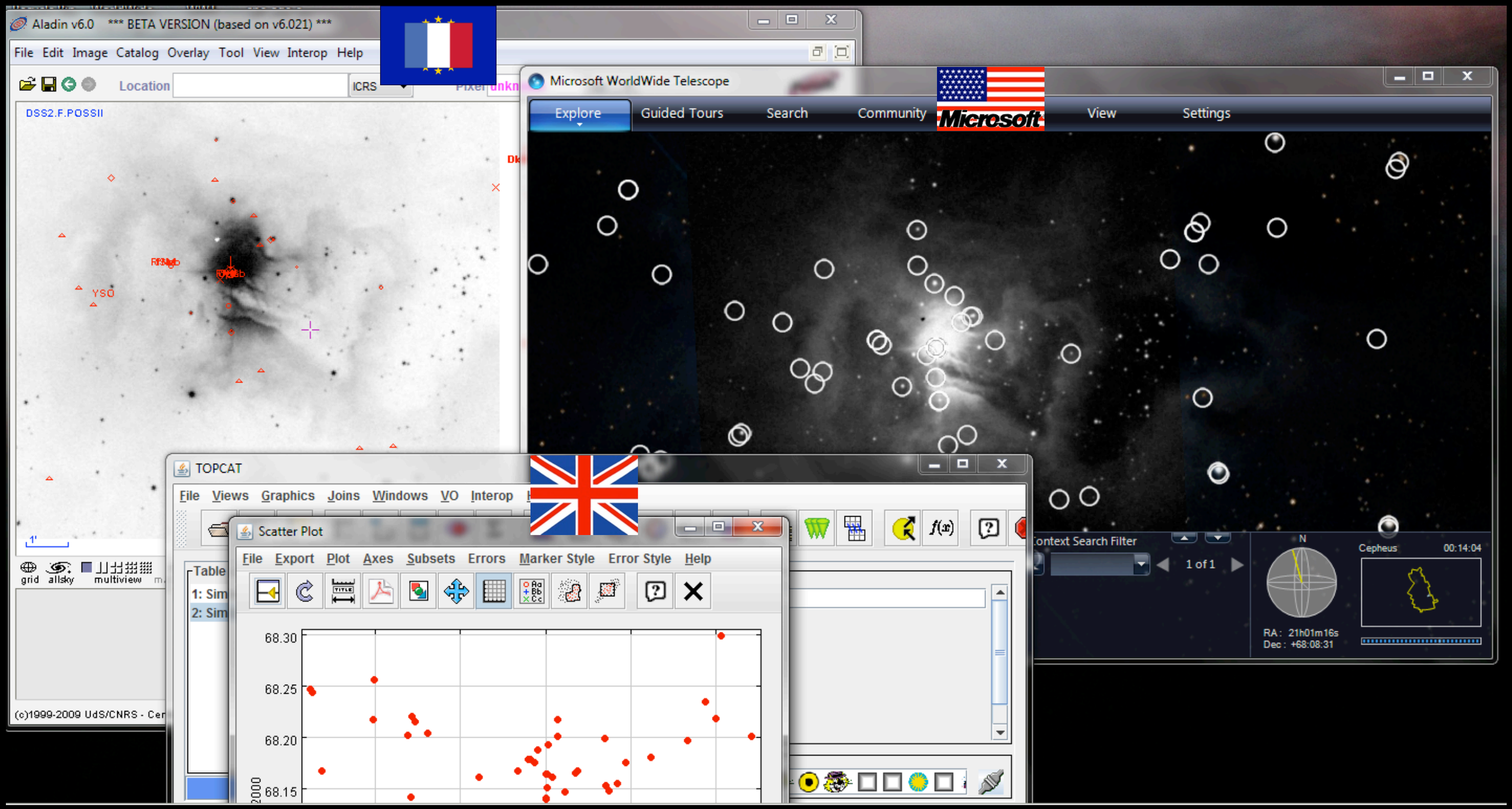
SAMP

(Simple Application Messaging Protocol)

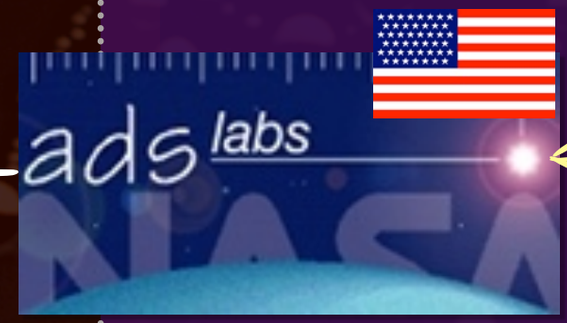


link to 12/2010 IVOA recommendation

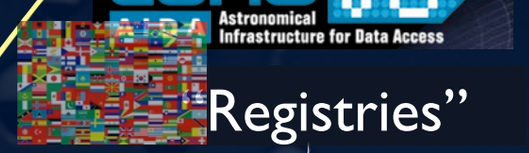
Literature

"Seamless Astronomy" (Tools)

Data

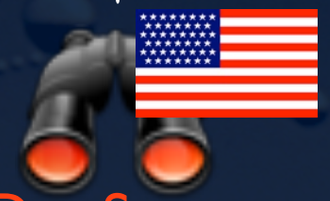


WorldWide Telescope



Blogs, Wikis, etc.

SAMP



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The ADS is operated by the Smithsonian Astrophysical Observatory under NASA Grant NNX09AB39G
Contact: ads at cfa.harvard.edu or through the feedback form.

ADS Labs/Seamless Astronomy Core Collaboration
*A. **Accomazzi**, A. Goodman, M. **Kurtz**, R. **Davé**, J. Luker, G. Muench, A. Pepe*

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- Uitenbroek, H (4)
- Amano, T (2)
- Angel, J (2)
- Asensio Ramos, A (2)
- Balasubramaniam, K (2)

Keywords

Archives

Missions

SIMBAD Objects
- Other object (3)
- Star (3)
- Nebula (1)
- NGC 7027 [1]
- [X]

ADS Publications
SIMBAD Info
World Wide Telescope
Aladin applet

Vizier Tables

Refereed status

Dates

3. 2010ApJ...716L...1A **The J = 1-0 Transitions of 12CH+, 13CH+, and 12CD+**
Amano, T.
The Astrophysical Journal Letters, Volume 716, Issue 1, pp. L1-L3 (2010). Jun 2010

4. 2009ApJ...705L.176S **Detection of the Zeeman Effect in the 36 GHz Class I CH3OH Maser Line with the EVLA**
Sarma, A. P.; Momjian, E.
The Astrophysical Journal Letters, Volume 705, Issue 2, pp. L176-L179 (2009). Nov 2009

11. 2003A&A...412..513B **The molecular Zeeman effect and diagnostics of solar and stellar magnetic fields. II. Synthetic Stokes profiles in the Zeeman regime**
Berdyugina, S. V.; Solanki, S. K.; Frutiger, C.
Astronomy and Astrophysics, v.412, p.513-527 (2003) Dec 2003

12. 2000PASP..112..873W **Magnetism in Isolated and Binary White Dwarfs**
Wickramasinghe, D. T.; Ferrario, Lilia
The Publications of the Astronomical Society of the Pacific, Volume 112, Issue 773, pp. 873-924. Jul 2000

Microsoft WorldWide Telescope Web Client

http://www.worldwidetelescope.org/webclient/default.aspx?wtml=http%3a%2f%2fww

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1 of 1

NGC 7027

WorldWide Telescope

"shift-click" on object

Finder Scope

NGC7027

Classification: Planetary Nebula in Cygnus

RA:	21h07m01s	Magnitude:	10.5
Dec:	42 : 14 : 10	Distance:	n/a
Alt:	-02 : 33 : 41	Rise:	23:50
Az:	342 : 18 : 46	Transit:	09:40
		Set:	19:35

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Info

http://gsss.stsci.edu/Acknowledgements/DataCo

Research | Show Object | Close

Look At: Sky

Imagery: Digitized Sky Survey (Color)

Cygnus

NGC7027

1 of 1

N

Cygnus 00:03:37

RA : 21h07m02s
Dec : 42:14:09

Done

Microsoft WorldWide Telescope Web Client

http://www.worldwidetelescope.org/webclient/default.aspx?wtml=http%3a%2f%2fww

Wave 2 PPOF | AY201b | ADS Labs | Google Calendar | ADS Best | AG Home Page | COMPLETE/TT | Harvard IIC: Projects | WWTSL | Open in Papers | VOUG | Press This | TinyURL!

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NGC 7027

WorldWide Telescope

click "Research, Information"

Finder Scope

NGC7027

Classification: Planetary Nebula in Cygnus

RA:	21h07m01s	Magnitude:	10.5
Dec:	42 : 14 : 10	Distance:	n/a
Alt:	02 : 36 : 57	Rise:	23:50
Az:	342 : 29 : 00	Transit:	09:40
		Set:	19:35

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Name:NGC7027

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Imagery ▶
Virtual Observatory Searches ▶

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Look up on SEDS
Look up on Wikipedia
Look up publications on ADS
Look up on NED
Look up on SDSS

...more data
...or more literature

SIMBAD

Look At: Sky
Imagery: Digitized Sky Survey (Color)

Cygnus

NGC7027

1 of 1

N

ads labs NASA

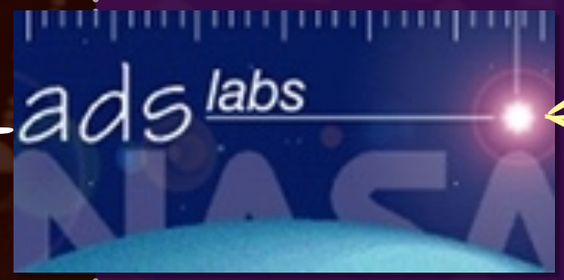
RA : 21h07m02s
Dec : 42:14:09

Done

Literature

Blogs, Wikis, etc.

"Seamless Astronomy" (Tools)



Data

Registries"

DataScope

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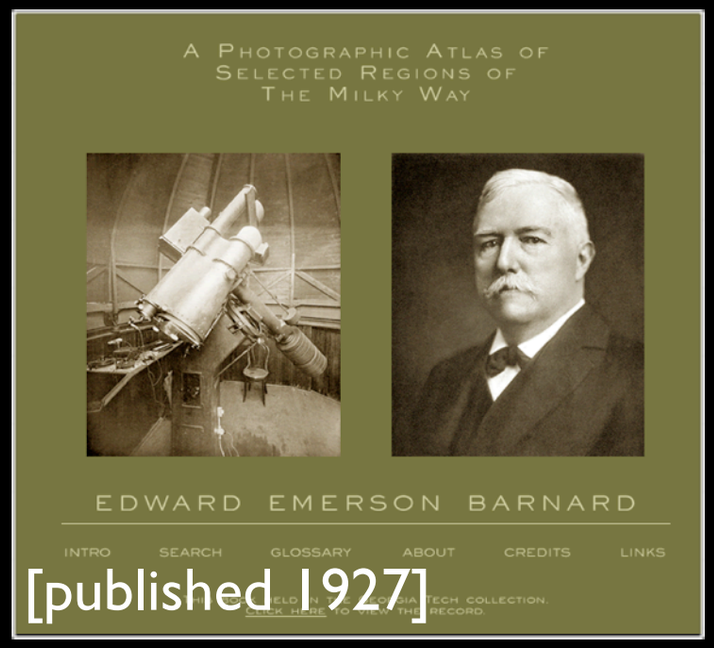
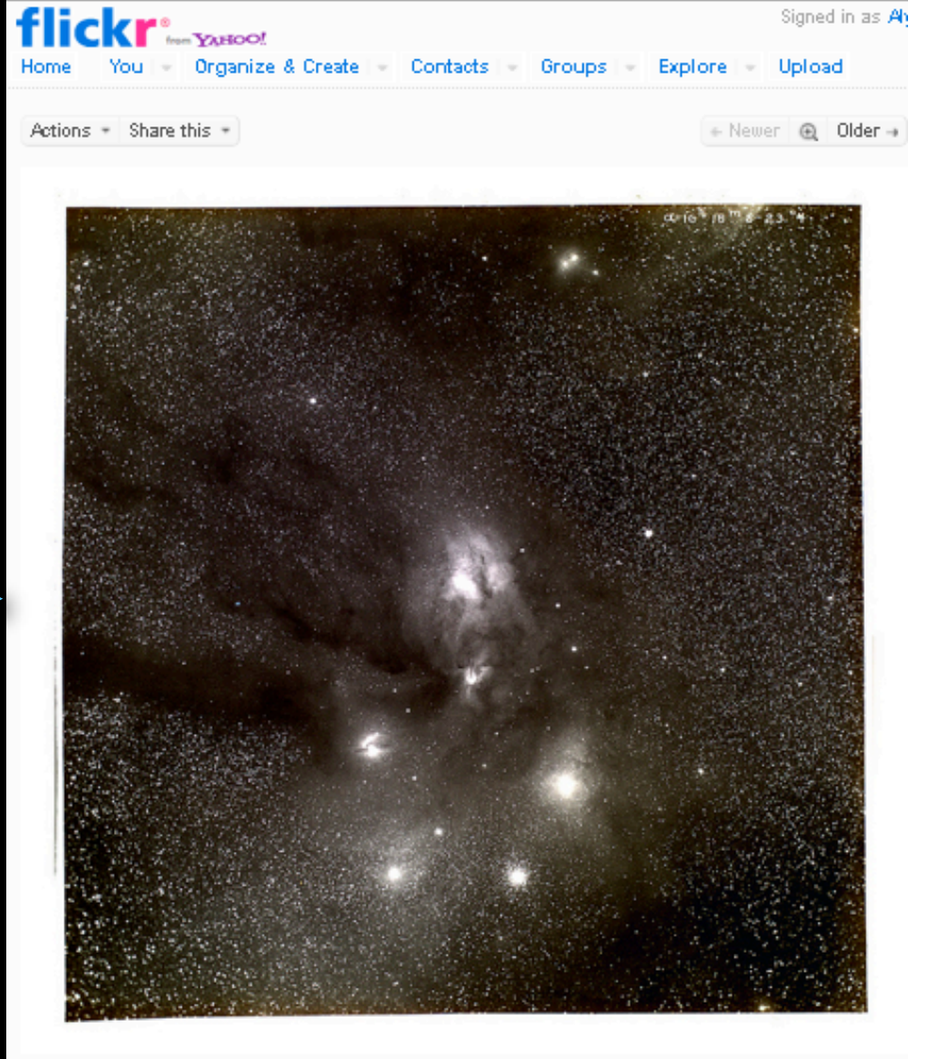
“Seamless Astronomy”...

astrometry.net + flickr + WWT



[published 1927]



barnardoph

E.E. Barnard's image of Ophiuchus
www.library.gatech.edu/bpdi/bpdi.php

Comments and faves astrometry.net

astrometry.net (6 days ago | reply | delete)
Hello, this is the blind astrometry solver. Your results are:
(RA, Dec) center:(246.421365149, -23.6749819397) degrees
(RA, Dec) center (H:M:S, D:M:S):(16:25:41.128, -23:40:29.935)
Orientation:178.34 deg E of N

Pixel scale:52.94 arcsec/pixel

Parity:Reverse ("Left-handed")
Field size :9.41 x 9.41 degrees

Your field contains:
The star Antares (αSco)
The star Graffias (β1Sco)
The star Al Niyat (σSco)
The star τSco
The star ω1Sco
The star νSco
The star ω2Sco
The star ωOph
The star 13Sco
The star οSco
IC 4592
IC 4601
NGC 6121 / M 4
IC 4603
IC 4604 / rho Oph nebula
IC 4605

View in World Wide Telescope

Education

WWT Ambassadors

WWT Ambassadors: WorldWide Telescope For Interactive Learning

Alyssa Goodman
Harvard University Professor of Astronomy, Microsoft Academic Partner

Pat Udomprasert
WWT Program Coordinator

Curtis Wong
Microsoft Research, WWT Creator

Stephen Strom
NOAO, WWTA Tucson Site Advisor

Sarah Block
Web site development

Using WWT to give experts and learners access to the Universe

data, literature, media

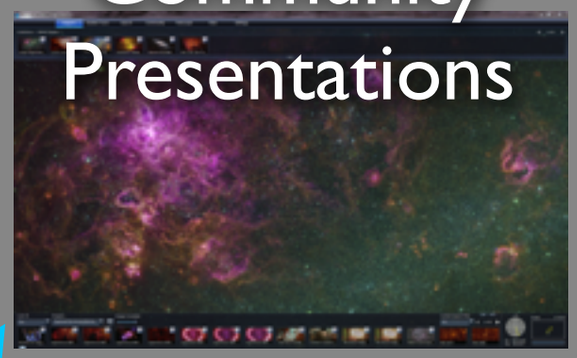
WWT

WWT Ambassadors

WWT Ambassadors Program

Recruiting, Vetting, Coordination

Community Presentations



WWT Tours

In-school programs

wwtambassadors.org

Microsoft® Research
WorldWide Telescope

Ambassadors Program

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About the WWT Telescope Ambassadors Program

WorldWide Telescope (WWT) is a rich visualization environment that functions as a virtual telescope, allowing anyone to make use of professional astronomical data to explore and understand the universe. As of early 2010, the new WWT Ambassadors Program is recruiting astronomically-literate volunteers, including retired scientists engineers—all of whom will be trained to be experts in using WWT as a teaching tool. Ambassadors will give volunteer presentations at public libraries, community centers, museums, and schools, demonstrating WWT's power to help laypeople visualize and understand our universe.

Read more

John Huchra's Universe

Submitted by patudom on Jan. 11

John Huchra, former president of the **American Astronomical Society**, passed away on October 8, 2010.

John's colleagues at the Harvard-Smithsonian Center for Astrophysics, in collaboration with the creators of WorldWide Telescope at Microsoft Research, have created a new, interactive, WWT Tour to honor John and his career. The Tour primarily focuses on John's quest to map the Universe in three dimensions. It is 12.5 minutes long.

The Tour is best experienced inside the WorldWide Telescope program itself. (**Note: You must have the version of WWT released on 1/13/2011 to view all of this Tour's content. You can download it from here.**) As viewed within the WWT program, the Tour content is interactive, allowing users to pause and explore the parts of the Universe featured in the tour, explore web hyperlinks, and more. For those who do not have the desktop client, the Tour has been posted as a video as well.

Video (Interactive WWT features will be disabled)

John Huchra's Universe

Friends of John Huchra have released a new WWT Tour to honor John and his work. The Tour primarily focuses on John's quest to map the Universe in three dimensions. You can view the Tour here.

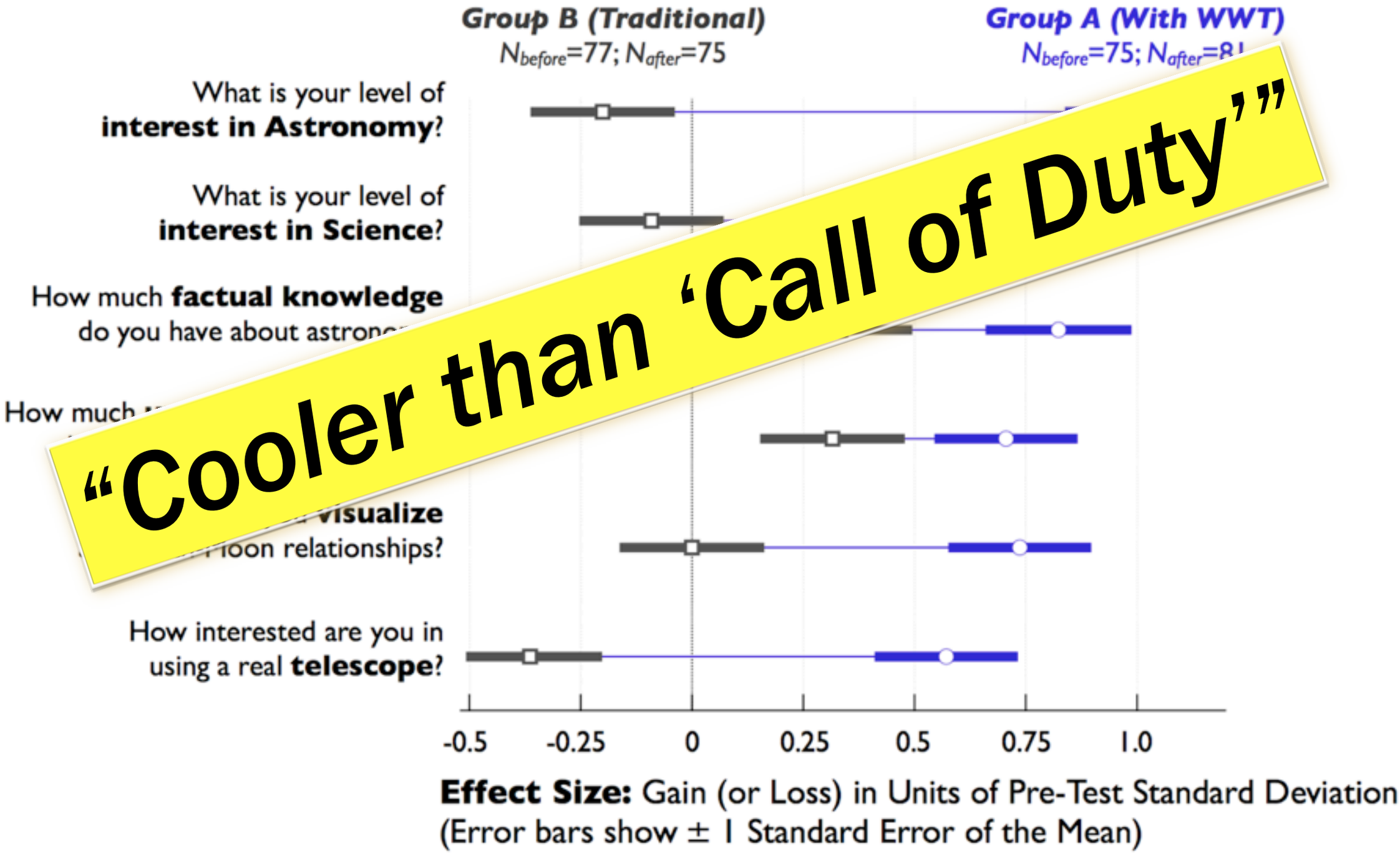
Upcoming

- Cyberlearning Tools for STEM Education Conference
  Mar. 8 - Mar. 9
- Cambridge Science Festival
  Apr. 30 - May. 10

Clarke Middle School, Lexington, MA (WWT Ambassadors Pilot School)

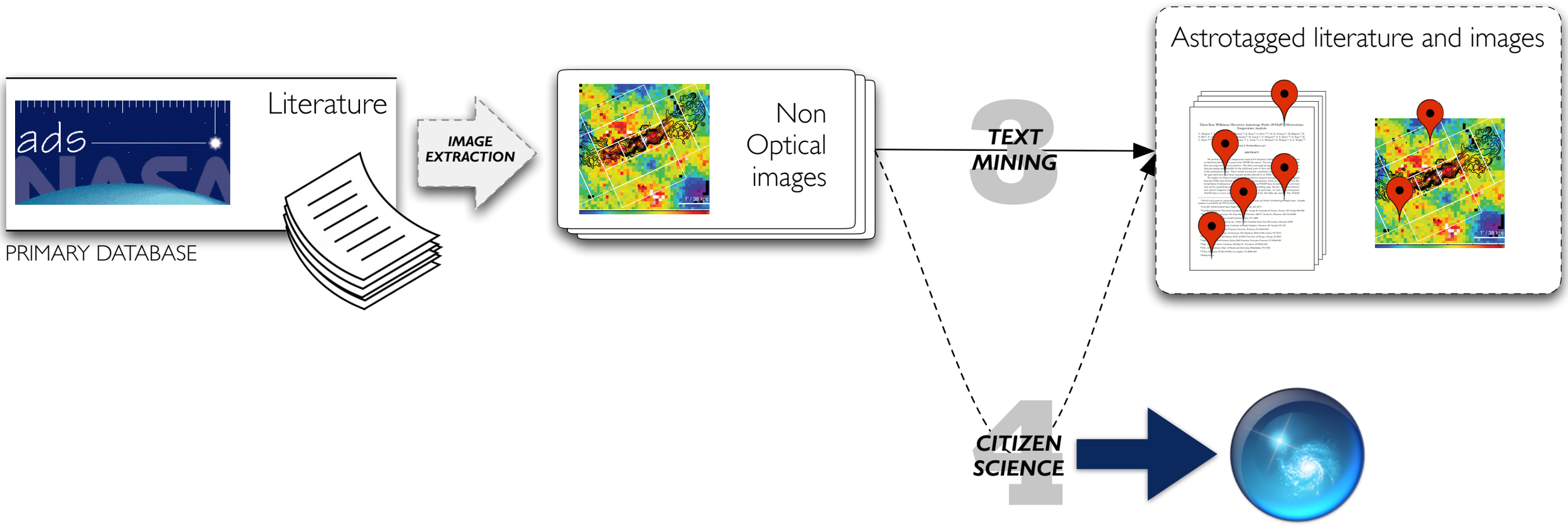
Gains in Student Interest and Understanding

("Traditional Way" vs "WWT Way")



Research+Education

Citizen Science in ADS All Sky Suvey
(Coming Soon...)



ZOONIVERSE
REAL SCIENCE ONLINE

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Planet Hunters

Using public data from NASA's Kepler mission, we are looking for planets around other stars.

JOIN IN

The Milky Way Project

The Milky Way Project aims to sort and measure our galaxy, the Milky Way. Initially we're asking you to help us find and draw bubbles in beautiful infrared data from the Spitzer Space Telescope.

JOIN IN

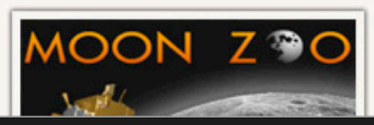
Old Weather

Help scientists recover worldwide weather observations made by Royal Navy ships around the time of World War I.

JOIN IN

Moon Zoo

Explore the Moon in unprecedented detail using images from NASA's Lunar Reconnaissance Orbiter.



Live Projects

planethunters.org
THE MILKY WAY PROJECT
MOON ZOO
GALAXY ZOO HUBBLE
oldWeather

EN · The Milky Way Project is part of the ZOONIVERSE ...just like SOLAR STORMWATCH

THE MILKY WAY PROJECT

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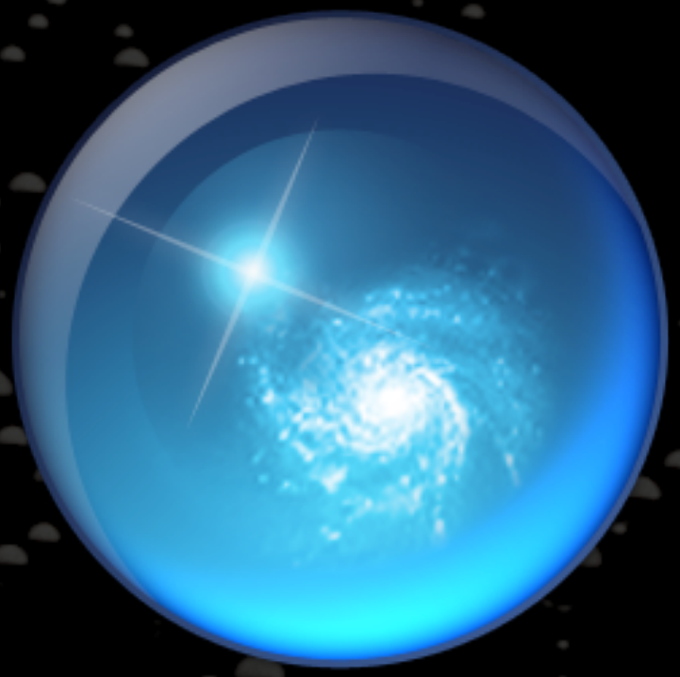

WorldWide Telescope

in “Real” Research and Education

Alyssa Goodman, Gus Muench, Alberto Pepe, and Patricia Udomprasert
(Harvard-Smithsonian Center for Astrophysics)
and Jonathan Fay and Curtis Wong (Microsoft Research)