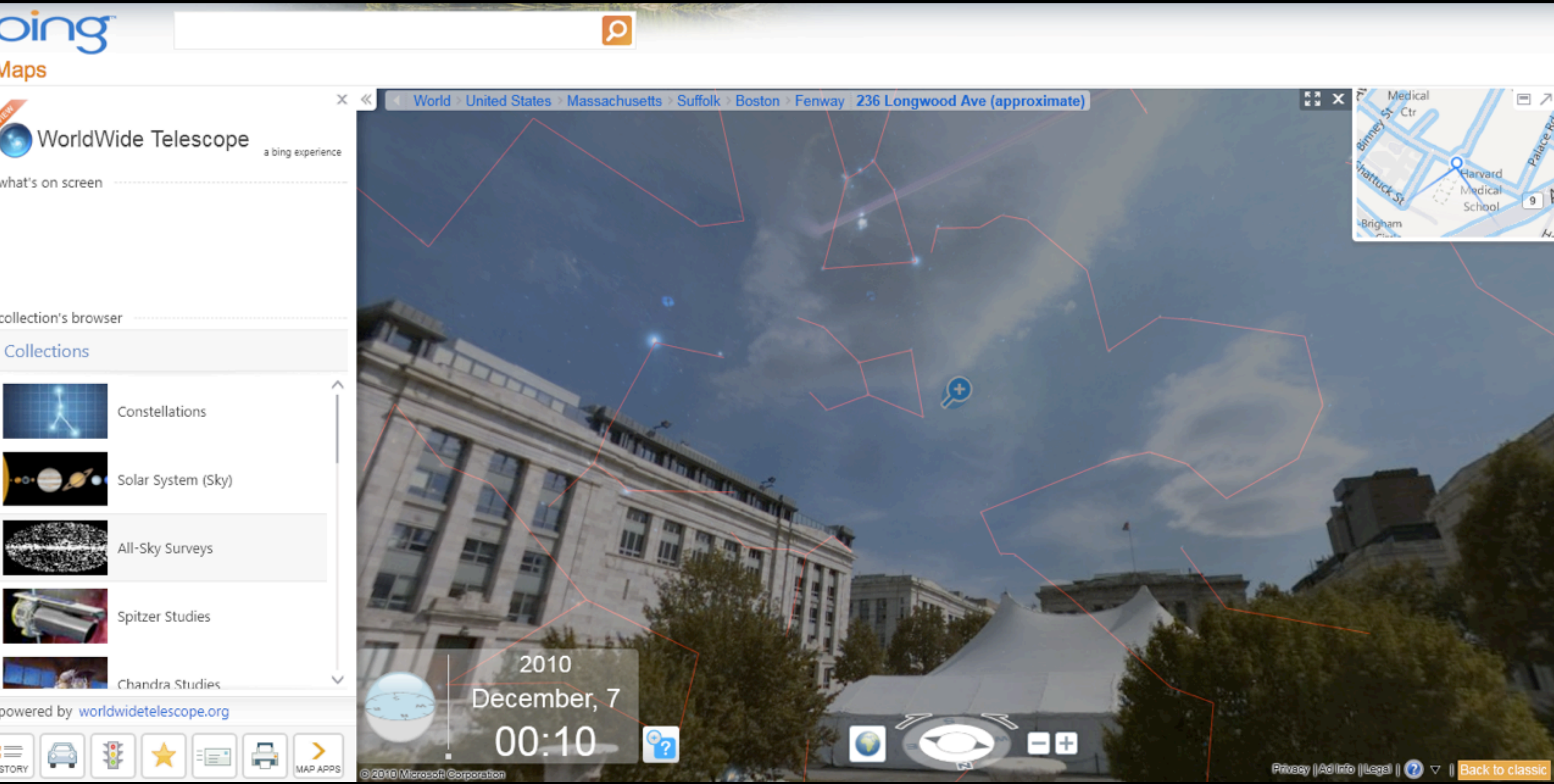
Seamless Astronomy

Alyssa A. Goodman

Harvard-Smithsonian Center for Astrophysics



with

Alberto Accomazzi, Douglas Burke, Gus Muench, Michael Kurtz & Alberto Pepe (Harvard-Smithsonian CfA); Eli Bressert (U. Exeter); Tim Clark (Massachusetts General Hospital/Harvard Medical School); Chris Borgman (UCLA); Jonathan Fay & Curtis Wong (Microsoft Research)

"Standard" Practices in Bioinformatics?

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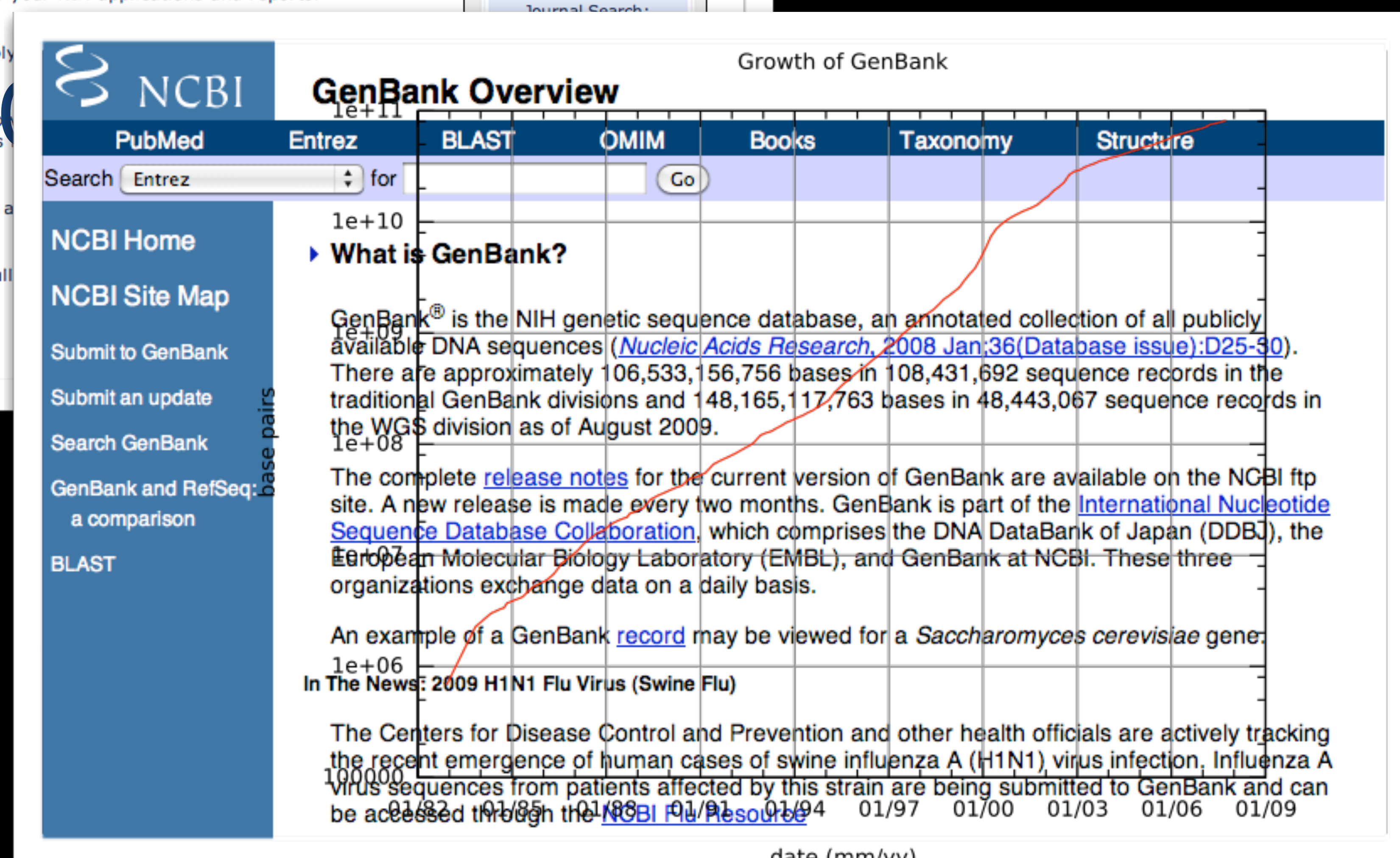
1



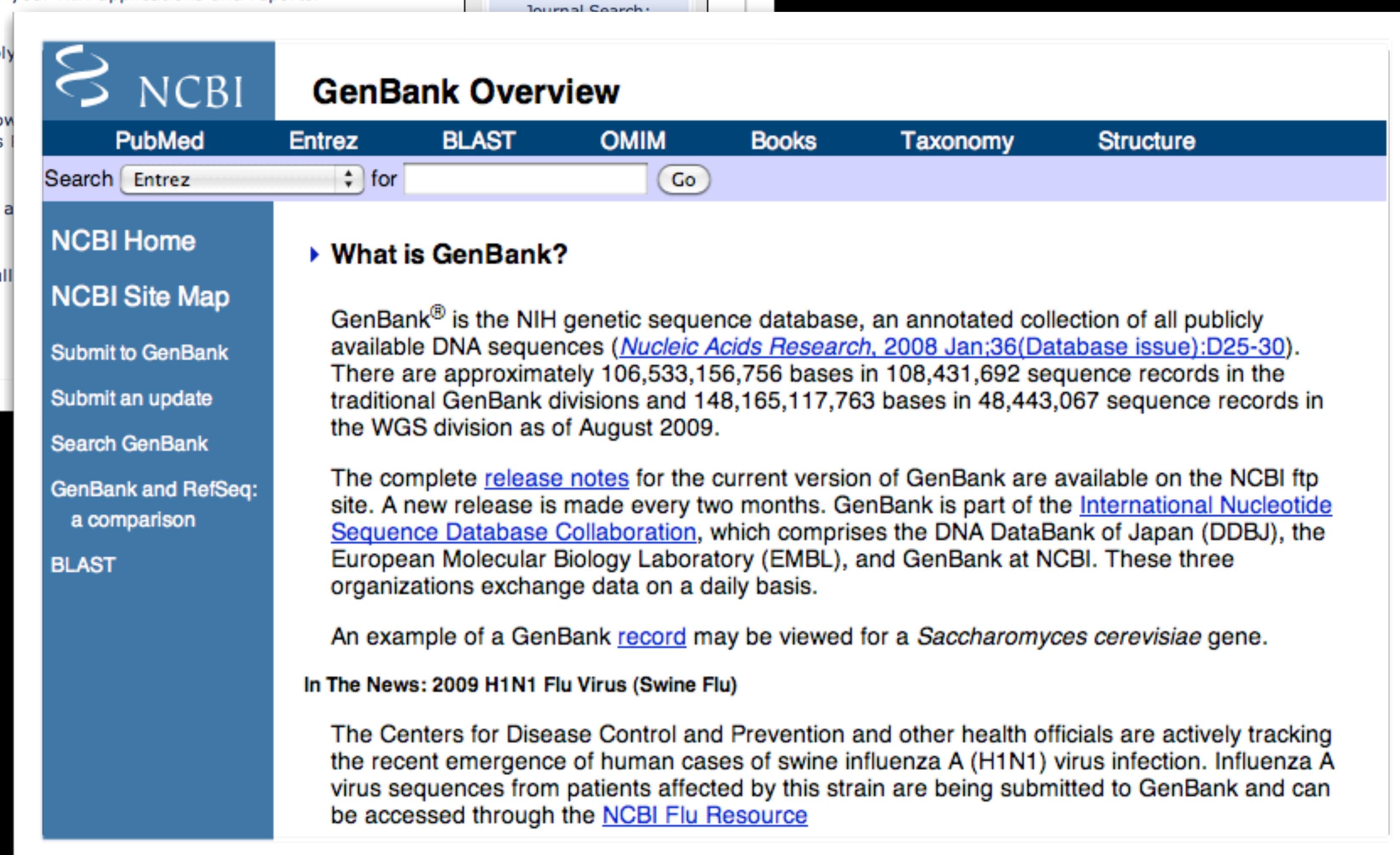
GenBank

1982

2009

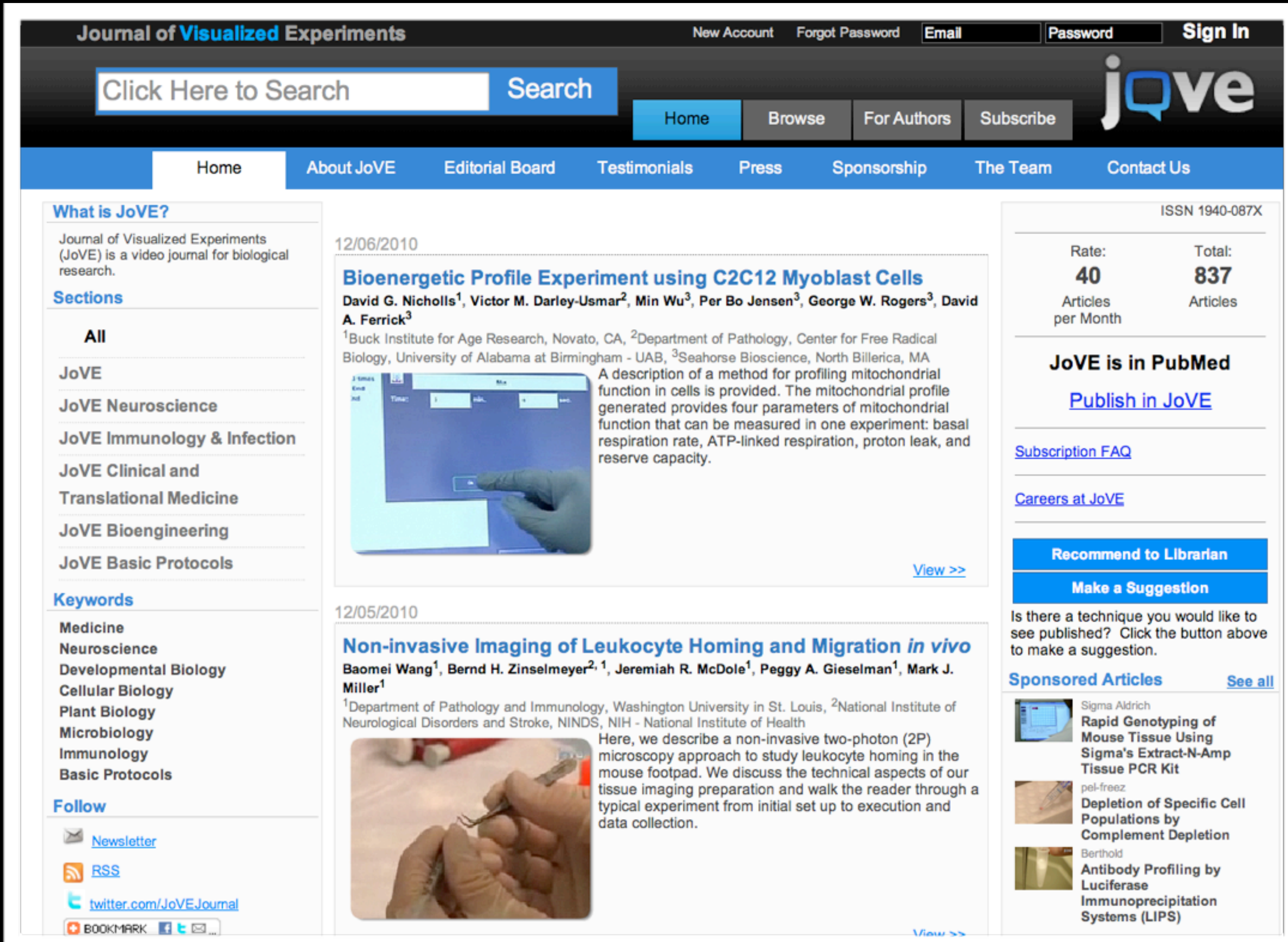
"Standard" Practices in Bioinformatics?

"Literature"



"Data"

(+ “Other”)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12/06/2010
Bioenergetic Profile Experiment using C2C12 Myoblast Cells
David G. Nicholls[1], Victor M. Darley-Usmar[2], Min Wu[3], Per Bo Jensen[3], George W. Rogers[3], David A. Ferrick[3]
[1]Buck Institute for Age Research, Novato, CA, [2]Department of Pathology, Center for Free Radical Biology, University of Alabama at Birmingham - UAB, [3]Seahorse Bioscience, North Billerica, MA
A description of a method for profiling mitochondrial function in cells is provided. The mitochondrial profile generated provides four parameters of mitochondrial function that can be measured in one experiment: basal respiration rate, ATP-linked respiration, proton leak, and reserve capacity.
View >>
12/05/2010
Non-invasive Imaging of Leukocyte Homing and Migration *in vivo*
Baomei Wang[1], Bernd H. Zinselmeyer[2, 1], Jeremiah R. McDole[1], Peggy A. Gieselman[1], Mark J. Miller[1]
[1]Department of Pathology and Immunology, Washington University in St. Louis, [2]National Institute of Neurological Disorders and Stroke, NINDS, NIH - National Institute of Health
Here, we describe a non-invasive two-photon (2P) microscopy approach to study leukocyte homing in the mouse footpad. We discuss the technical aspects of our tissue imaging preparation and walk the reader through a typical experiment from initial set up to execution and data collection.
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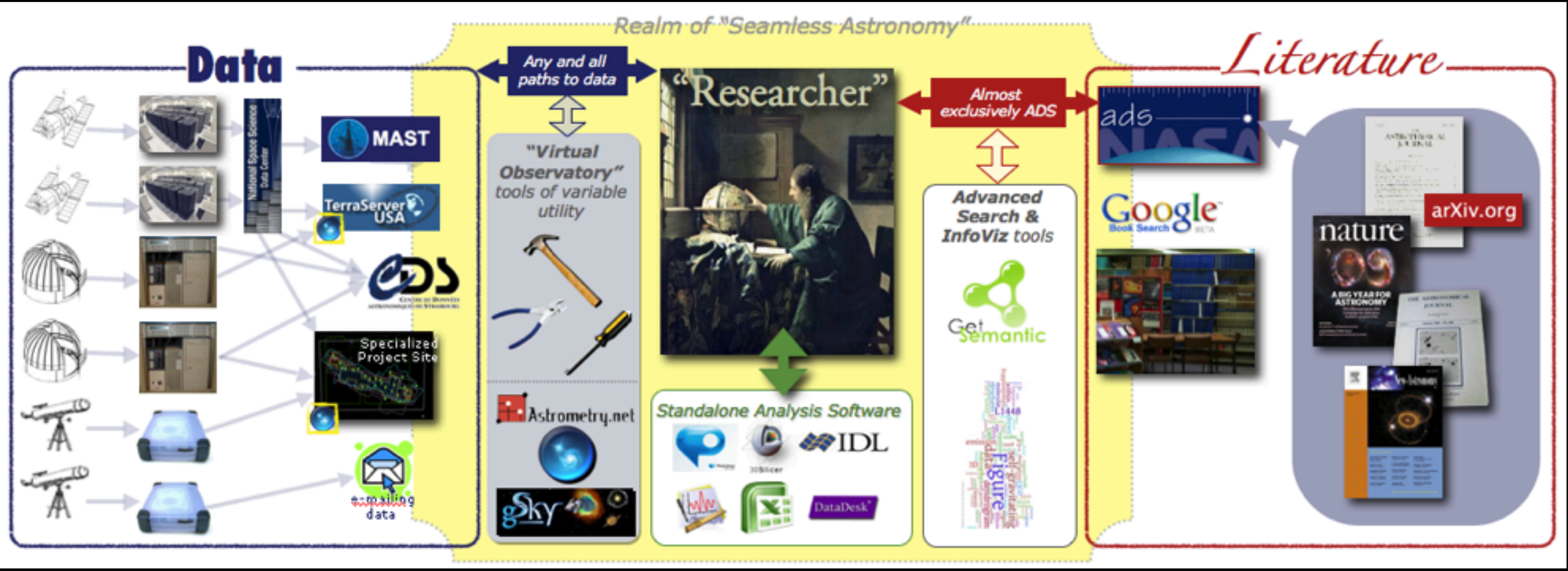
Realm of Seamless Astronomy



3500 years of Observing

Stonehenge, 1500 BC

Ptolemy in Alexandria, 100 AD

Observatory Tower, Lincolnshire, UK, c. 1300

Galileo, 1600

The "Scientific Revolution"

Reber's Radio Telescope, 1937

NASA/Explorer 7 (Space-based Observing) 1959

"The Internet"

Long-distance remote-control/ "robotic" telescopes 1990s

"Virtual Observatories" 21st century

What can today's Astronomer's "Research" look like?

http://www.cfa.harvard.edu/~agoodman/

Publishing

Data | Simulation

WorldWide Telescope

e-Science Tools | Viz

WorldWide Telescope Ambassadors Program

http://www.cfa.harvard.edu/WWTAmbassadors/

Harvard University, WGBH & Microsoft Research

Alyssa Goodman, Patricia Udomprasert, Annie Valva & Curtis Wong

What is WorldWide Telescope and its Ambassadors Program?

WorldWide Telescope (WWT) is a fantastic "Universe Information System" created primarily by Curtis Wong and Jonathan Fay at Microsoft Research. It functions as a Virtual Astronomical Observatory linking its users to much of the world's store of online data and information about our Universe. WWT is evolving to become a key research tool within the online astronomy ecosystem known in the US presently as the "VAO" (see A. Goodman's "Seamless Astronomy" talk at this meeting), but it also offers unprecedented new opportunities for STEM outreach.

The **WorldWide Telescope Ambassadors Program** promotes WWT as a future-leaning way to teach and learn STEM concepts by *recruiting astronomically-literate volunteers who are trained to be experts in using WWT as a teaching tool.*

Who are we?

Our current collaboration brings together professional astronomers and science educators at Harvard, computational virtuosos at MS Research, and STEM education and outreach specialists at WGBH. The next phase of the project (see table below) will include participants from selected areas within the US, including Washington, Florida, Arizona, Alaska, and Appalachia.

Who are the WWT Ambassadors, and what do they do?

WWT Ambassadors are carefully recruited for training from amongst: 1) retired STEM professionals and amateur astronomers with a demonstrable deep knowledge of astronomy and physics; 2) undergraduate and graduate students and postdoctoral fellows in Astronomy and Physics; and 3) science teachers. In their training, Ambassadors learn how to use WWT's tools in general, and also how to create and publish guided "Tours" of astrophysical concepts. These Tours allow users to display beautiful astronomical images in their proper context in the night sky, while demonstrating the physical principles at work in those images. Ambassadors can create and use materials within WWT; give volunteer presentations at variety of public venues; help out in classroom settings; or choose to do more than one of the above!

What have we done so far?

Our program began in the Fall of 2009. Initial Ambassadors are currently working with 80 middle school students and their teacher, Michelle Bartley, at the Clarke Middle School in Lexington, MA, helping the students to prepare tours within WWT based on a six-week-long research experience. WWT and its Ambassadors have generated tremendous enthusiasm from the students, and have inspired quality learning through exploration and discovery. Results from the Pilot at Clarke are being collected online through a dedicated commenting site open to all students, and an analysis of the Pilot experience will serve to inform the NSF proposal being submitted to expand the program in the Spring of 2010.

What's the whole plan, and what are the program's goals?

We are presently preparing a proposal to the National Science Foundation, based in large part on our "Pilot" experience, to implement "Phase I" of the Ambassadors Project (see table), where we will begin a limited expansion within the US, carefully selecting cities and partners where we will be able to maximize success with the available resources, while increasing the socioeconomic diversity of our sites. We plan to expand nationally in Phase II, and internationally in Phase III. With minimal advertising, we have already received inquiries from dozens of interested and qualified potential volunteers in multiple states and countries.

A critical goal of this project is to create a **full astronomy curriculum using WWT Tours created by our Ambassadors**. These Tours will be vetted by the astronomy and science education professionals within our collaboration, and they will be freely available, centrally managed, and searchable, through web services at WGBH. The entire WWT Ambassadors "Tour Curriculum" will be integrated with **WGBH Teachers' Domain**, which currently has nearly 400,000 registered users.

WorldWide Telescope can help change how students learn science by demonstrating the joys of inquiry and discovery, and the WWT Ambassadors Program is designed to help to increase science literacy in the general public while forming intergenerational connections within their communities.

Phase	Scope	Timeline
Pilot	Boston Area	Fall 2009-Spring 2010
Phase I	Limited US Expansion	Fall 2010-Summer 2011
Phase II	US-wide	Fall 2011-Summer 2012
Phase III	International	2012+

External Research

Microsoft Research

WorldWide Telescope: a UIS from Microsoft Research [UIS=Universe Information System]

Seamless *Data/Literature Connections* (e.g. ADS)

"Modular Craftsmanship" (e.g. flickr)

Collections, Communities & *Guided Tours*

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

Created by Curtis Wong and Jonathan Fay at MSR; AG is "Academic Partner" on the WWT Project

The (US) Backstory

2001 ················ 2008 (2010)

Science New

$10 Million N

ScienceDaily (Oc
its users the worl
research institutio
starting an ambiti
universe online.

See Also: (NVO), headed by astronomer Alex

NVO

. . . the Universe at your fingertips

NVO senior personnel:
Charles Alcock, University of Pennsylvania Kirk B rne, Astro
Tim Cornwell, NSF National Radio Astronomy Ob atory
Optical Astronomy Observatory Giuseppina Fabbia , Smit
*Observatory Alyssa Goodman, Harvard University **Jim Gray**,*
Hanisch, Space Telescope Science Institute George Helou, N
Analysis Center Stephen Kent, Fermilab Carl Kesselman, Uni
Miron Livny, University of Wisconsin, Madison Carol Lonsdo
and Analysis Center Tom McGlynn, GSFC/HEASARC/USRA A
University Reagan Moore, San Diego Supercomputer Cente
Naval Observatory, Flagstaff Station Ray Plante, University
Thomas Prince, California Institute of Technology Ethan Sch
STScI Nicholas White, NASA Goddard Space Flight Center R
of Technology

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- Upcoming Due Dates
- Advanced Funding Search
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- About Funding

Proposals and Awards

- Proposal and Award Policies and Procedures Guide
  - Introduction
  - Proposal Preparation and

VAO

VIRTUAL ASTRONOMICAL OBSERVATORY

SEARCH
NSF Web Site

ICS | ABOUT

Print

Management and Operation of the Virtual Astronomical Observatory

NSF

NASA

CONTACTS

Name	Email
Nigel Sharp	nsharp@nsf.gov
Eileen D. Friel	efriel@nsf.gov

PROGRAM GUIDELINES

Solicitation 08-537

Please be advised that the NSF Proposal & Award Policies & Procedure (PAPPG) includes revised guidelines to implement the mentoring pro the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring that will be provided for such individuals. Proposals that do not comp this requirement will be returned without review (see the PAPP Guide Grant Proposal Guide Chapter II for further information about the implementation of this new requirement).

2001 ··············· 2008 (2010)

and meanwhile...

RVO

Astro Grid

Aus-VO

VObs.it

vo-i

CVO

SVO
Spanish Virtual Observatory

BRAVO

ArVO
Armenian Virtual Observatory

NVO
NATIONAL VIRTUAL OBSERVATORY

IVOA

China-VO

EURO VO

JVO

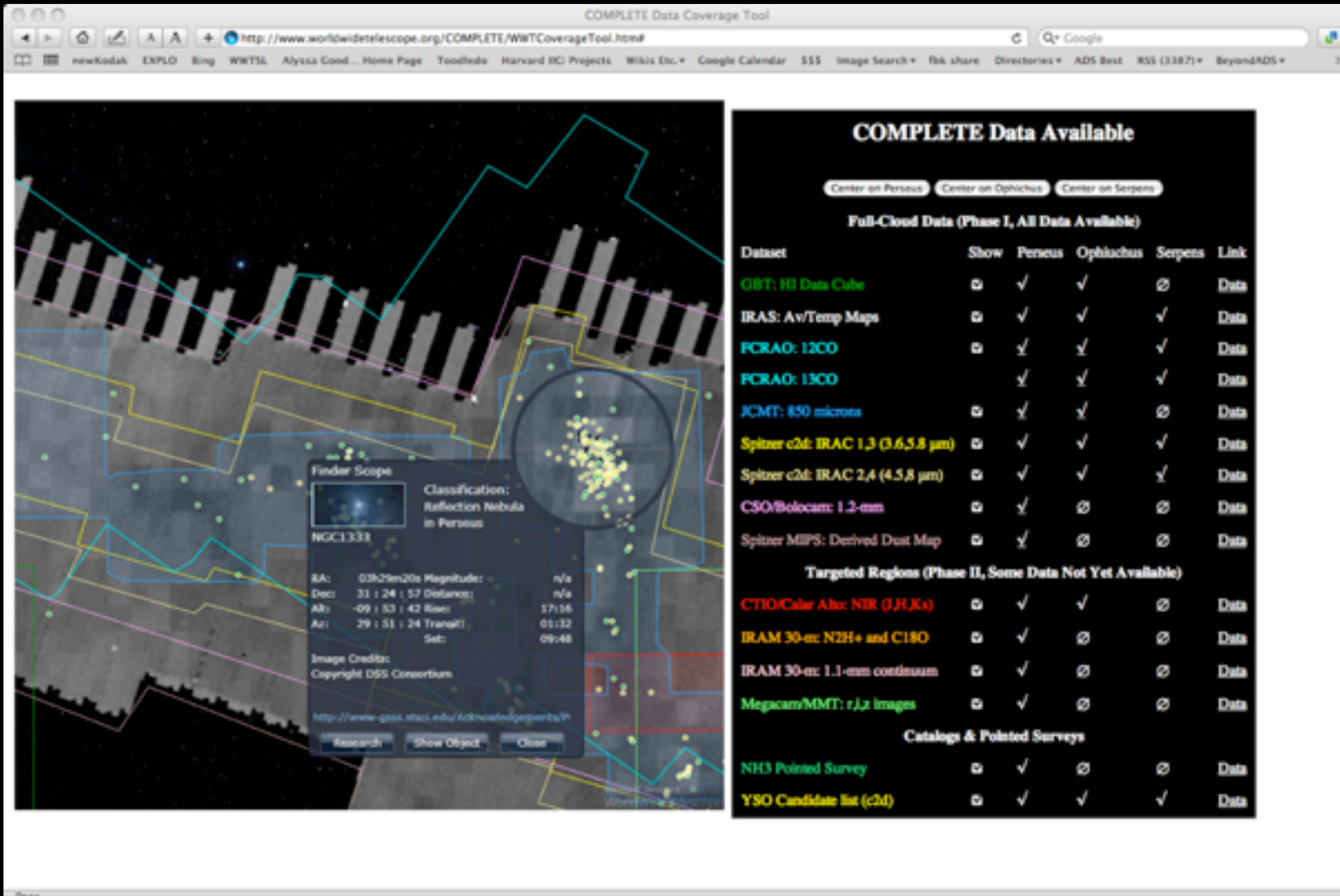
HVO
Hungarian Virtual Observatory

GERMAN ASTROPHYSICAL
GAVO
VIRTUAL OBSERVATORY

France

~~The~~ VO

What/where are/is "Data"?



Dataset	Show	Perseus	Ophiuchus	Serpens	Link
Full-Cloud Data (Phase I, All Data Available)					
GBT: HI Data Cube	☑	✓	✓	Ø	Data
IRAS: Av/Temp Maps	☑	✓	✓	✓	Data
FCRAO: 12CO	☑	✓	✓	✓	Data
FCRAO: 13CO		✓	✓	✓	Data
JCMT: 850 microns	☑	✓	✓	Ø	Data
Spitzer c2d: IRAC 1,3 (3.6,5.8 μm)	☑	✓	✓	✓	Data
Spitzer c2d: IRAC 2,4 (4.5,8 μm)	☑	✓	✓	✓	Data
CSO/Bolocam: 1.2-mm	☑	✓	Ø	Ø	Data
Spitzer MIPS: Derived Dust Map	☑	✓	Ø	Ø	Data
Targeted Regions (Phase II, Some Data Not Yet Available)					
CTIO/Calar Alto: NIR (J,H,Ks)	☑	✓	✓	Ø	Data
IRAM 30-m: N2H+ and C18O	☑	✓	Ø	Ø	Data
IRAM 30-m: 1.1-mm continuum	☑	✓	Ø	Ø	Data
Megacam/MMT: r,i,z images	☑	✓	Ø	Ø	Data
Catalogs & Pointed Surveys					
NH3 Pointed Survey	☑	✓	Ø	Ø	Data
YSO Candidate list (c2d)	☑	✓	✓	✓	Data

What/where is literature?

Object Query Results

http://adsabs.harvard.edu/cgi-bin/abs_connect?db_key=AST&sim_query=YES&object=NGC%207

DCDCLXV Texify newKodak EXPLO Bing Clarke WWTSL Alyssa Good... Home Page Toodledo Harvard IIC: Projects Wikis Etc. Google Calendar $$$ Image Search

agoodman@cfa.harvard.edu | my Account | Sign off

SAO/NASA Astrophysics Data System (ADS)

Query Results from the Astronomy Database

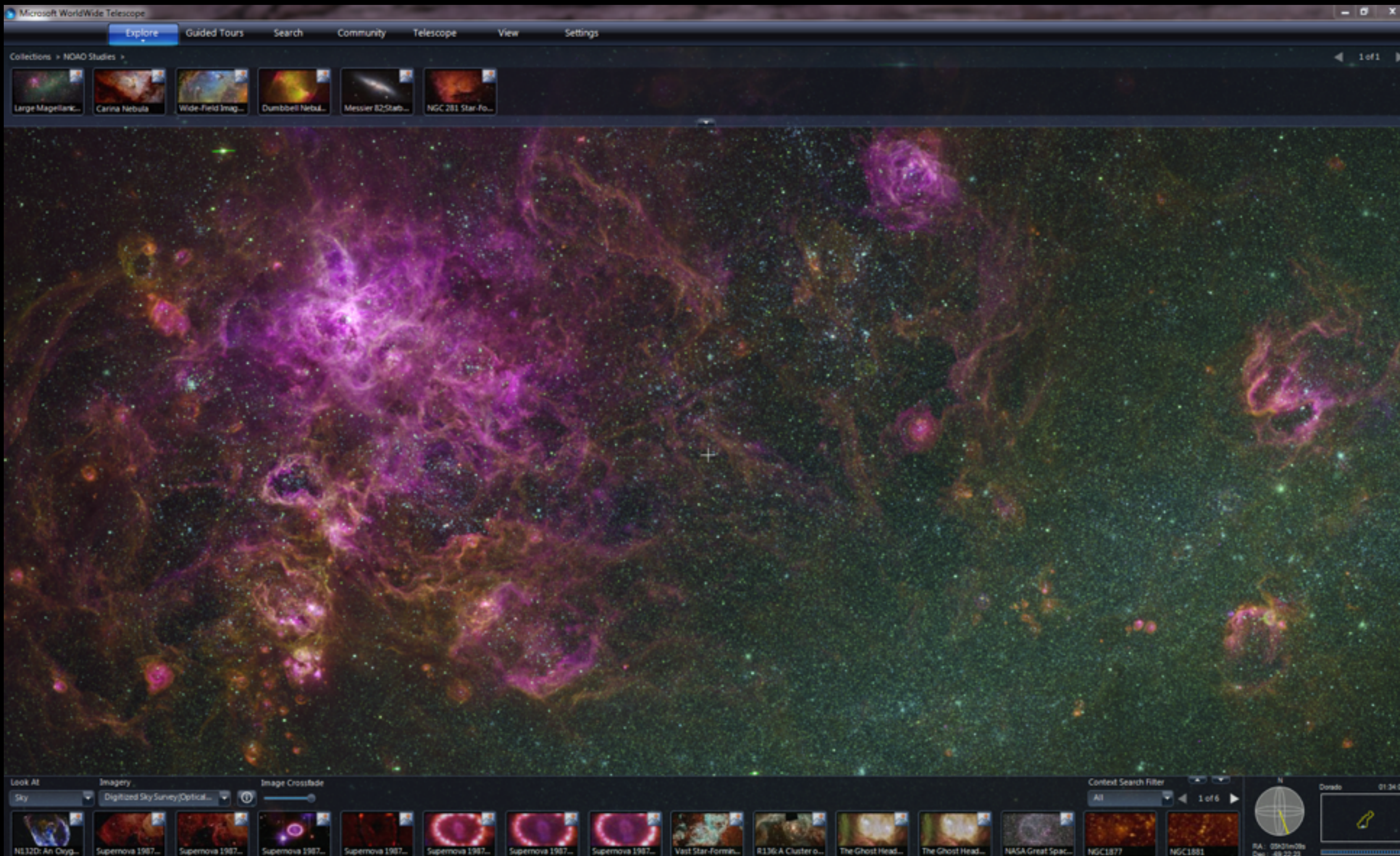
Go to bottom of page

Retrieved **200** abstracts, starting with number **1**. Total number selected: **393**.

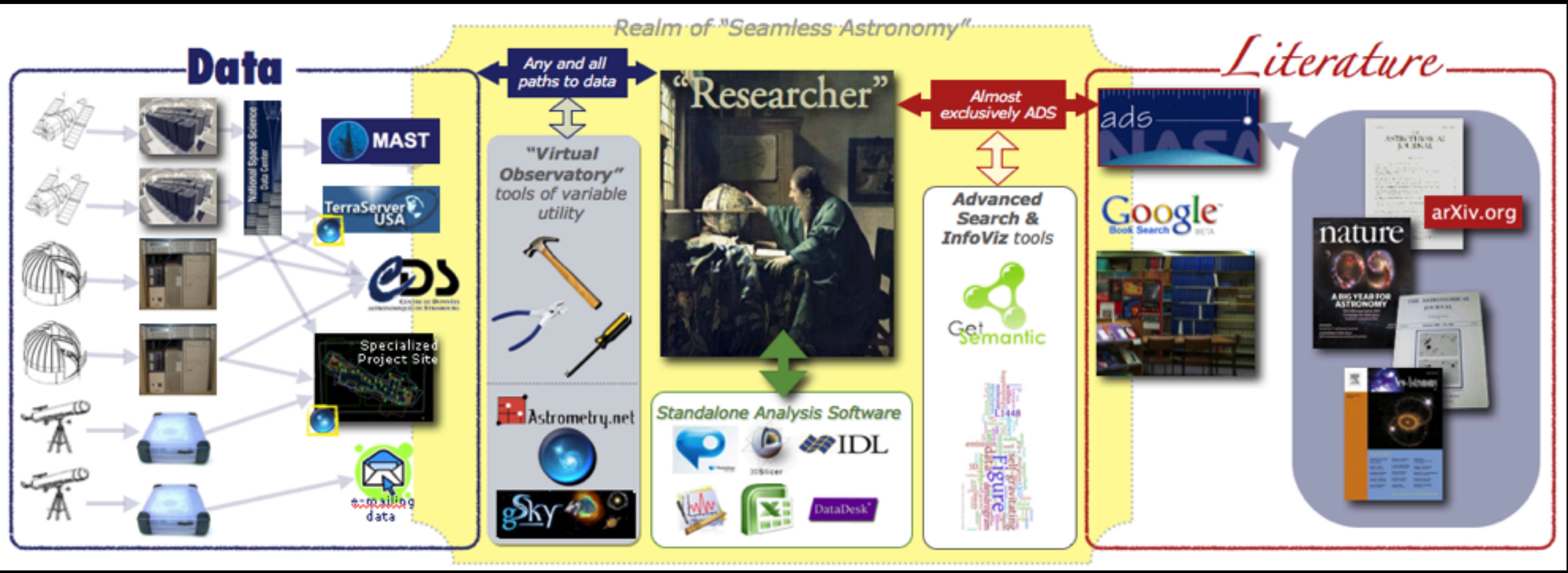
Sort options

#	Bibcode / Authors	Score / Title	Date	List of Links / Access Control Help
1	2009ApJ...700.1609M Myers, Philip C.	1.000 Filamentary Structure of Star-forming Complexes	08/2009	A Z E F L X R C S U
2	2009ApJ...700.1190D Desai, Vandana; Soifer, B. T.; Dey, Arjun; LeFloc'h, Emeric; Armus, Lee; Brand, Kate; Brown, Michael J. I.; Brodwin, Mark; Jannuzi, Buell T.; Houck, James R.; and 8 coauthors	1.000 Strong Polycyclic Aromatic Hydrocarbon Emission from $z \approx 2$ ULIRGs	08/2009	A Z E F L X R C S U
3	2009MNRAS.396.1851N Nutter, D.; Stamatellos, D.; Ward-Thompson, D.	1.000 The initial conditions of isolated star formation - IX. Akari mapping of an externally heated pre-stellar core	07/2009	A Z E F L X R S U
4	2009A&A...502..175B Boersma, C.; Peeters, E.; Martín-Hernández, N. L.; van der Wolk, G.; Verhoeff, A. P.; Tielens, A. G. G. M.; Waters, L. B. F. M.; Pel, J. W.	1.000 A spatial study of the mid-IR emission features in four Herbig Ae/Be stars	07/2009	A Z E F L R S U
5	2009MNRAS.395.1695H Hernán-Caballero, A.; Pérez-Fournon, I.; Hatziminaoglou, E.; Afonso-Luis, A.; Rowan-Robinson, M.; Rigopoulou, D.; Farrah, D.; Lonsdale, C. J.; Babbedge, T.;	1.000 Mid-infrared spectroscopy of infrared-luminous galaxies at $z \sim 0.5$-3	05/2009	A Z E F L X R C S U

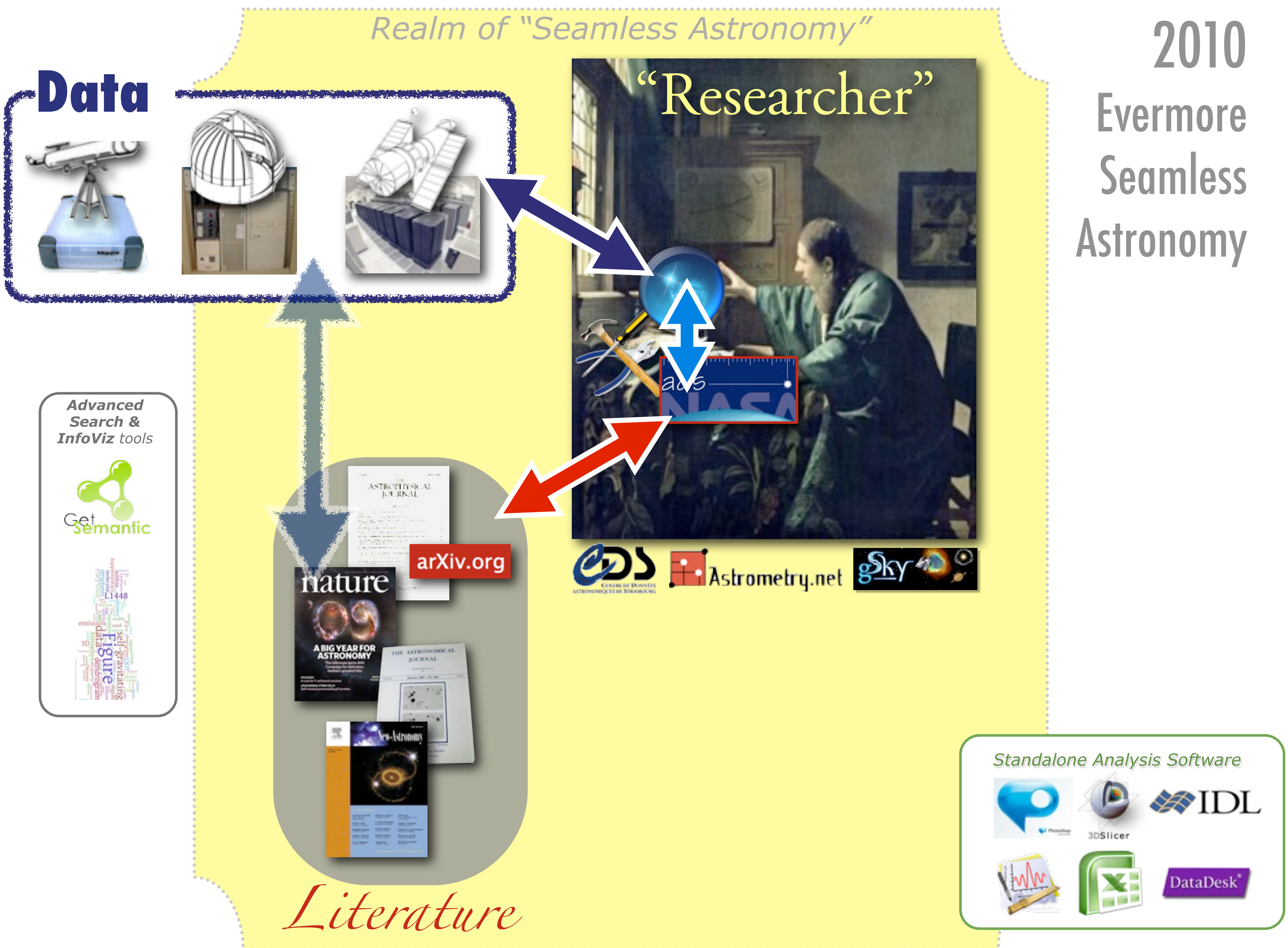
What is a Virtual Observatory?



Seamless Astronomy



But, that was 2009...



2010
Evermore
Seamless
Astronomy
Realm of "Seamless Astronomy"
Data
"Researcher"
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Advanced Search & InfoViz tools
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nature
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DataDesk

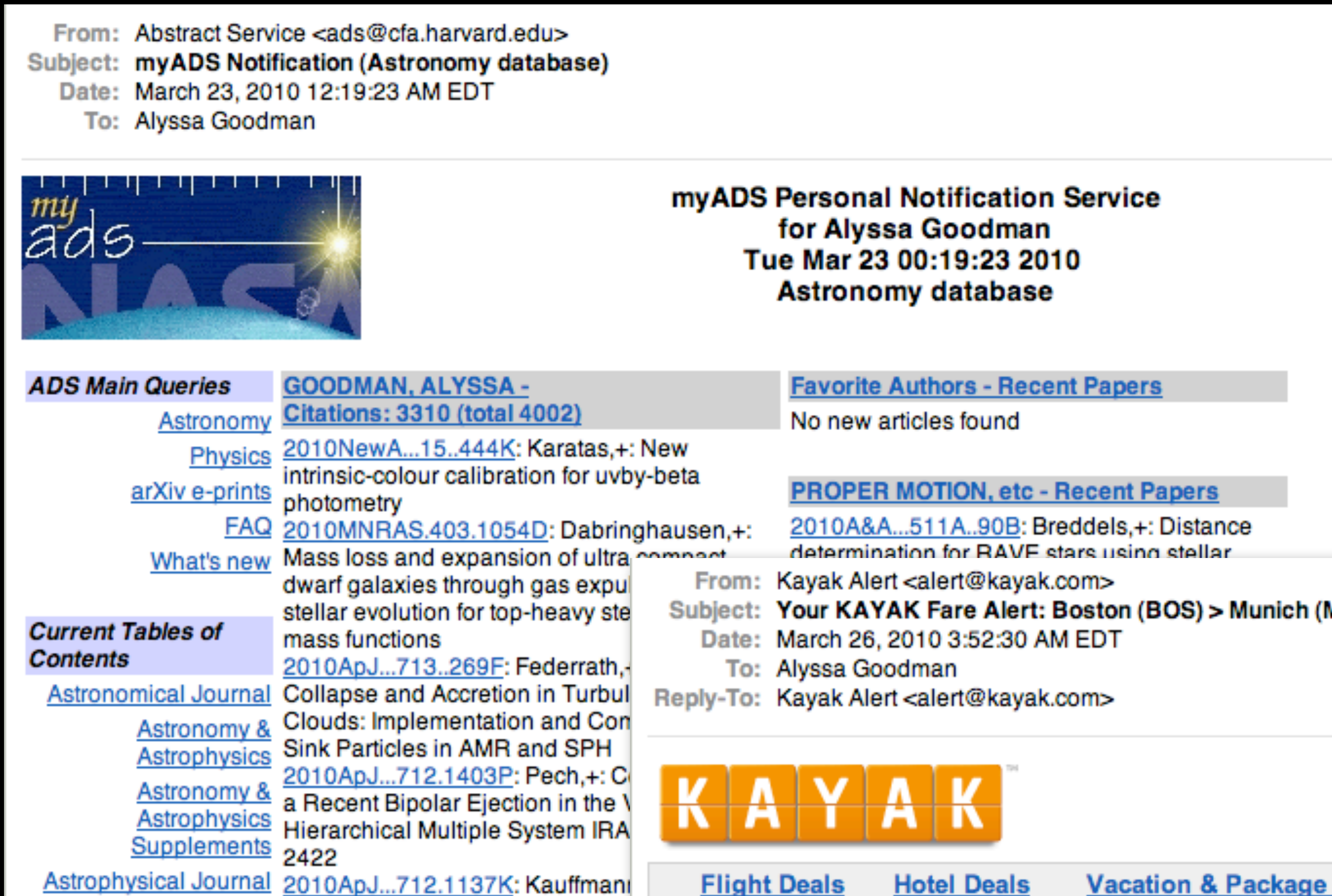
This simple argument, first made at the 2009 WWT session at AAS, seems to be working:

"Astronomy research tools should work as seamlessly as travel research tools."

"Astronomy research tools should work as seamlessly as travel research tools."

When the concept of a **"Virtual Observatory" (VO)** was first discussed by future-looking astronomers in the mid-1990s, all thoughts were about **distributed data** and a **common system** to access it. But, information access on today's web primarily works in the **reverse**: **distributed tools** accessing **common data centers**. Capability and ease-of-use improvements to the web typically now come in the form of **nesting, aggregating or connecting tools.** Think **kayak.com**, iGoogle, or Bing Maps. In the "Seamless Astronomy" view to be discussed, today's "VO" should be thought of as the **ever-improving set** of **data archives, tools, interconnections,** and **standards** that strive to make astronomical research as "seamless" as travel research. The good news is that the cutting-edge of the astronomical research environment is moving rapidly in this seamless direction. The most savvy institutions are beginning to realize that the original VO model of data distributed on thousands of individual researchers' desktop hard drives is not a sustainable model, and that they need to offer **data hosting, archiving, and stewardship** services the way libraries offer such services for printed matter. **Software tools** are becoming much more **interoperable** thanks to protocols for message-passing such as "**SAMP**." And, the improved speed of **web applications** is to some extent removing platform-dependence as an obstacle to programmers and users alike. The bad news is that **most astronomers are largely unaware** of the tools that this new nirvana offers, and instead still conduct online research in the same way they did a decade ago. In this talk, I will focus in particular on how our recent work on connecting Microsoft's **WorldWide Telescope** program to other commonly-used astronomical research tools--most notably literature searching tools--has made the astronomical research environment more seamless. More generally, I will emphasize and demonstrate that an **ever-increasing diversity of tools** allow researchers to carry out a particular research task, so that the **important research** for the future lies in figuring out **how to make the tools, their interconnections, and their connections to data and literature resources useful and well-known to the astronomical community.**

(Abstract of the *Evermore Seamless Astronomy* presentation by A. Goodman at the Microsoft External Research Symposium, April 2010.)



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for Alyssa Goodman
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Astronomy & Astrophysics
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Astrophysical Journal

GOODMAN, ALYSSA - Citations: 3310 (total 4002)
2010NewA...15..444K: Karataş,+: New intrinsic-colour calibration for uvby-beta photometry
2010MNRAS.403.1054D: Dabringhausen,+: Mass loss and expansion of ultra compact dwarf galaxies through gas expu[...] stellar evolution for top-heavy ste[...] mass functions
2010ApJ...713..269F: Federrath,+[...] Collapse and Accretion in Turbul[...] Clouds: Implementation and Co[...] Sink Particles in AMR and SPH
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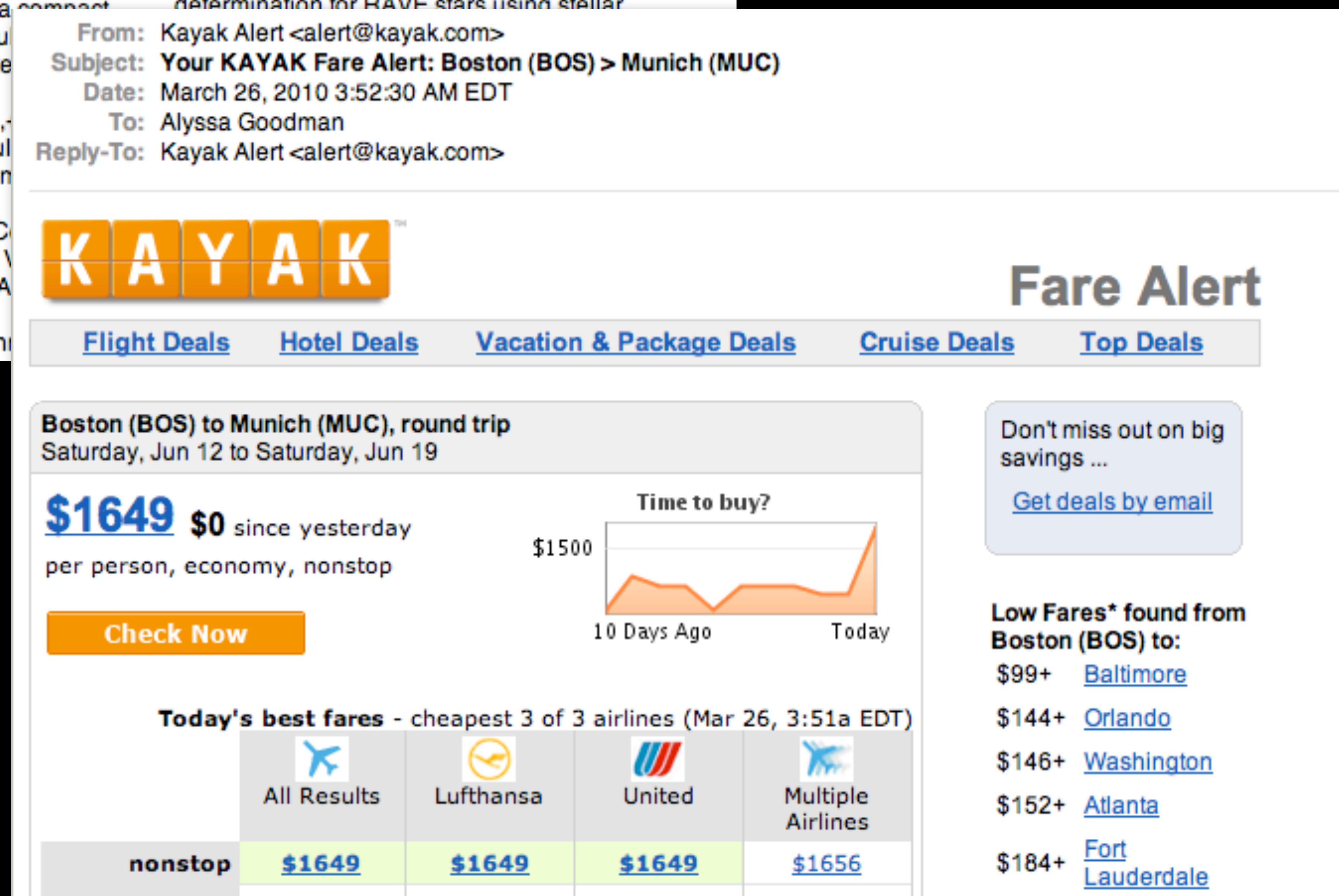

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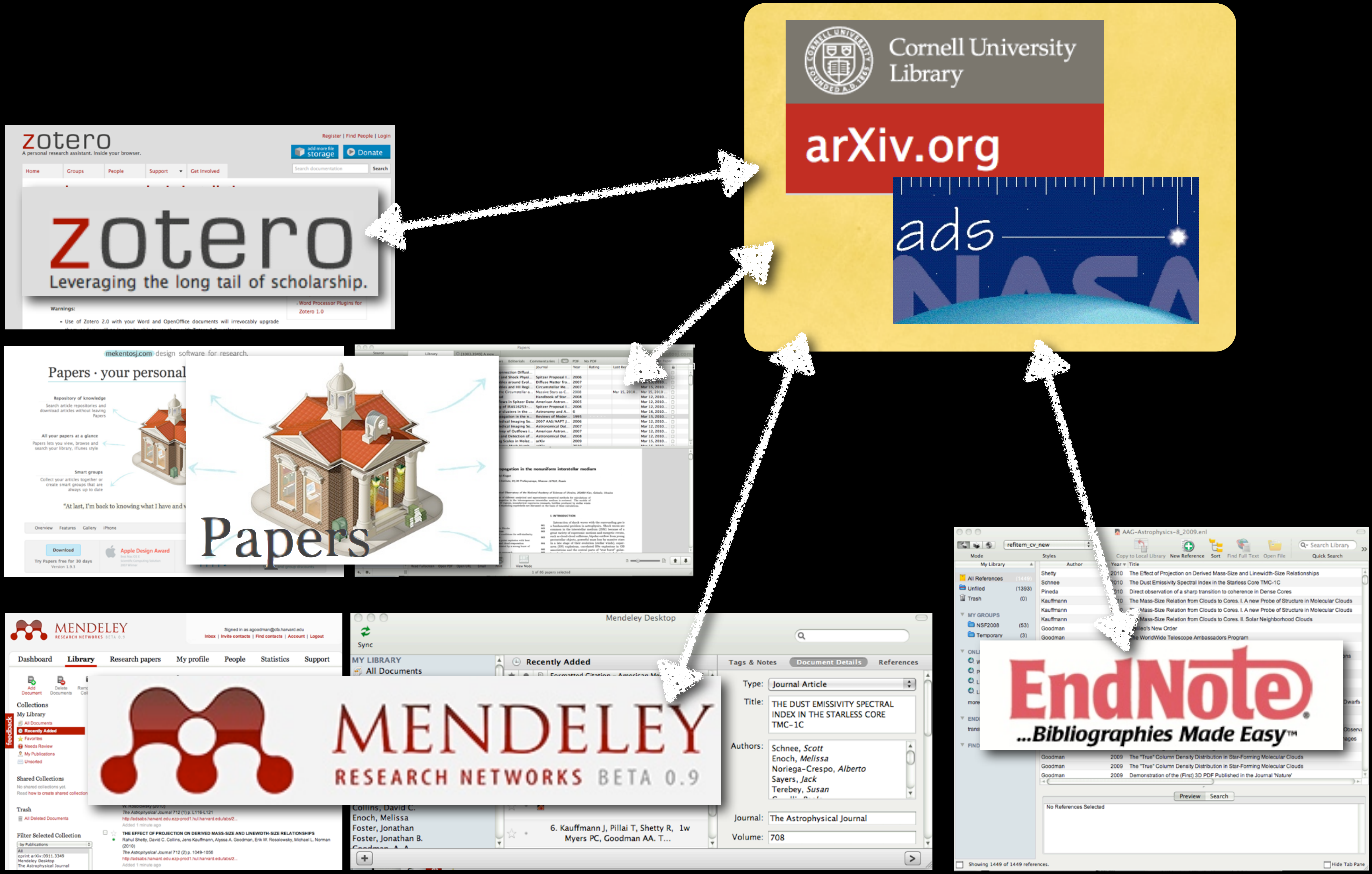
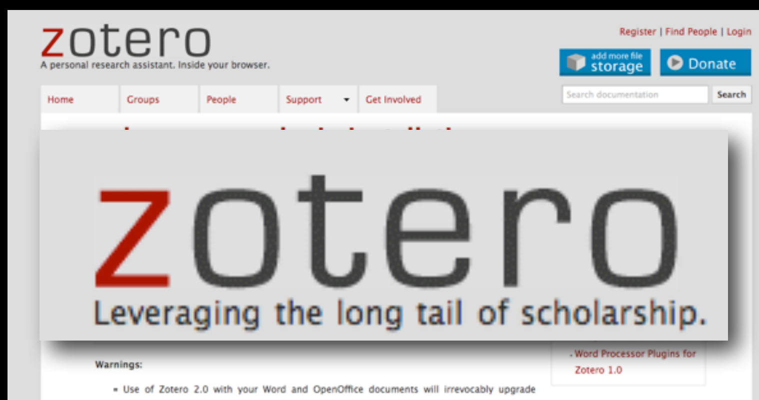
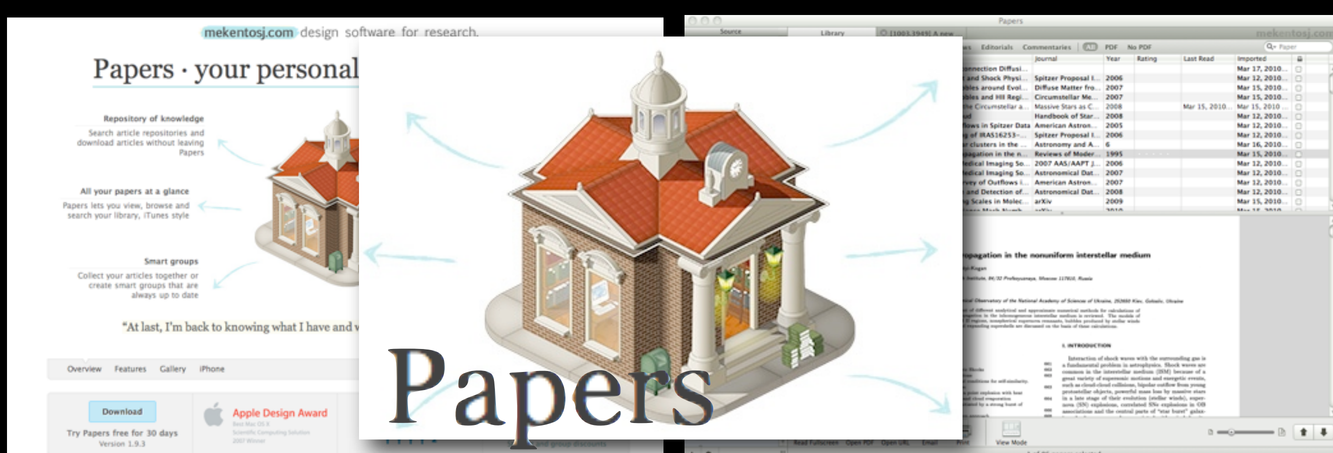
Astronomers can see parallels...

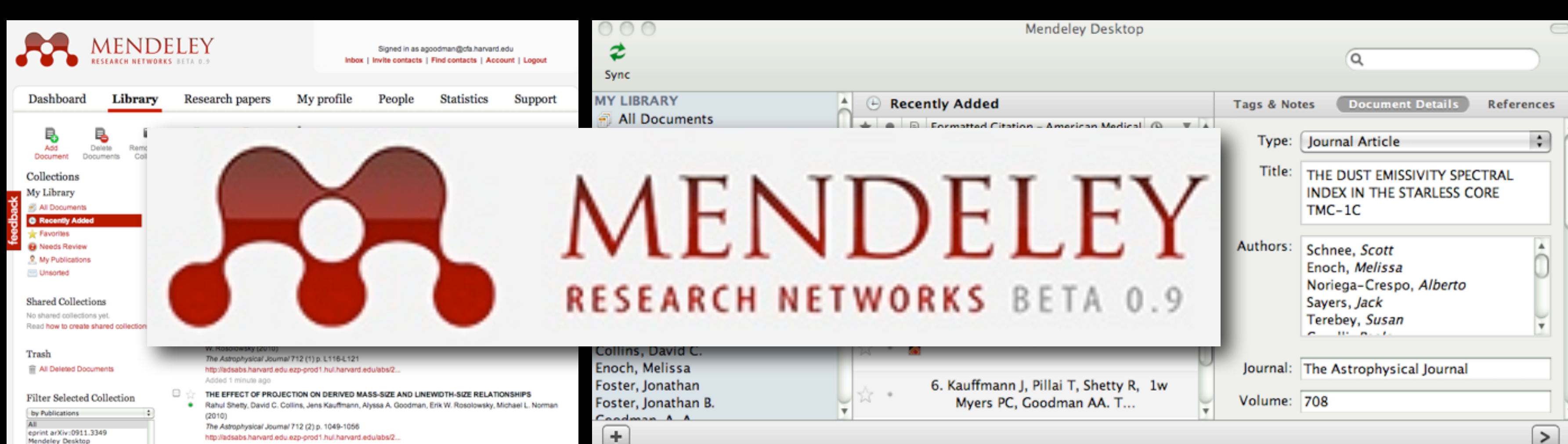
Literature Handling: *Diverse Apps*, *Common Data*

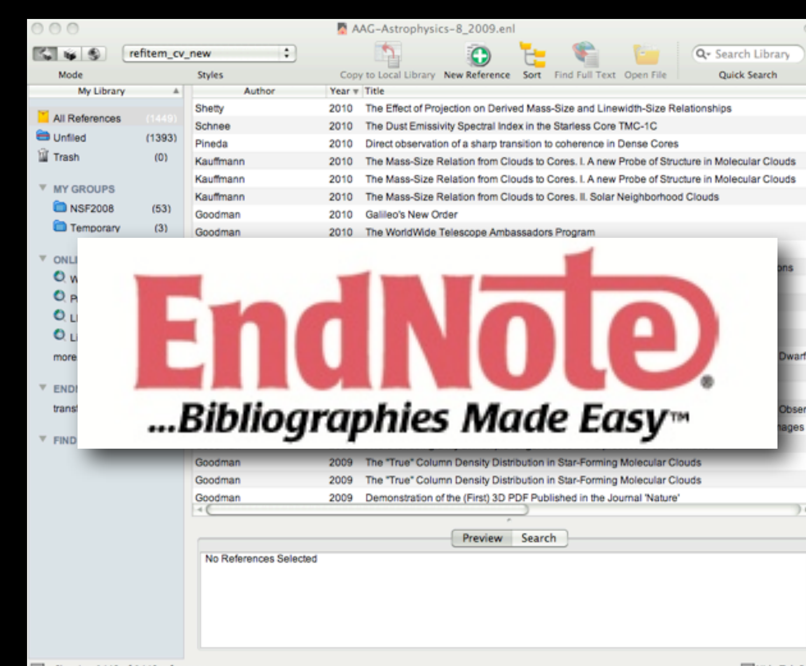


What fraction of astronomy researchers know about these tools?

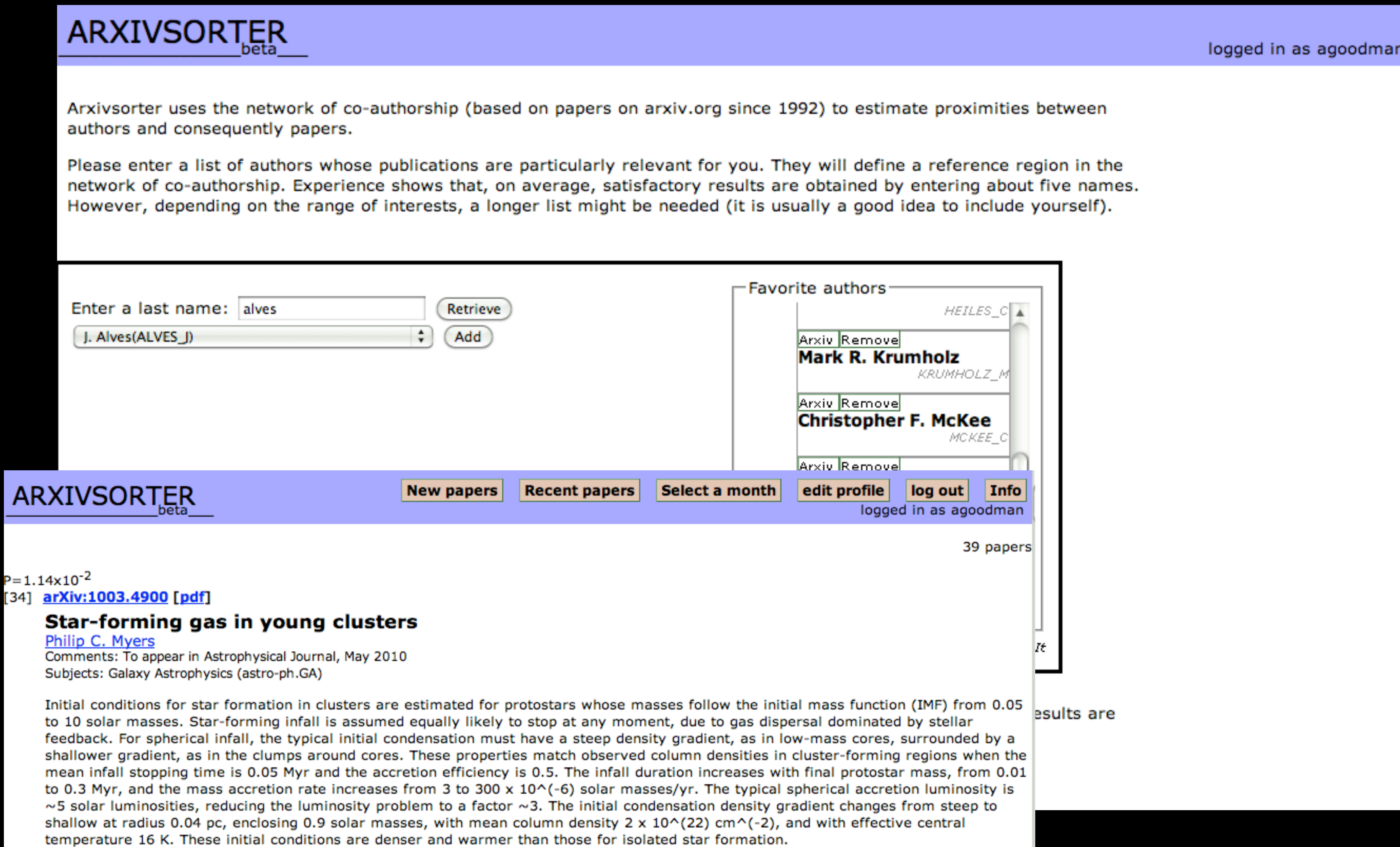








“writemypaper.org?”



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39 papers

P=1.14x10^{-2}

[34] arXiv:1003.4900 [pdf]

Star-forming gas in young clusters

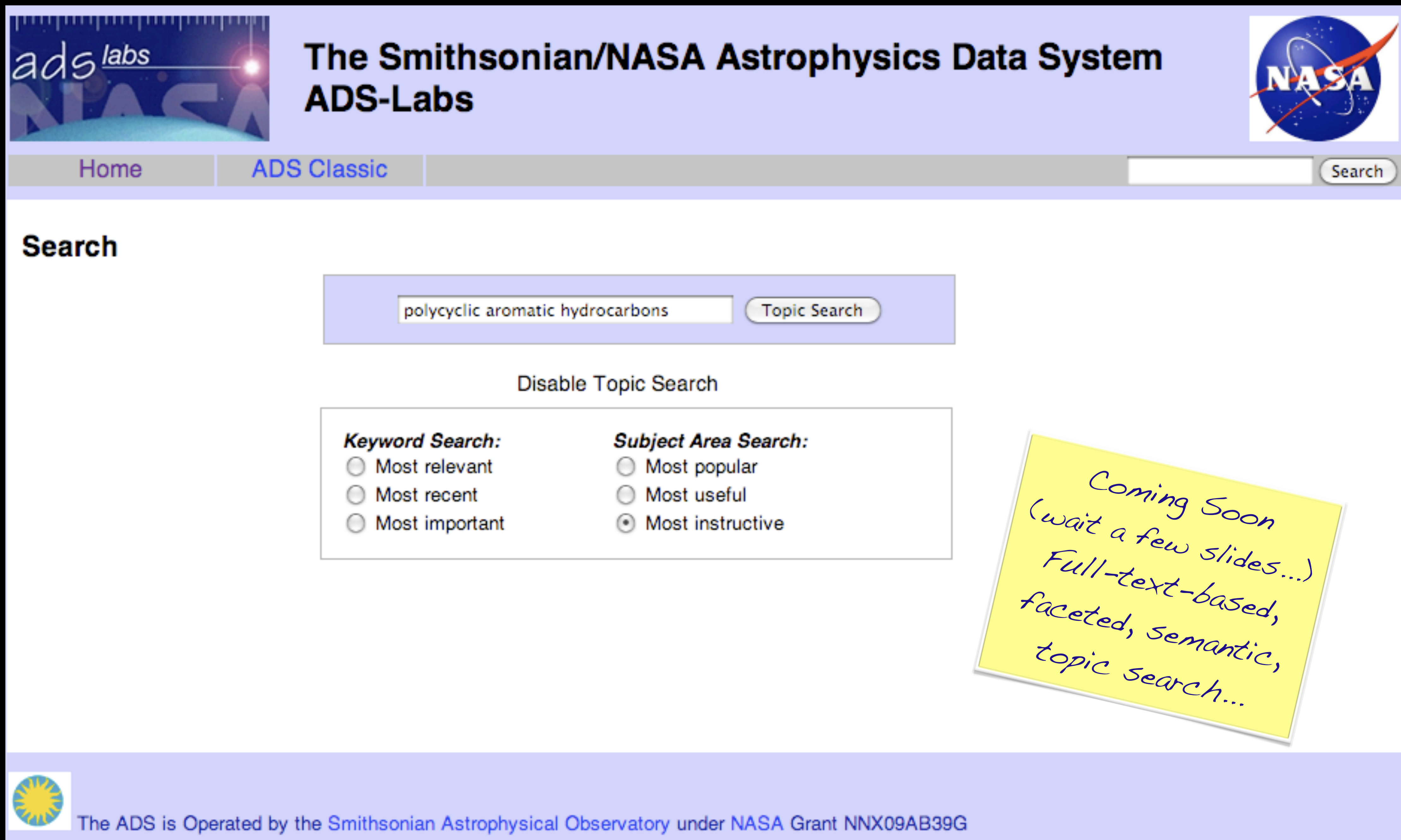
Philip C. Myers

Comments: To appear in Astrophysical Journal, May 2010

Subjects: Galaxy Astrophysics (astro-ph.GA)

Initial conditions for star formation in clusters are estimated for protostars whose masses follow the initial mass function (IMF) from 0.05 to 10 solar masses. Star-forming infall is assumed equally likely to stop at any moment, due to gas dispersal dominated by stellar feedback. For spherical infall, the typical initial condensation must have a steep density gradient, as in low-mass cores, surrounded by a shallower gradient, as in the clumps around cores. These properties match observed column densities in cluster-forming regions when the mean infall stopping time is 0.05 Myr and the accretion efficiency is 0.5. The infall duration increases with final protostar mass, from 0.01 to 0.3 Myr, and the mass accretion rate increases from 3 to 300 x 10^(-6) solar masses/yr. The typical spherical accretion luminosity is ~5 solar luminosities, reducing the luminosity problem to a factor ~3. The initial condensation density gradient changes from steep to shallow at radius 0.04 pc, enclosing 0.9 solar masses, with mean column density 2 x 10^(22) cm^(-2), and with effective central temperature 16 K. These initial conditions are denser and warmer than those for isolated star formation.

“writemypaper.org?”



This page generated using ADS faceted Search, as developed by Doug Burke, Rahul Davé, Jay Luker, Michael Kurtz, Alberto Accomazzi & Jonathan Fay

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RA
Dec
Go
1 of 2
NGC7023
WorldWide Telescope
Finder Scope
Classification:
Reflection Nebula
in Cepheus
NGC 7023
RA: 21h01m36s
Dec: 68 : 10 : 11
Alt: 30 : 55 : 38
Az: 341 : 36 : 56
Magnitude: n/a
Distance: n/a
Rise: Circumpolar
Transit: Circumpolar
Set: Circumpolar
Image Credits:
Jack Newton
http://www.jacknewton.com/
Research
Show Object
Close
Look At
Sky
Imagery
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1 of 23
Sculptor
Earth
Uranus
NGC 300
Sculptor Galaxy
Cartwheel Galaxy
Cartwheel Galaxy
Cepheus
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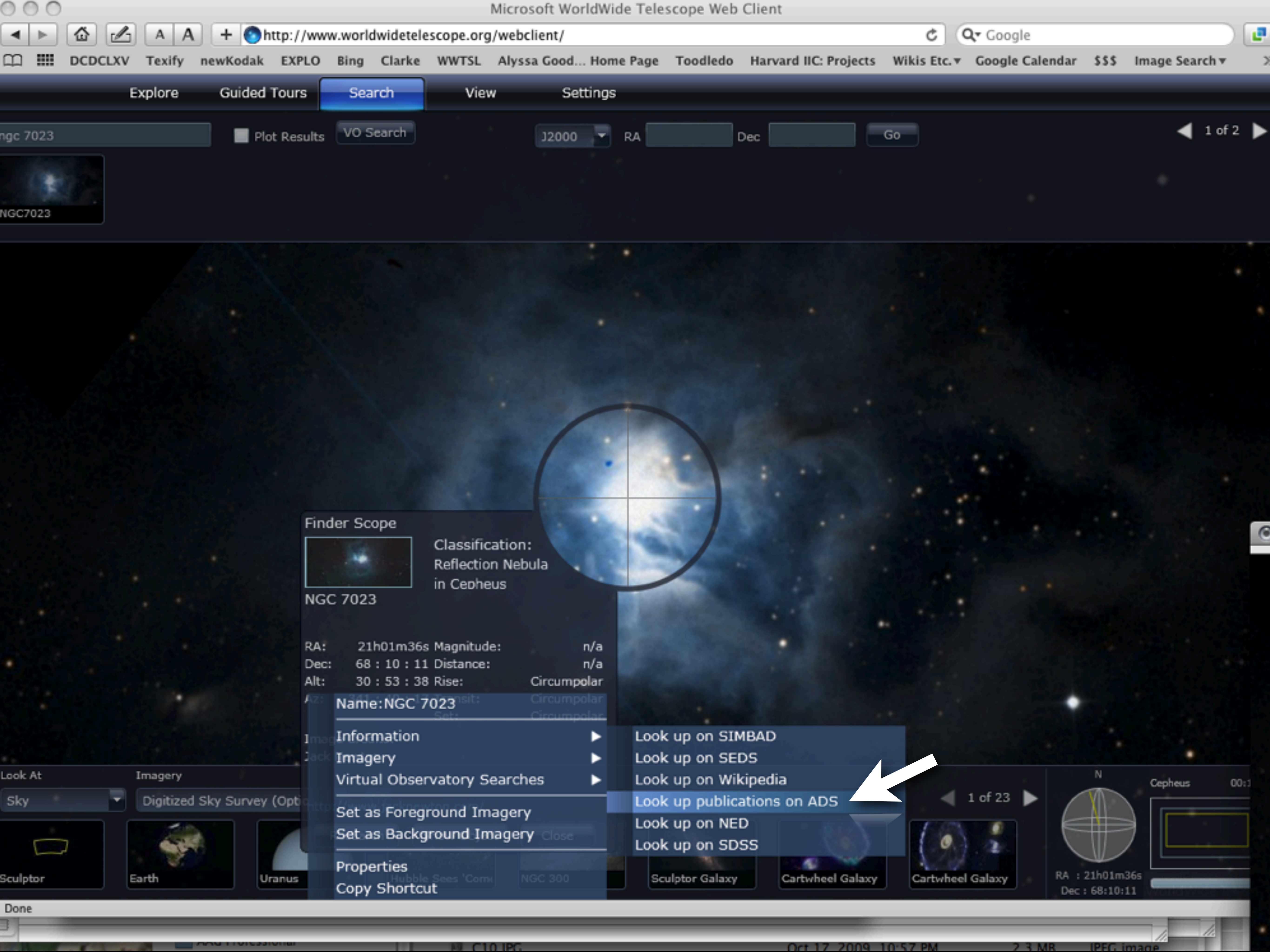
Microsoft WorldWide Telescope Web Client
http://www.worldwidetelescope.org/webclient/
Google
DCDCLXV Texify newKodak EXPLO Bing Clarke WWTSL Alyssa Good... Home Page Toodledo Harvard IIC: Projects Wikis Etc. Google Calendar $$$ Image Search
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1 of 2
NGC7023
Finder Scope
Classification:
Reflection Nebula
in Cepheus
NGC 7023
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Dec: 68 : 10 : 11
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Magnitude: n/a
Distance: n/a
Rise: Circumpolar
Name:NGC 7023
Information
Imagery
Virtual Observatory Searches
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Set as Background Imagery
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RA : 21h01m36s
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Done

Object Query Results

http://adsabs.harvard.edu/cgi-bin/abs_connect?db_key=AST&sim_query=YES&object=NGC%207

DCDCLXV Texify newKodak EXPLO Bing Clarke WWTSL Alyssa Good... Home Page Toodledo Harvard IIC: Projects Wikis Etc. Google Calendar $$$ Image Search

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SAO/NASA Astrophysics Data System (ADS)

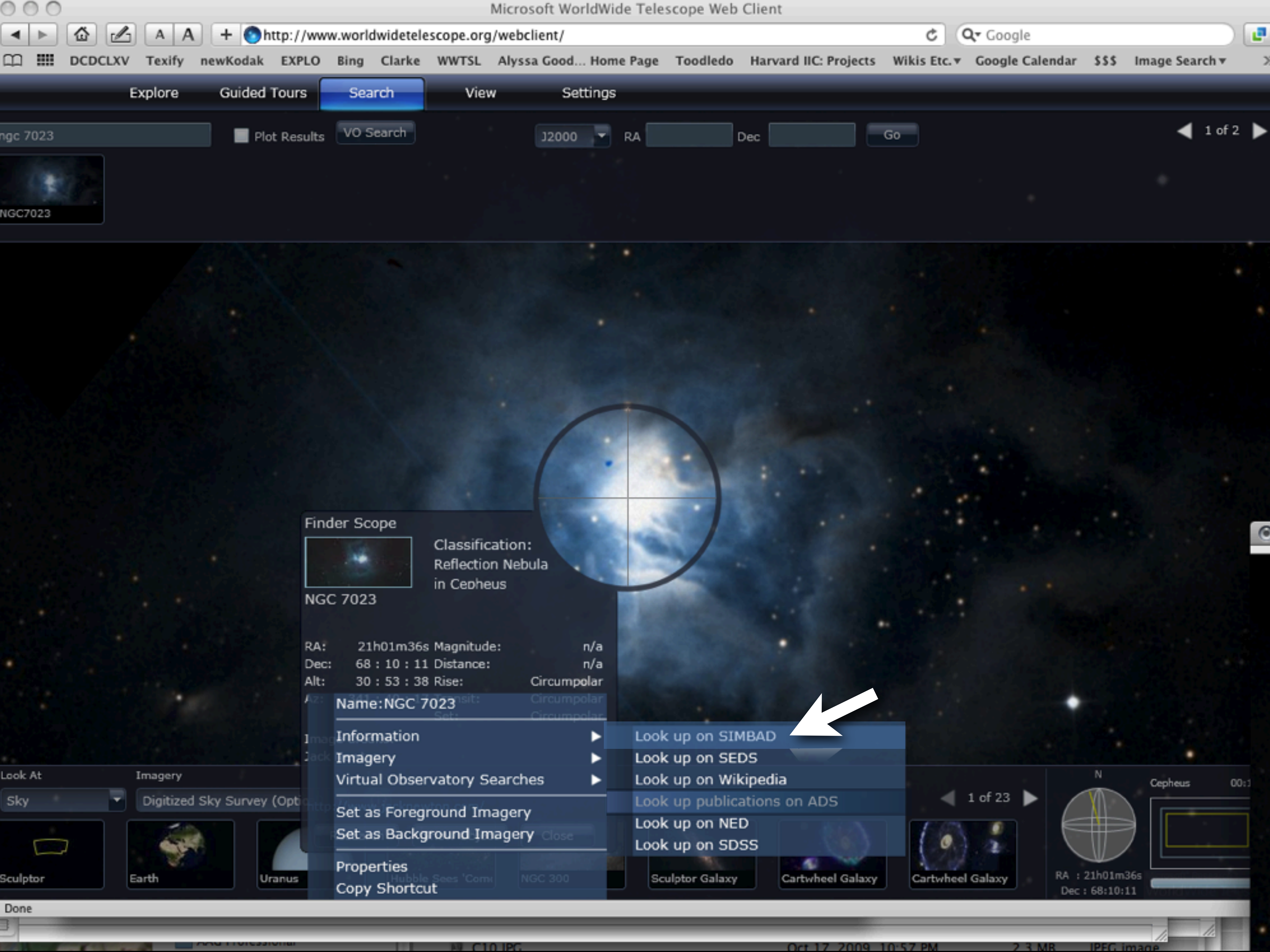
Query Results from the Astronomy Database

Go to bottom of page

Retrieved **200** abstracts, starting with number **1**. Total number selected: **393**.

Sort options

#	Bibcode Authors	Score Title	Date	List of Links Access Control Help
1	2009ApJ...700.1609M Myers, Philip C.	1.000 Filamentary Structure of Star-forming Complexes	08/2009	A Z E F L X R C S U
2	2009ApJ...700.1190D Desai, Vandana; Soifer, B. T.; Dey, Arjun; LeFloc'h, Emeric; Armus, Lee; Brand, Kate; Brown, Michael J. I.; Brodwin, Mark; Jannuzi, Buell T.; Houck, James R.; and 8 coauthors	1.000 Strong Polycyclic Aromatic Hydrocarbon Emission from $z \approx 2$ ULIRGs	08/2009	A Z E F L X R C S U
3	2009MNRAS.396.1851N Nutter, D.; Stamatellos, D.; Ward-Thompson, D.	1.000 The initial conditions of isolated star formation - IX. Akari mapping of an externally heated pre-stellar core	07/2009	A Z E F L X R S U
4	2009A&A...502..175B Boersma, C.; Peeters, E.; Martín-Hernández, N. L.; van der Wolk, G.; Verhoeff, A. P.; Tielens, A. G. G. M.; Waters, L. B. F. M.; Pel, J. W.	1.000 A spatial study of the mid-IR emission features in four Herbig Ae/Be stars	07/2009	A Z E F L R S U
5	2009MNRAS.395.1695H Hernán-Caballero, A.; Pérez-Fournon, I.; Hatziminaoglou, E.; Afonso-Luis, A.; Rowan-Robinson, M.; Rigopoulou, D.; Farrah, D.; Lonsdale, C. J.; Babbedge, T.;	1.000 Mid-infrared spectroscopy of infrared-luminous galaxies at $z \sim 0.5$-3	05/2009	A Z E F L X R C S U



Microsoft WorldWide Telescope Web Client
http://www.worldwidetelescope.org/webclient/
Explore
Guided Tours
Search
View
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Plot Results
VO Search
J2000
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1 of 2
NGC7023
Finder Scope
Classification:
Reflection Nebula
in Cepheus
NGC 7023
RA: 21h01m36s Magnitude: n/a
Dec: 68 : 10 : 11 Distance: n/a
Alt: 30 : 53 : 38 Rise: Circumpolar
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Information
Imagery
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Properties
Copy Shortcut
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Look up publications on ADS
Look up on NED
Look up on SDSS
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Digitized Sky Survey (Opt
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Earth
Uranus
Sculptor Galaxy
Cartwheel Galaxy
Cartwheel Galaxy
1 of 23
N
Cepheus
RA : 21h01m36s
Dec : 68:10:11
Done

SIMBAD query result

http://simbad.u-strasbg.fr/simbad/sim-id?Ident=NGC+7023&jsessionid=B8F7CD92574727FFC

SIMBAD query result

Object query : NGC 7023

C.D.S. - SIMBAD4 rel 1.132 - 2009.10.23CEST21:59:31

Available data Basic data | Identifiers | Plot & images | Bibliography | Measurements | External archives | Notes

Basic data :

NGC 7023 -- Open (galactic) Cluster

query around with radius 2 arcmin

Other object types:	Cl* (C,Cl,[BDB2003]) ,OpC (OCISM) ,HII (LBN) ,V* (AAVSO) ,IR (IRAS)
ICRS coord. (ep=2000) :	21 01 36.9 +68 09 48 (-) [- - -] D -
FK5 coord. (ep=2000 eq=2000) :	21 01 36.9 +68 09 48 (-) [- - -] D -
	104.0616 +14.1926 (-) [- - -] D -
Fluxes (1) :	B 7.20 [-] D -

Identifiers (11) :

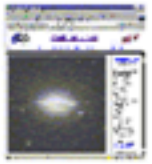
NGC 7023	IRAS 20599+6755	LBN 487	[BDB2003] G104.06+14.19
C 2059+679	IRAS F20599+6755	OCISM 50	AAVSO 2044+67
Cl VDB 139	LBN 104.08+14.21	OCl 235	

Plots and Images

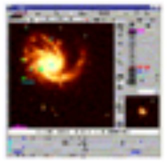
plot around

radius 10 arcmin

Aladin previewer



Aladin applet



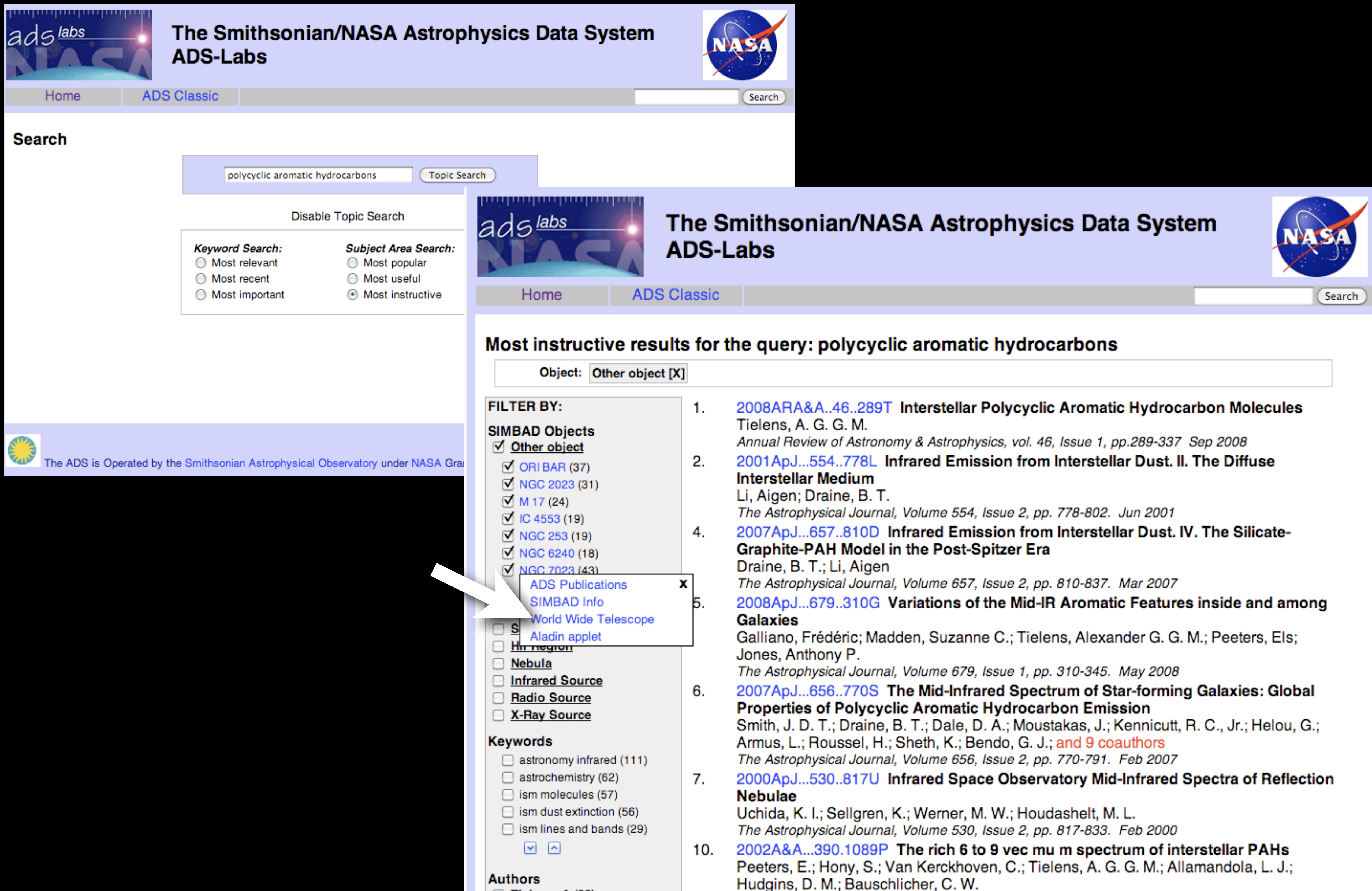
References (371 between 1983 and 2009)

Simbad bibliographic survey began in 1950 for stars (at least bright stars) and in 1983 for all other objects (outside the solar system).

display reference summary

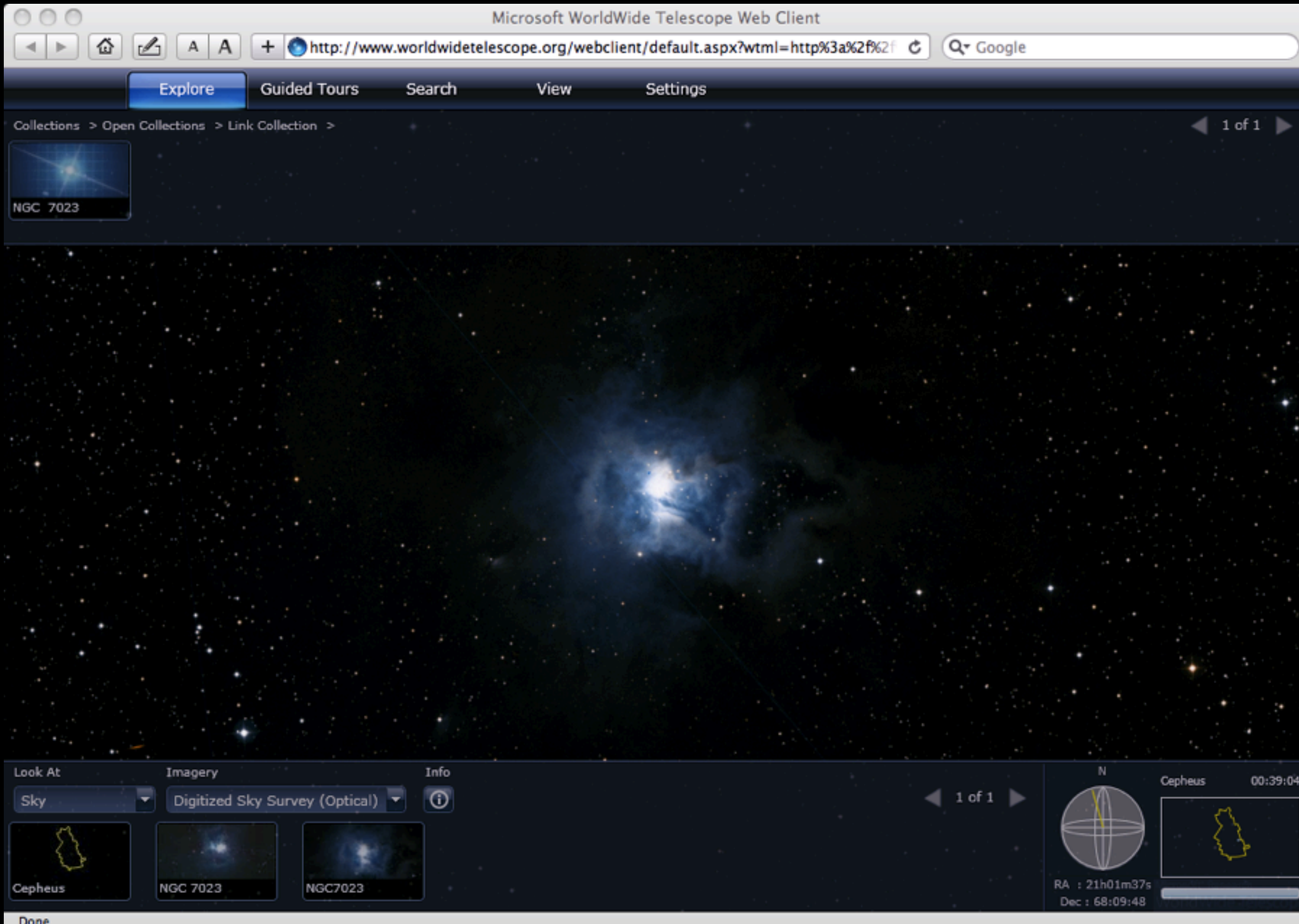
from: 1983 to: 2009

"writemypaper.org?"



This page generated using ADS faceted Search, as developed by Doug Burke, Rahul Davé, Jay Luker, Michael Kurtz, Alberto Accomazzi & Jonathan Fay

And now we got to NGC 7023 by using the literature as a filter.



Seamless "Registration" through...

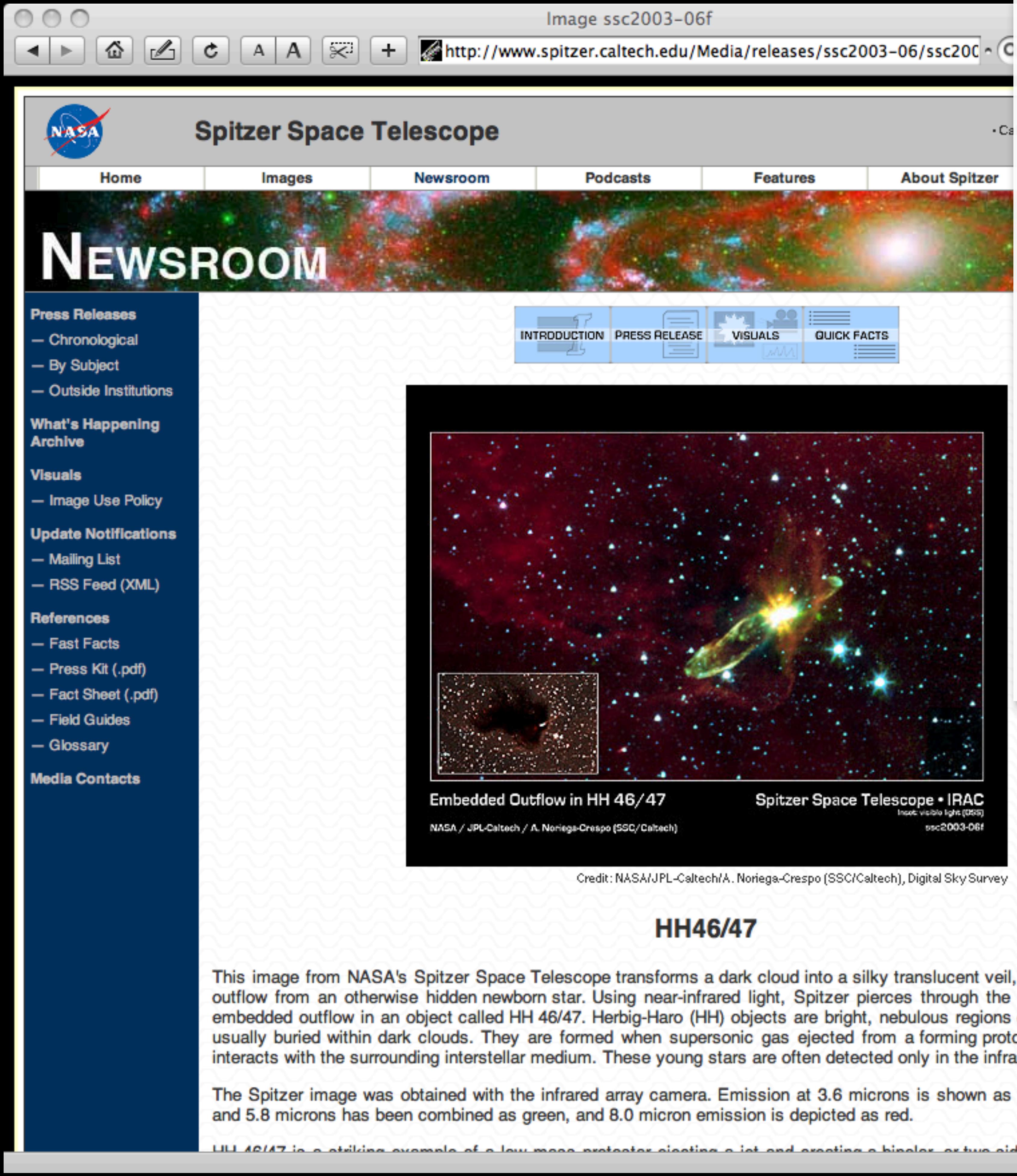
flickr

+

astrometry.net

+

WWT !?



http://www.flickr.com/photos/66496709@N00/3175344278/

flickr

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HH4647

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Alyssa_Goodman's photostream

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astrometry (Pool)

Tags

Astrometrydotnet:version=10145

Astrometrydotnet:id=alpha-200901-20629873

Astrometrydotnet:status=solved

Add a tag

Additional Information

Anyone can see this photo (edit)

- Add to your map
- Taken on December 12, 2003 (edit)
- Photo stats
- Viewed 7 times (Not including you)
- Edit title, description, and tags

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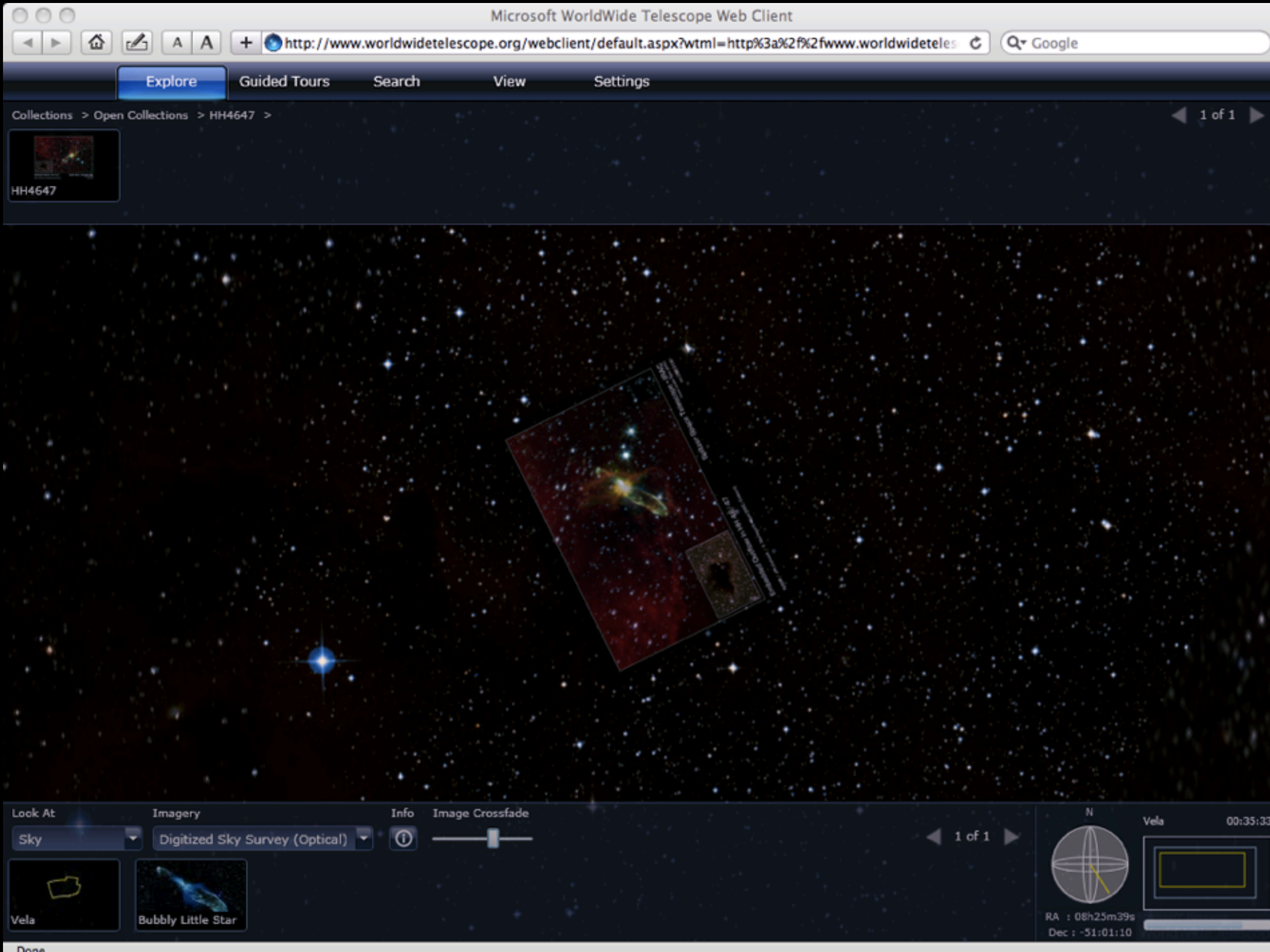
Microsoft WorldWide Telescope Web Client
http://www.worldwidetelescope.org/webclient/default.aspx?wtml=http%3a%2f%2fwww.worldwidetele
Google
Explore
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HH4647
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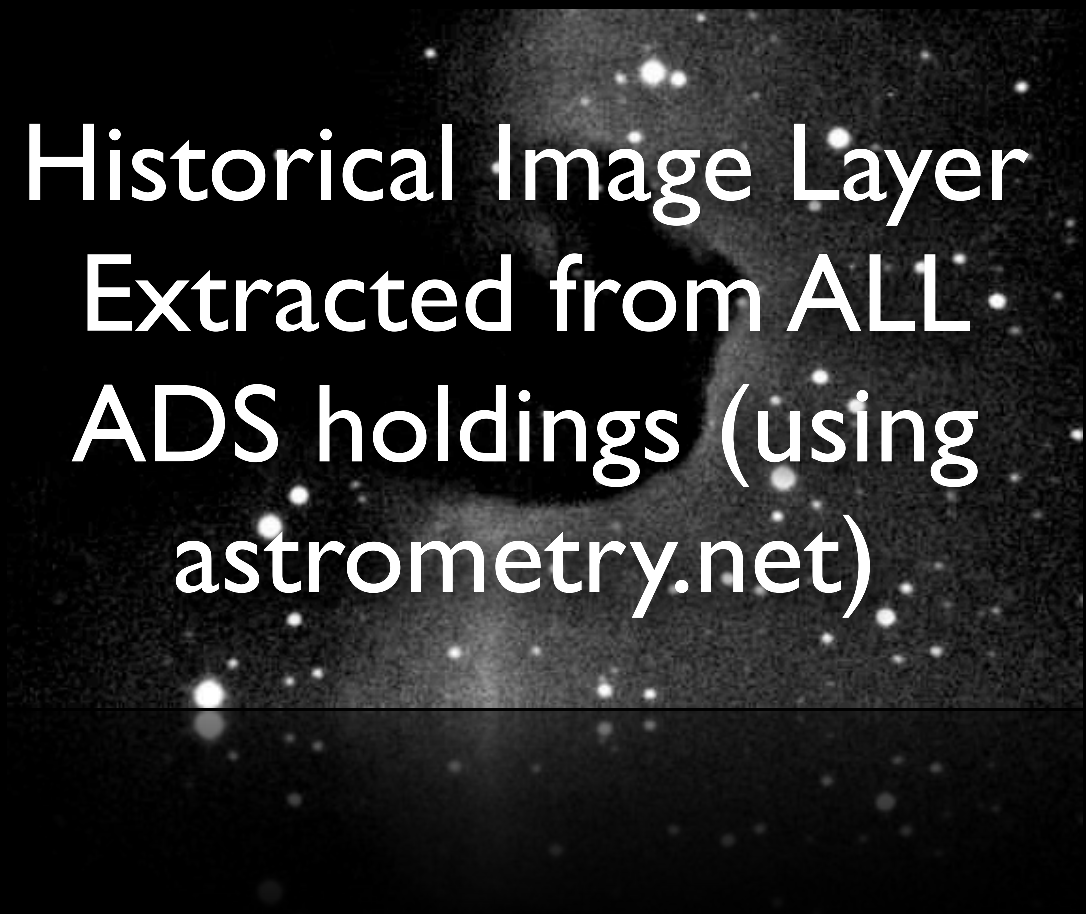
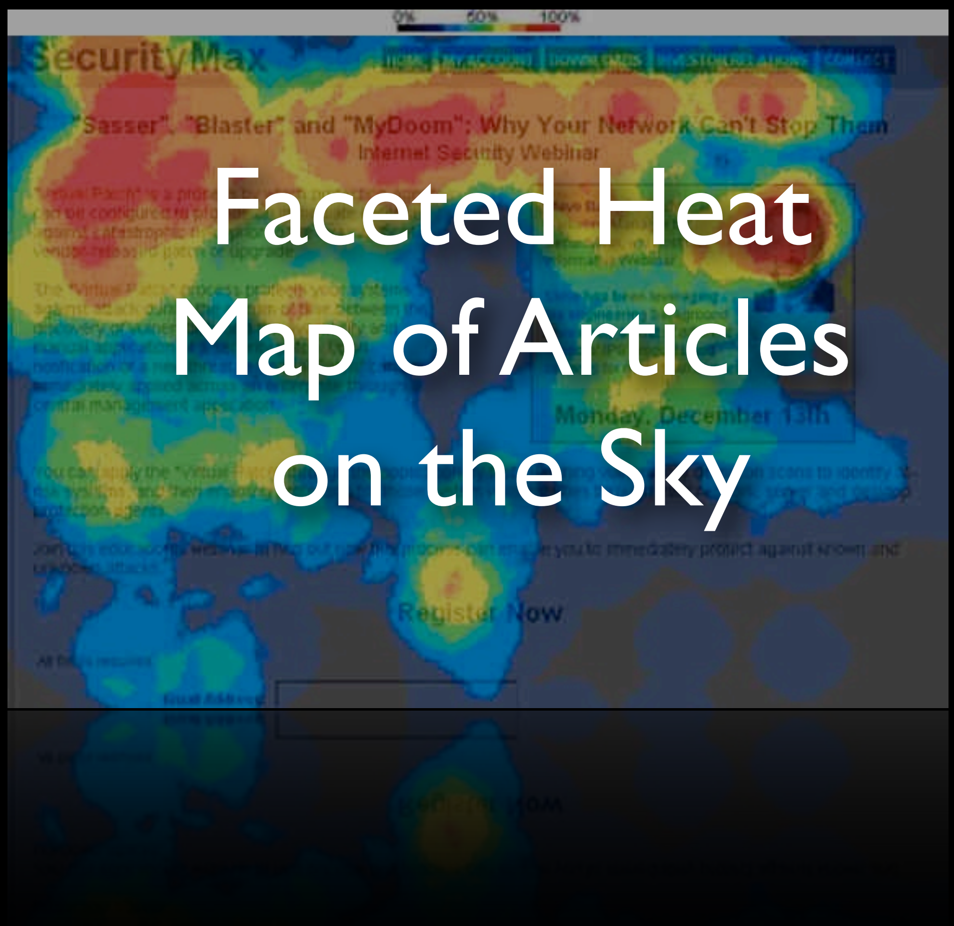
Coming Soon

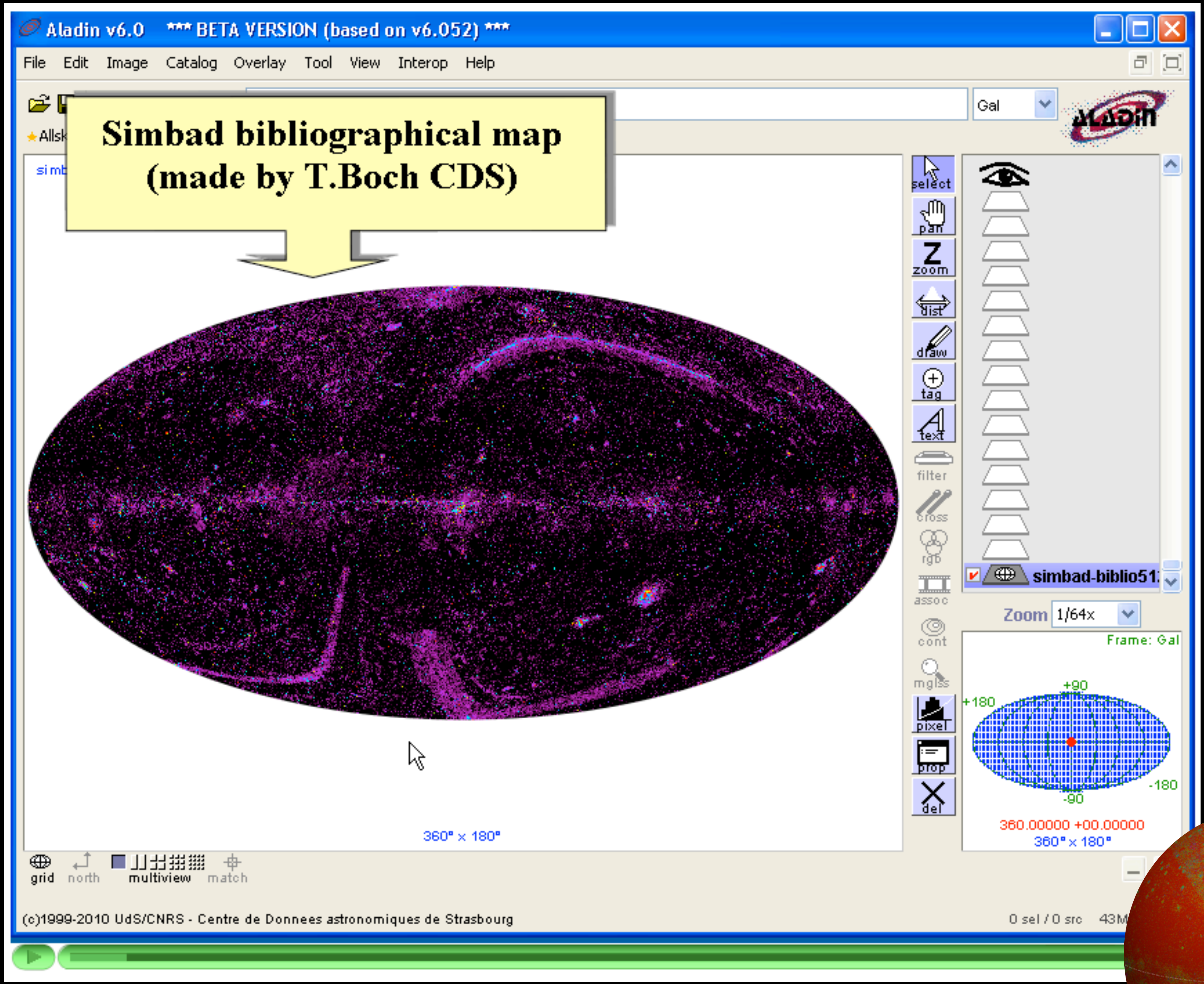


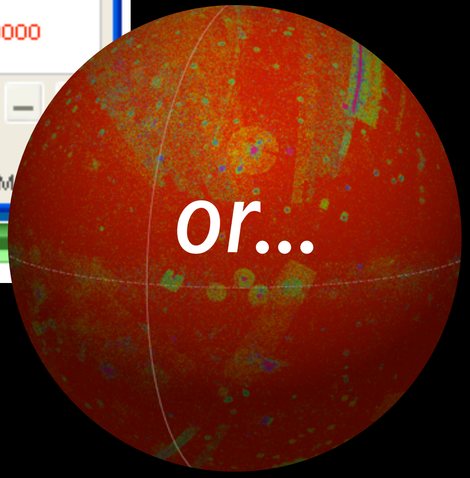
ADS-Seamless-astrometry.net collaboration



ADS-CDS-Seamless collaboration

Prototype of Articles on the Sky (April 2010)





with thanks to CDS/Pierre Fernique

The future (is here)... data *IN* articles

Note: This work came from the "AstroMed" project am.iic.harvard.edu

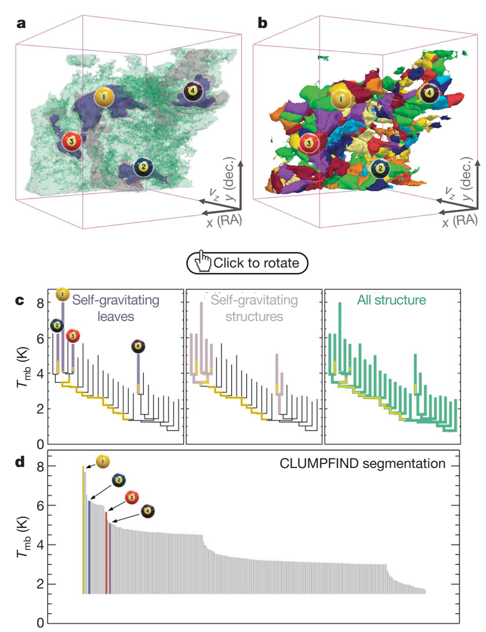


Figure 2 | Comparison of the 'dendrogram' and 'CLUMPFIND' feature-identification algorithms as applied to ^{13}CO emission from the L1448 region of Perseus. a, 3D visualization of the surfaces indicated by colours in the dendrogram shown in **c**. Purple illustrates the smallest scale self-gravitating structures in the region corresponding to the leaves of the dendrogram; pink shows the smallest surfaces that contain distinct self-gravitating leaves within them; and green corresponds to the surface in the data cube containing all the significant emission. Dendrogram branches corresponding to self-gravitating objects have been highlighted in yellow over the range of T_{mb} (main-beam temperature) test-level values for which the virial parameter is less than 2. The x–y locations of the four 'self-gravitating' leaves labelled with billiard balls are the same as those shown in Fig. 1. The 3D visualizations show position–position–velocity (p–p–v) space. RA, right ascension; dec., declination. For comparison with the ability of dendrograms (**c**) to track hierarchical structure, **d** shows a pseudo-dendrogram of the CLUMPFIND segmentation (**b**), with the same four labels used in Fig. 1 and in **a**. As 'clumps' are not allowed to belong to larger structures, each pseudo-branch in **d** is simply a series of lines connecting the maximum emission value in each clump to the threshold value. A very large number of clumps appears in **b** because of the sensitivity of CLUMPFIND to noise and small-scale structure in the data. In the online PDF version, the 3D cubes (**a** and **b**) can be rotated to any orientation, and surfaces can be turned on and off (interaction requires Adobe Acrobat version 7.0.8 or higher). In the printed version, the front face of each 3D cube (the 'home' view in the interactive online version) corresponds exactly to the patch of sky shown in Fig. 1, and velocity with respect to the Local Standard of Rest increases from front ($-0.5\ \mathrm{km\,s^{-1}}$) to back ($8\ \mathrm{km\,s^{-1}}$).

data, CLUMPFIND typically finds features on a limited range of scales, above but close to the physical resolution of the data, and its results can be overly dependent on input parameters. By tuning CLUMPFIND's two free parameters, the same molecular-line data set[8] can be used to show either that the frequency distribution of clump mass is the same as the initial mass function of stars or that it follows the much shallower mass function associated with large-scale molecular clouds (Supplementary Fig. 1).

Four years before the advent of CLUMPFIND, 'structure trees'[9] were proposed as a way to characterize clouds' hierarchical structure using 2D maps of column density. With this early 2D work as inspiration, we have developed a structure-identification algorithm that abstracts the hierarchical structure of a 3D (p–p–v) data cube into an easily visualized representation called a 'dendrogram'[10]. Although well developed in other data-intensive fields[11,12], it is curious that the application of tree methodologies so far in astrophysics has been rare, and almost exclusively within the area of galaxy evolution, where 'merger trees' are being used with increasing frequency[13].

Figure 3 and its legend explain the construction of dendrograms schematically. The dendrogram quantifies how and where local maxima of emission merge with each other, and its implementation is explained in Supplementary Methods. Critically, the dendrogram is determined almost entirely by the data itself, and it has negligible sensitivity to algorithm parameters. To make graphical presentation possible on paper and 2D screens, we 'flatten' the dendrograms of 3D data (see Fig. 3 and its legend), by sorting their 'branches' to not cross, which eliminates dimensional information on the x axis while preserving all information about connectivity and hierarchy. Numbered 'billiard ball' labels in the figures let the reader match features between a 2D map (Fig. 1), an interactive 3D map (Fig. 2a online) and a sorted dendrogram (Fig. 2c).

A dendrogram of a spectral-line data cube allows for the estimation of key physical properties associated with volumes bounded by isosurfaces, such as radius (R), velocity dispersion (σ_v) and luminosity (L). The volumes can have any shape, and in other work[14] we focus on the significance of the especially elongated features seen in L1448 (Fig. 2a). The luminosity is an approximate proxy for mass, such that $M_{\mathrm{lum}} = X_{13\mathrm{CO}} L_{13\mathrm{CO}}$, where $X_{13\mathrm{CO}} = 8.0 \times 10^{20}\ \mathrm{cm^2\,K^{-1}\,km^{-1}\,s}$ (ref. 15; see Supplementary Methods and Supplementary Fig. 2). The derived values for size, mass and velocity dispersion can then be used to estimate the role of self-gravity at each point in the hierarchy, via calculation of an 'observed' virial parameter, $\alpha_{\mathrm{obs}} = 5\sigma_v^2 R/GM_{\mathrm{lum}}$. In principle, extended portions of the tree (Fig. 2, yellow highlighting) where $\alpha_{\mathrm{obs}} < 2$ (where gravitational energy is comparable to or larger than kinetic energy) correspond to regions of p–p–v space where self-gravity is significant. As α_{obs} only represents the ratio of kinetic energy to gravitational energy at one point in time, and does not explicitly capture external over-pressure and/or magnetic fields[16], its measured value should only be used as a guide to the longevity (boundedness) of any particular feature.

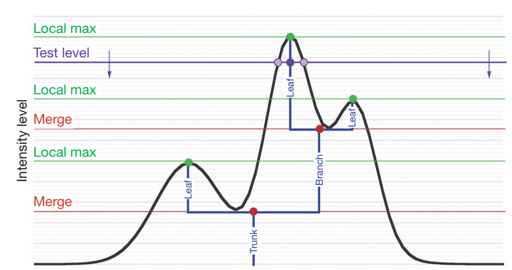
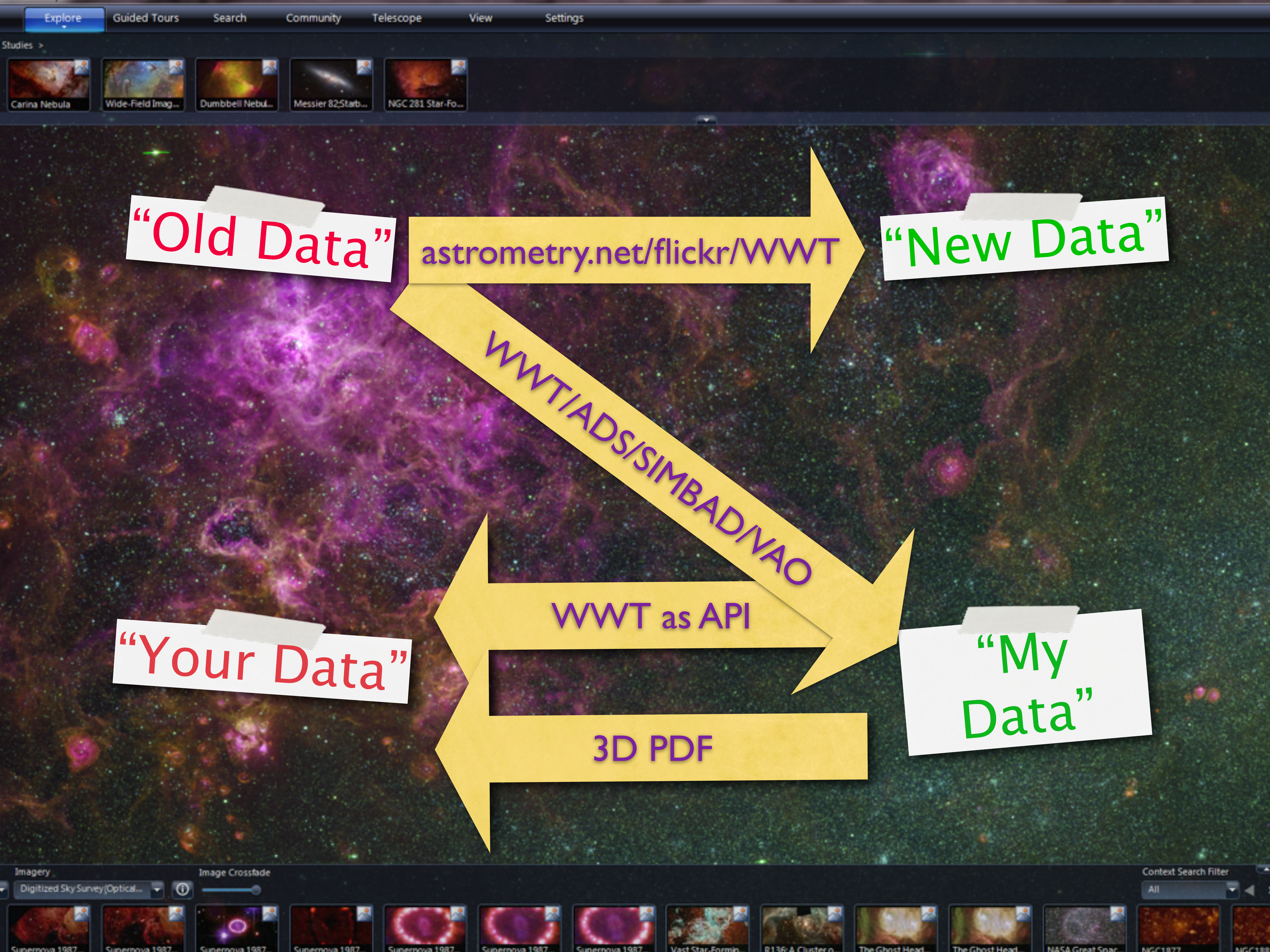


Figure 3 | Schematic illustration of the dendrogram process. Shown is the construction of a dendrogram from a hypothetical one-dimensional emission profile (black). The dendrogram (blue) can be constructed by 'dropping' a test constant emission level (purple) from above in tiny steps (exaggerated in size here, light lines) until all the local maxima and mergers are found, and connected as shown. The intersection of a test level with the emission is a set of points (for example the light purple dots) in one dimension, a planar curve in two dimensions, and an isosurface in three dimensions. The dendrogram of 3D data shown in Fig. 2c is the direct analogue of the tree shown here, only constructed from 'isosurface' rather than 'point' intersections. It has been sorted and flattened for representation on a flat page, as fully representing dendrograms for 3D data cubes would require four dimensions.

Goodman et al. *Nature*, 2009



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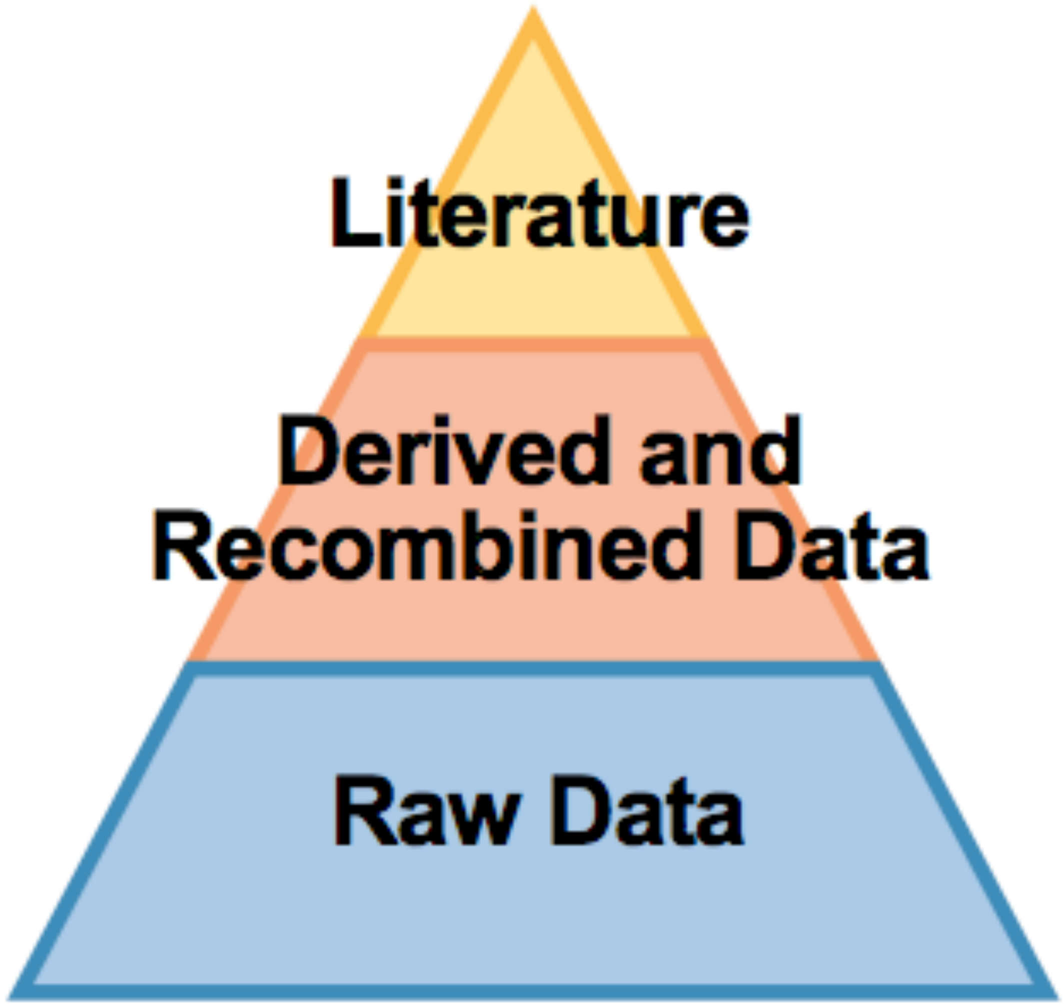
Context Search Filter
All

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

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



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

How do we increase the fraction of astronomy researchers who know about these tools?

User Groups
(CfA now has one)

+Suggestions?!

User Groups (CfA now has one)

WIKIBOOKS
Open books for an open world

ASTROBETTER
Tips and Tricks for Professional Astronomers

.astronomy

YouTube

my experiment

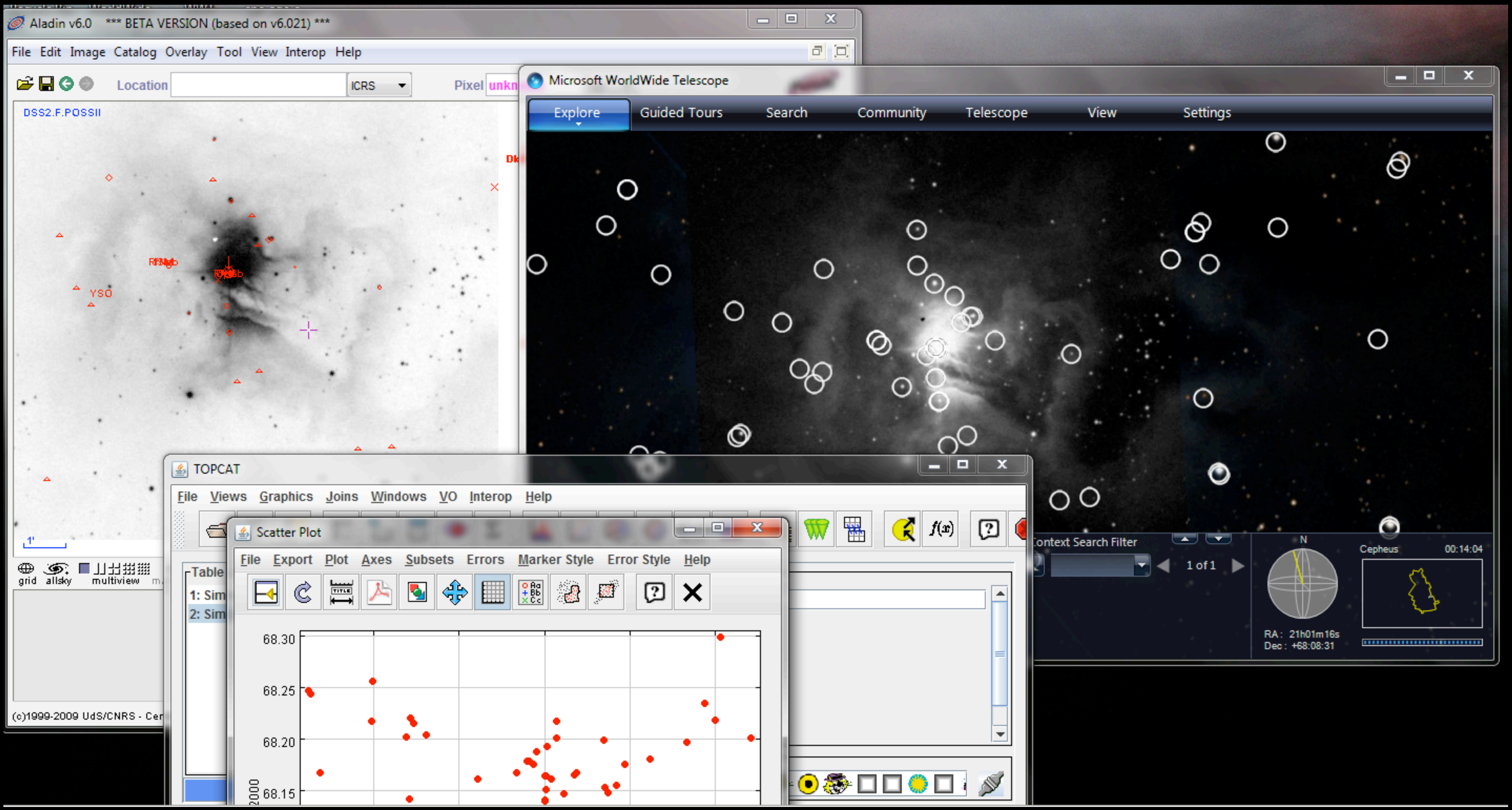
How do we increase the number of people who create and interlink new tools?

Kiva model: WWT Partners & "VAO Associates"

How do we organize such diverse tools, so as to make them interoperably useful?....

“SAMP” is a great technical start, but offers a very significant user interface challenge.

SAMP


Aladin v6.0 *** BETA VERSION (based on v6.021) ***
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2: Sim
Scatter Plot
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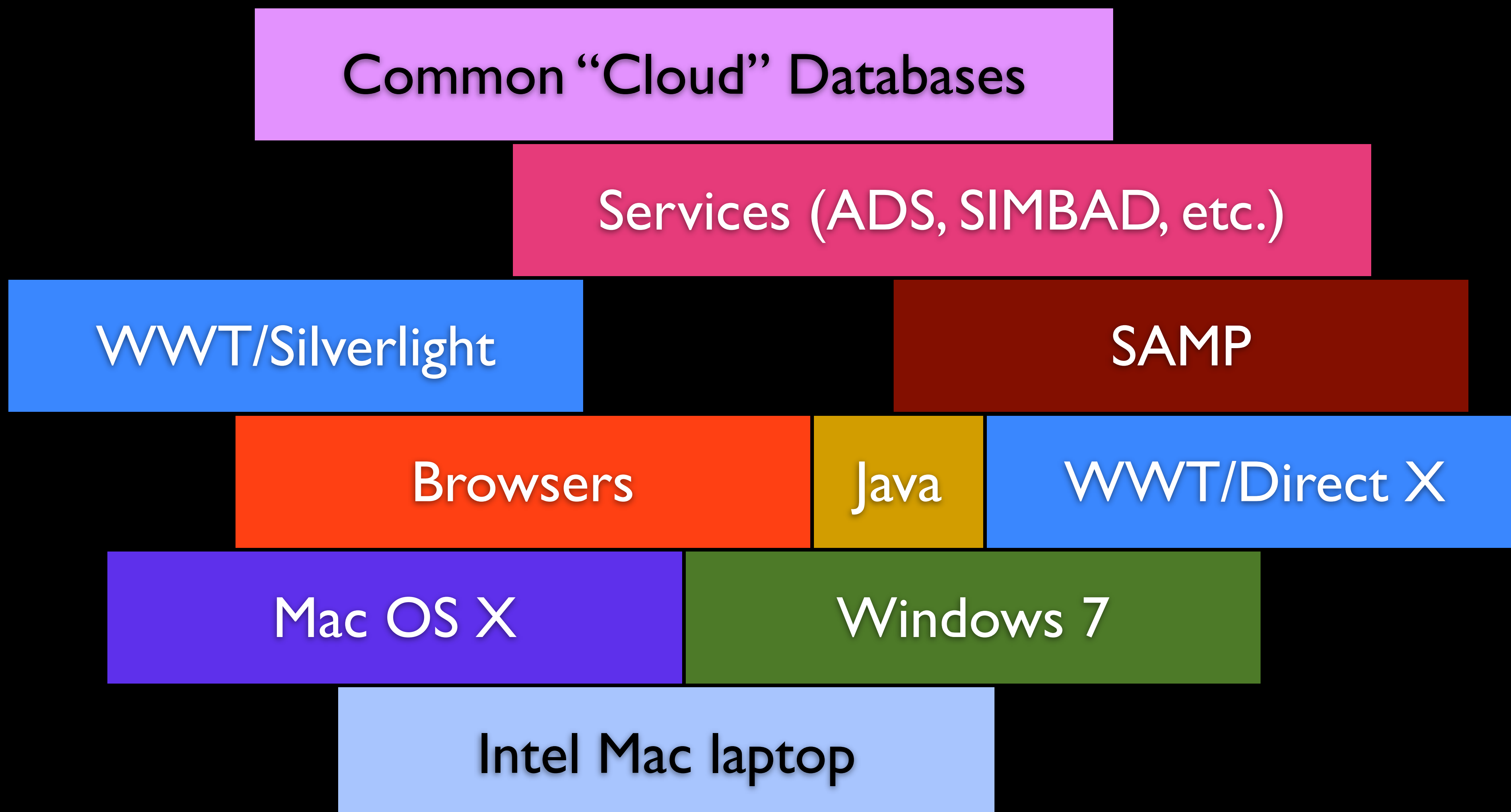
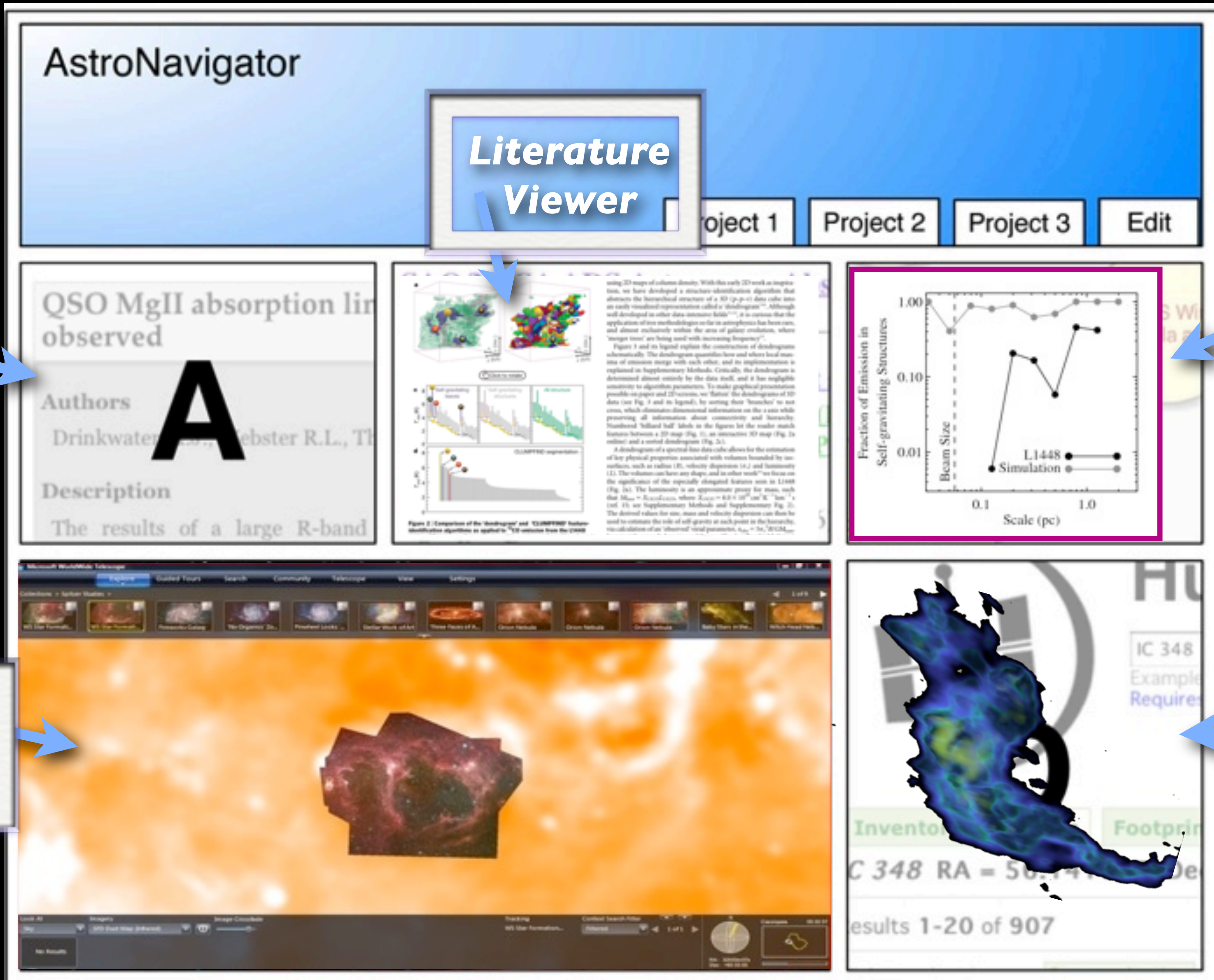
68.15

Think about the "modules" needed to make this work...but do the details matter, to your research, if the system works seamlessly?



Seamless Astronomy

Semantic Search



Literature Viewer

Info-Vis for Analytics

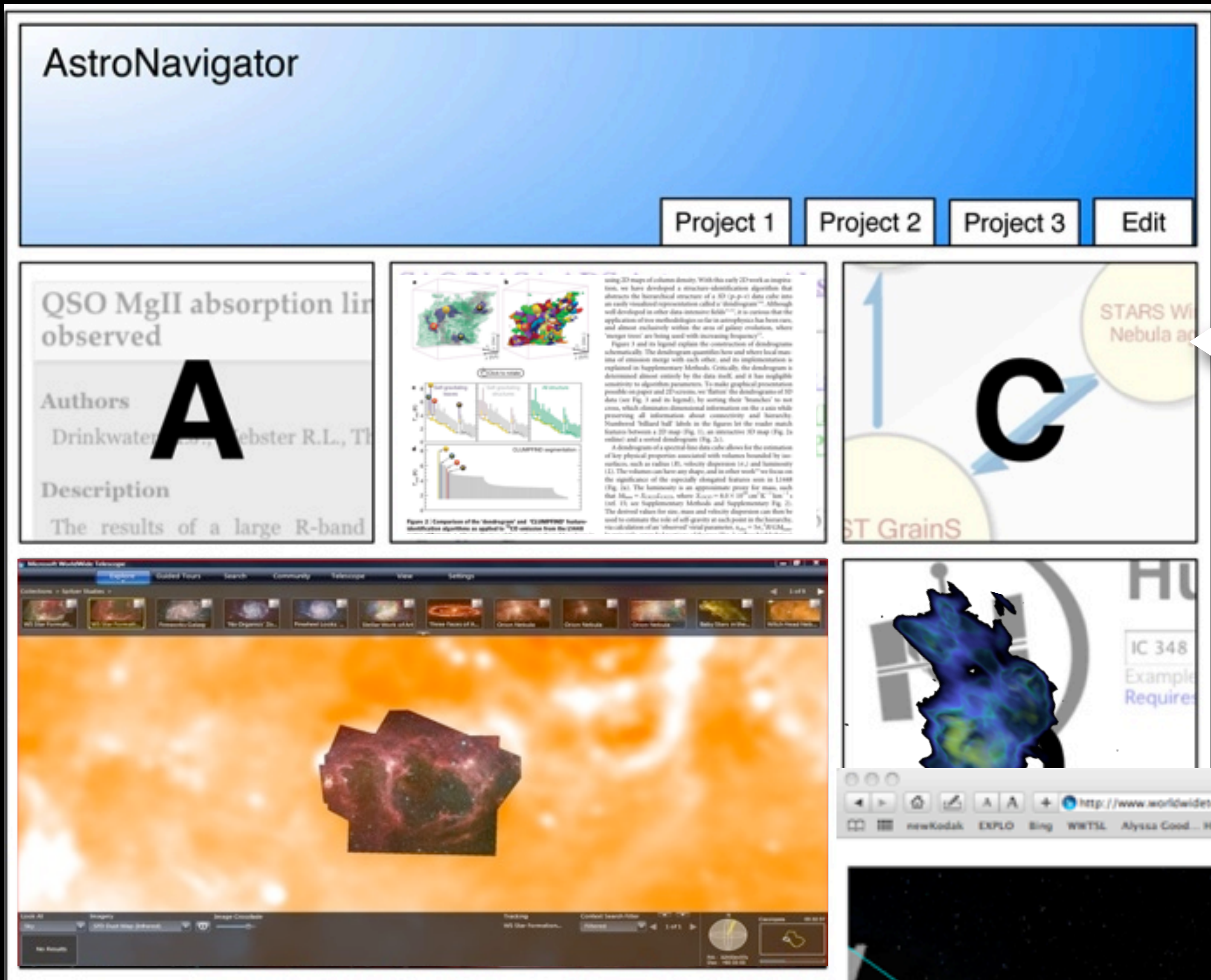
Sift-based Search Results

Data Viewer (e.g. WWT)

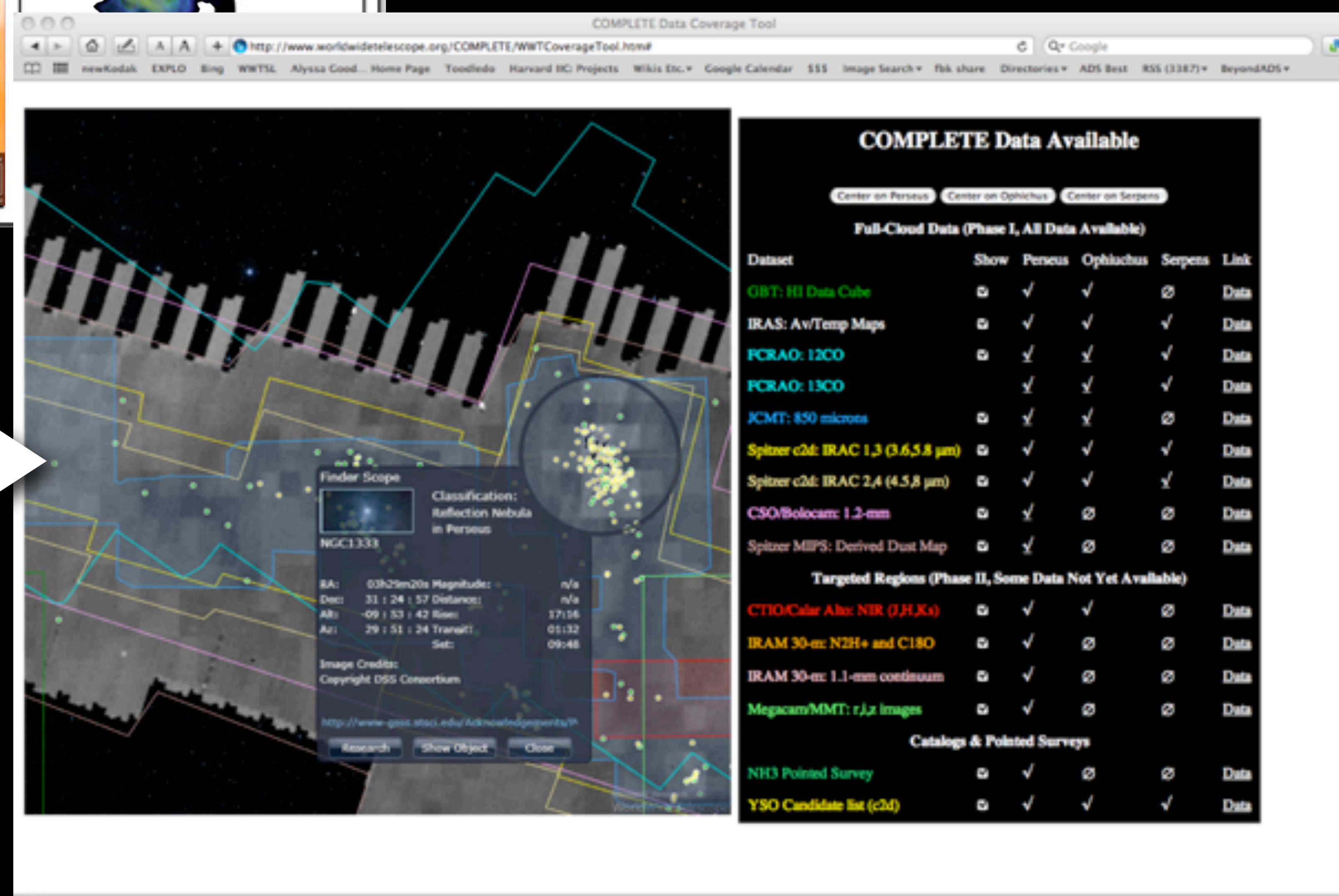
Archive Browser

3D Viewer

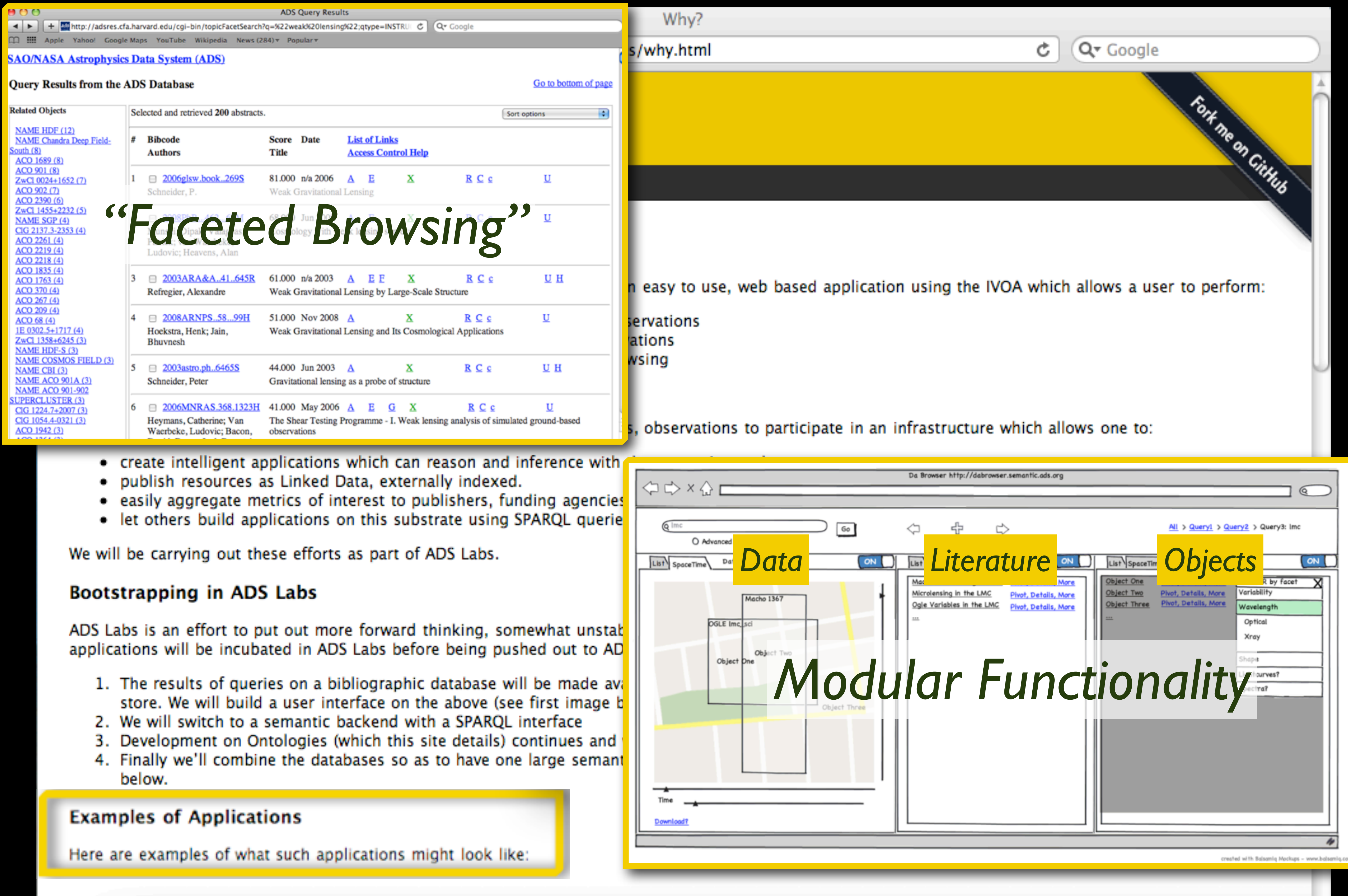
Mockup based on work of Eli Bressert, excerpted from NASA AISRP proposal by Goodman, Muench, Christian, Conti, Kurtz, Burke, Accomazzi, McGuinness, Hendler & Wong, 2008



Fiction
(for now)
but, coming very soon, e.g. ASCOT



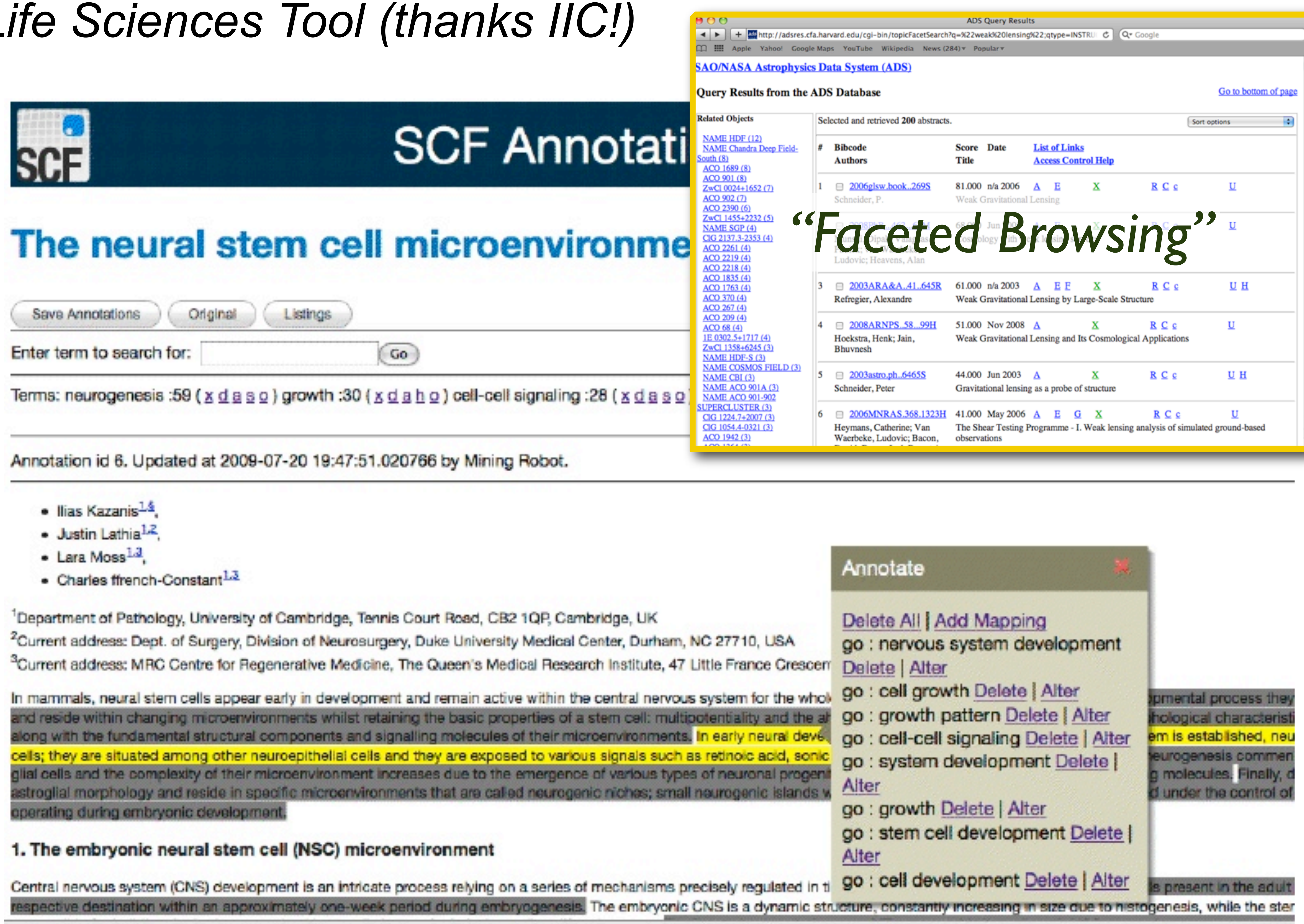
Fact
(right now)



Ongoing "ADS Labs" Work: Alberto Accomazzi, Rahul Davé, Alberto Pepe, Michael Kurtz, Gus Muench, AG

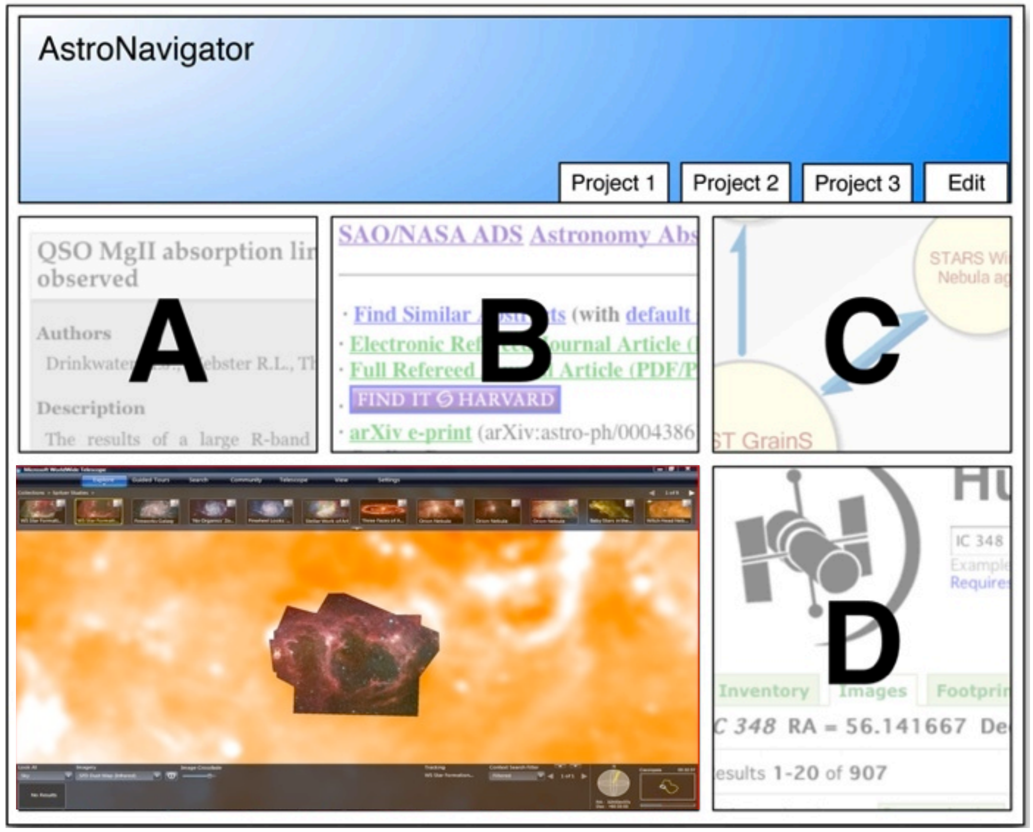
Thanks to ADS (NASA)/VAO(NASA+NSF)/MSFT funding.

Article Markup via ADS will be similar to working Life Sciences Tool (thanks IIC!)



ASCOT (University of Washington)

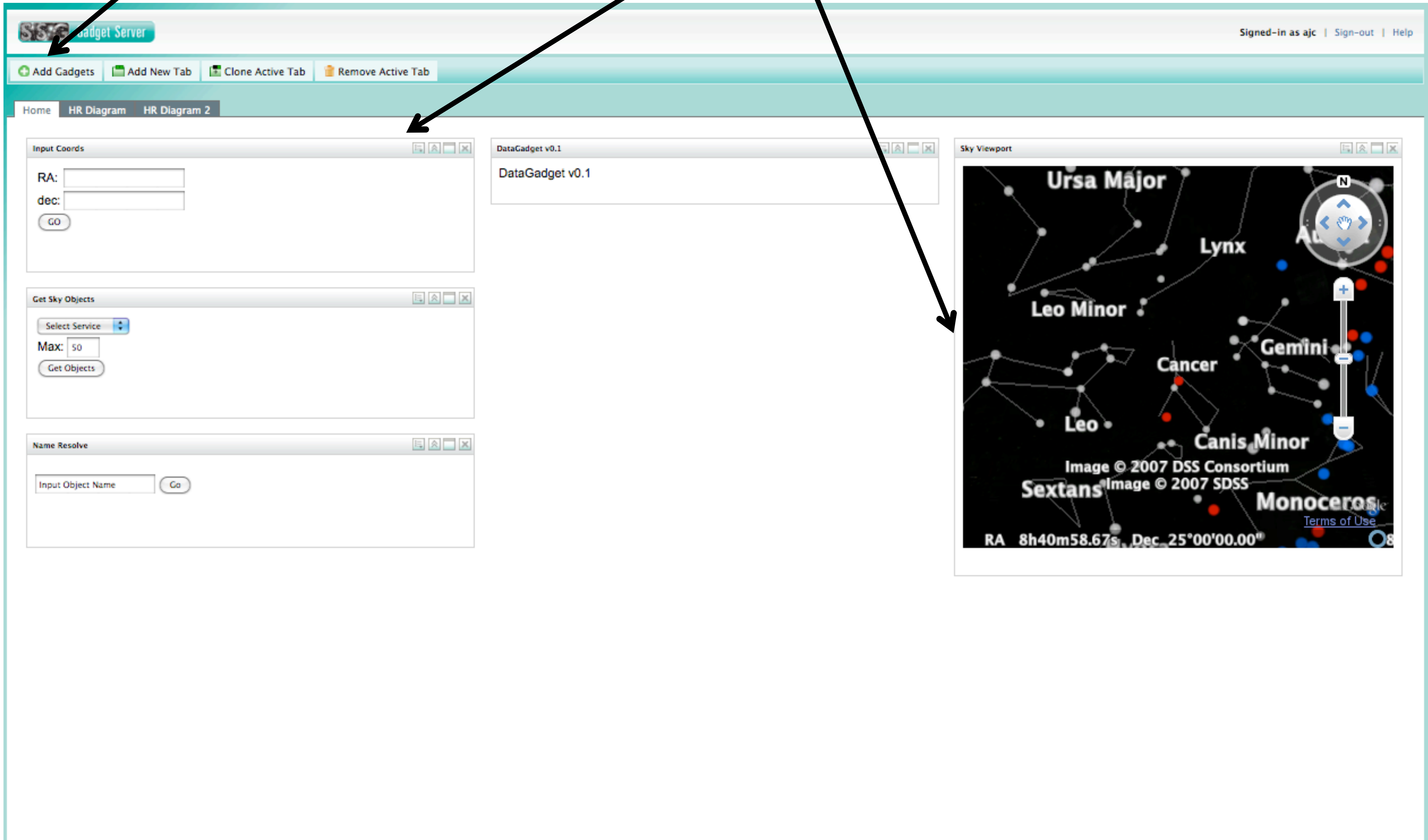
- **Research in a Browser**
  - **"iGoogle" for Astronomy**
    - Collections of simple atomic applications (gadgets)
    - Users choose the view they want
    - All gadgets can communicate with each other
  - **Customizable and sharable**
    - Users can build and share "mashups"
    - Widgets are simple to create
    - Widgets call virtual observatory resources
  - **Efficient**
    - Communication is within the browser (fast)
    - Built from javascript (standard)



Collaborative Astronomy (Connolly, Gibson, Krughoff, Sayers, Smith 2010)

Select Gadgets

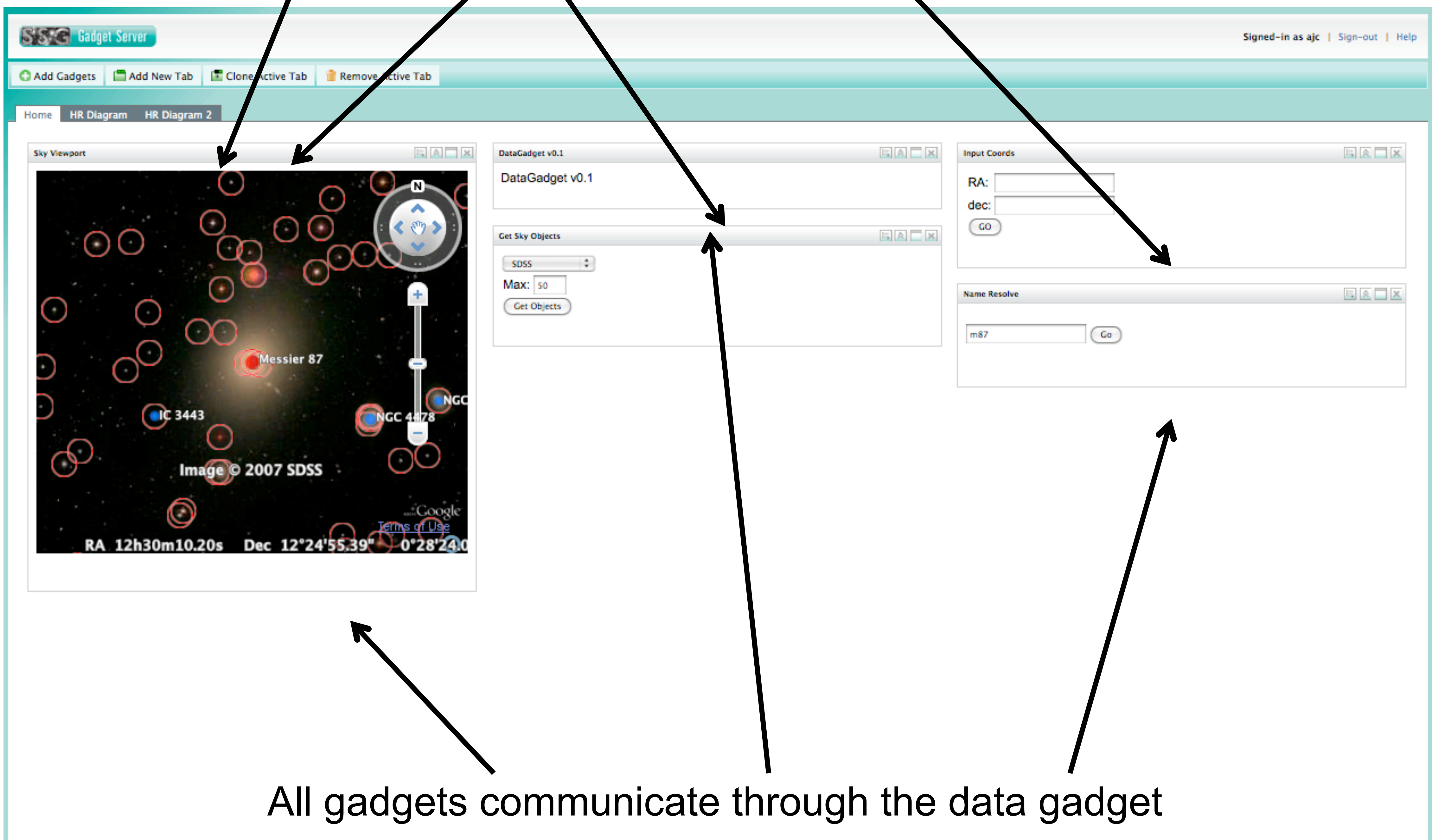
Rearrange based on your preference



Collaborative Astronomy (Connolly, Gibson, Krughoff, Sayers, Smith 2010)

Query the SDSS based on viewport and return the source overlaid on images

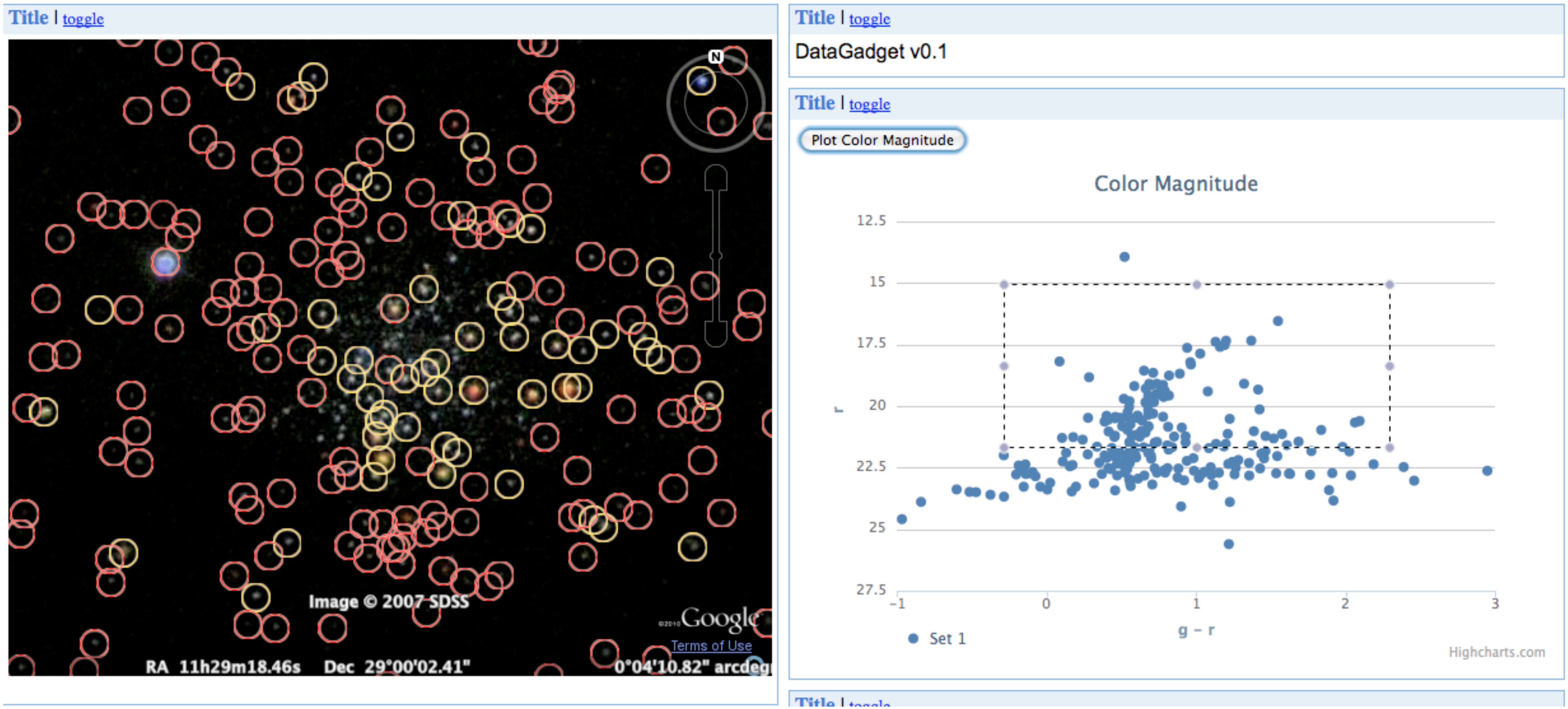
Name resolver and zoom to field



All gadgets communicate through the data gadget

Collaborative Astronomy (Connolly, Gibson, Krughoff, Sayers, Smith 2010)

Create, store and share multiple views of gadgets



Interaction allows selections to be shown on the viewport

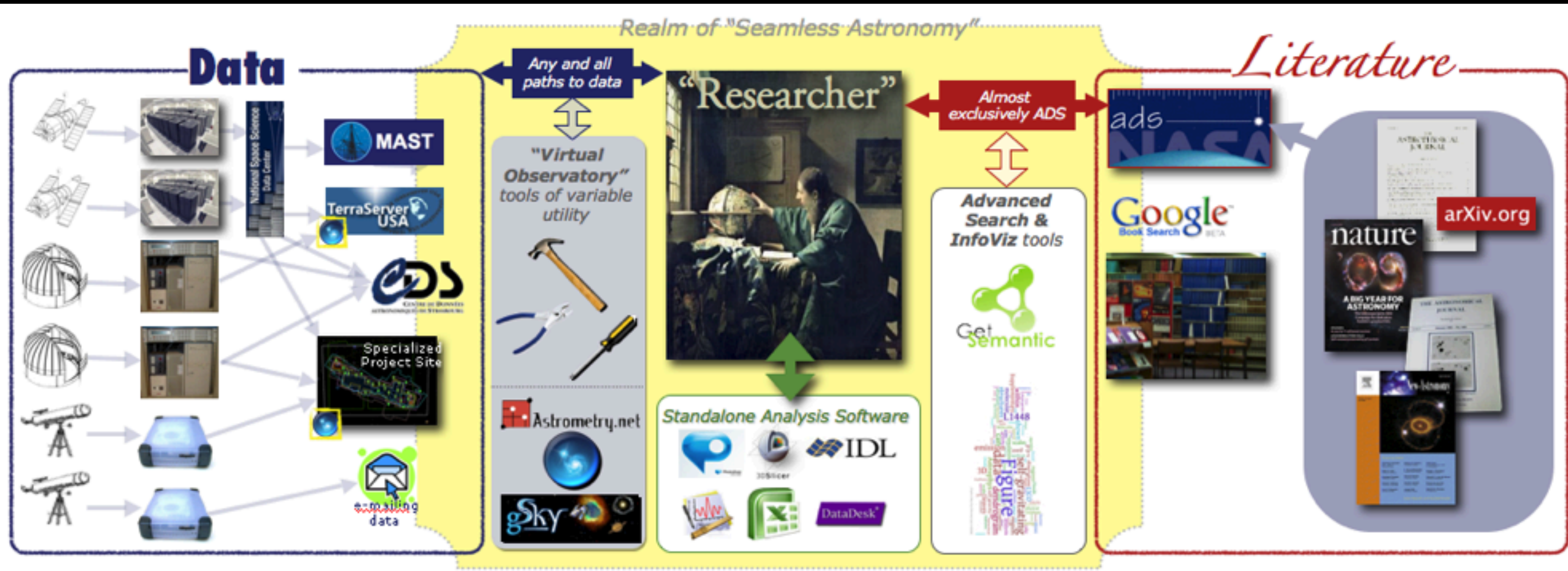
Collaborative Astronomy (Connolly, Gibson, Krughoff, Sayers, Smith 2010)

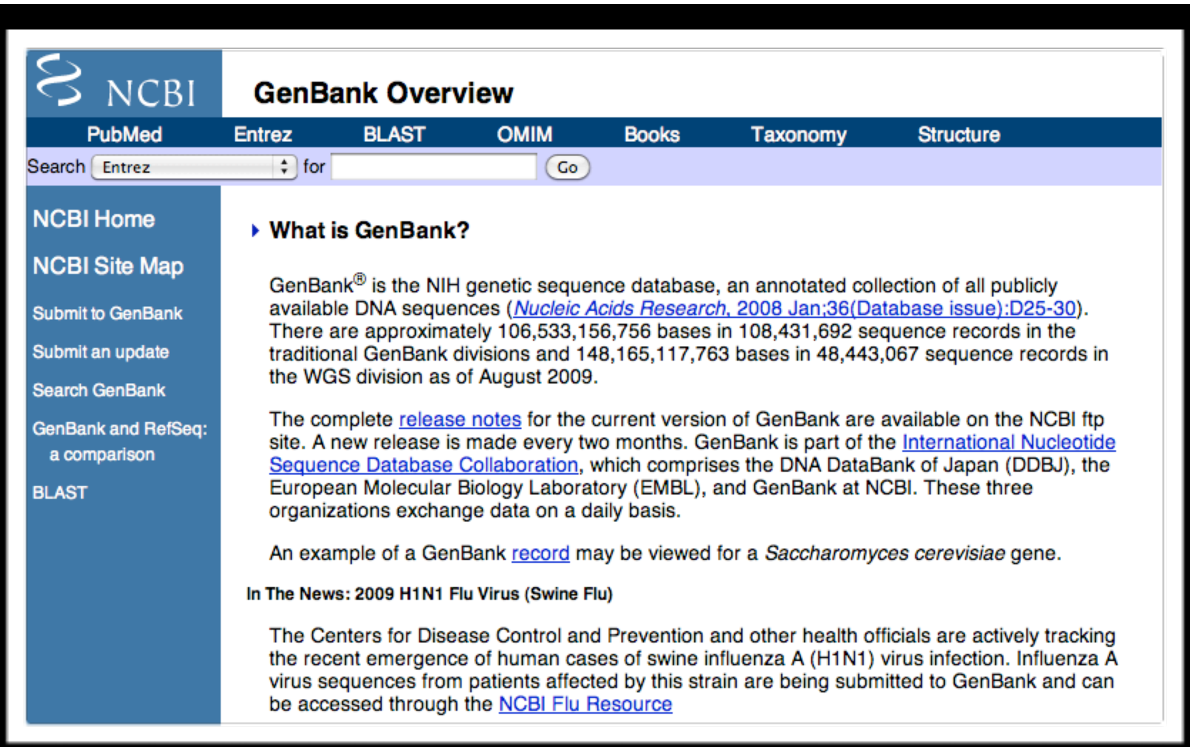
New Resources

http://blogs.nature.com/fourthparadigm/

http://sites.nationalacademies.org/PGA/brdi/index.htm

New, Seamless, Science?





NCBI GenBank Overview

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What is GenBank?

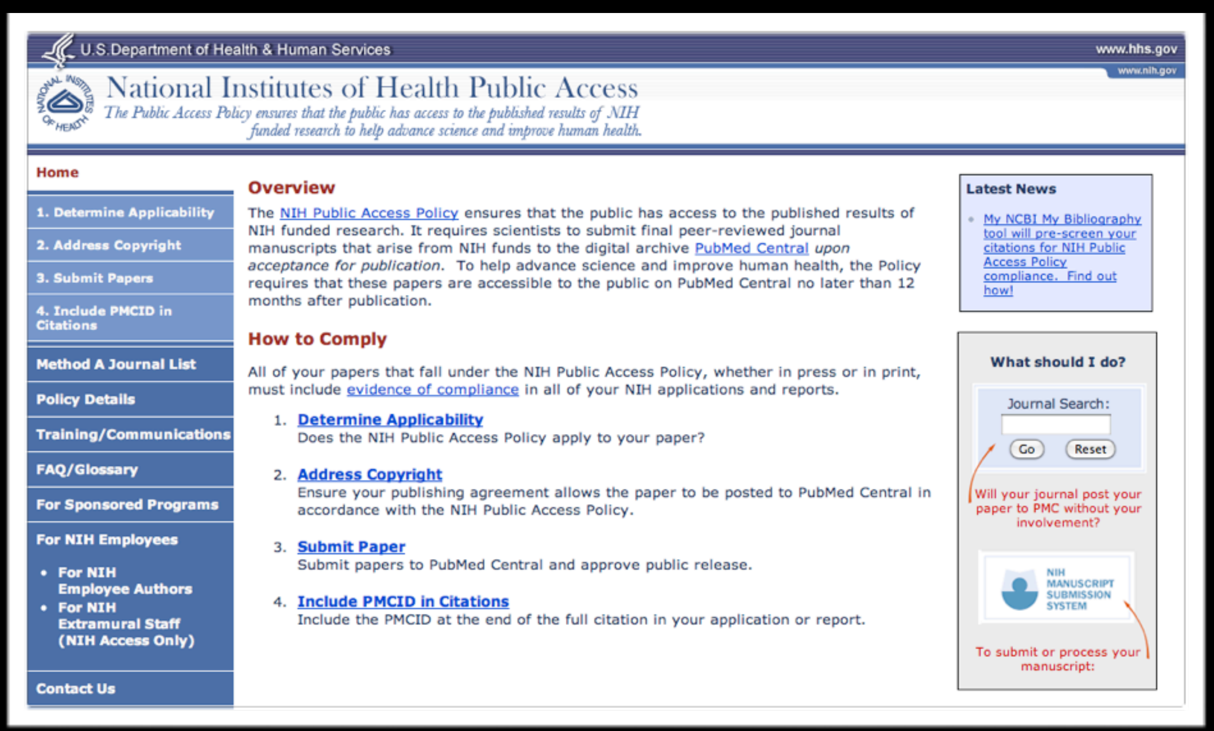
GenBank® is the NIH genetic sequence database, an annotated collection of all publicly available DNA sequences (*Nucleic Acids Research, 2008 Jan;36(Database issue):D25-30*). There are approximately 106,533,156,756 bases in 108,431,692 sequence records in the traditional GenBank divisions and 148,165,117,763 bases in 48,443,067 sequence records in the WGS division as of August 2009.

The complete release notes for the current version of GenBank are available on the NCBI ftp site. A new release is made every two months. GenBank is part of the International Nucleotide Sequence Database Collaboration, which comprises the DNA DataBank of Japan (DDBJ), the European Molecular Biology Laboratory (EMBL), and GenBank at NCBI. These three organizations exchange data on a daily basis.

An example of a GenBank record may be viewed for a *Saccharomyces cerevisiae* gene.

In The News: 2009 H1N1 Flu Virus (Swine Flu)

The Centers for Disease Control and Prevention and other health officials are actively tracking the recent emergence of human cases of swine influenza A (H1N1) virus infection. Influenza A virus sequences from patients affected by this strain are being submitted to GenBank and can be accessed through the NCBI Flu Resource



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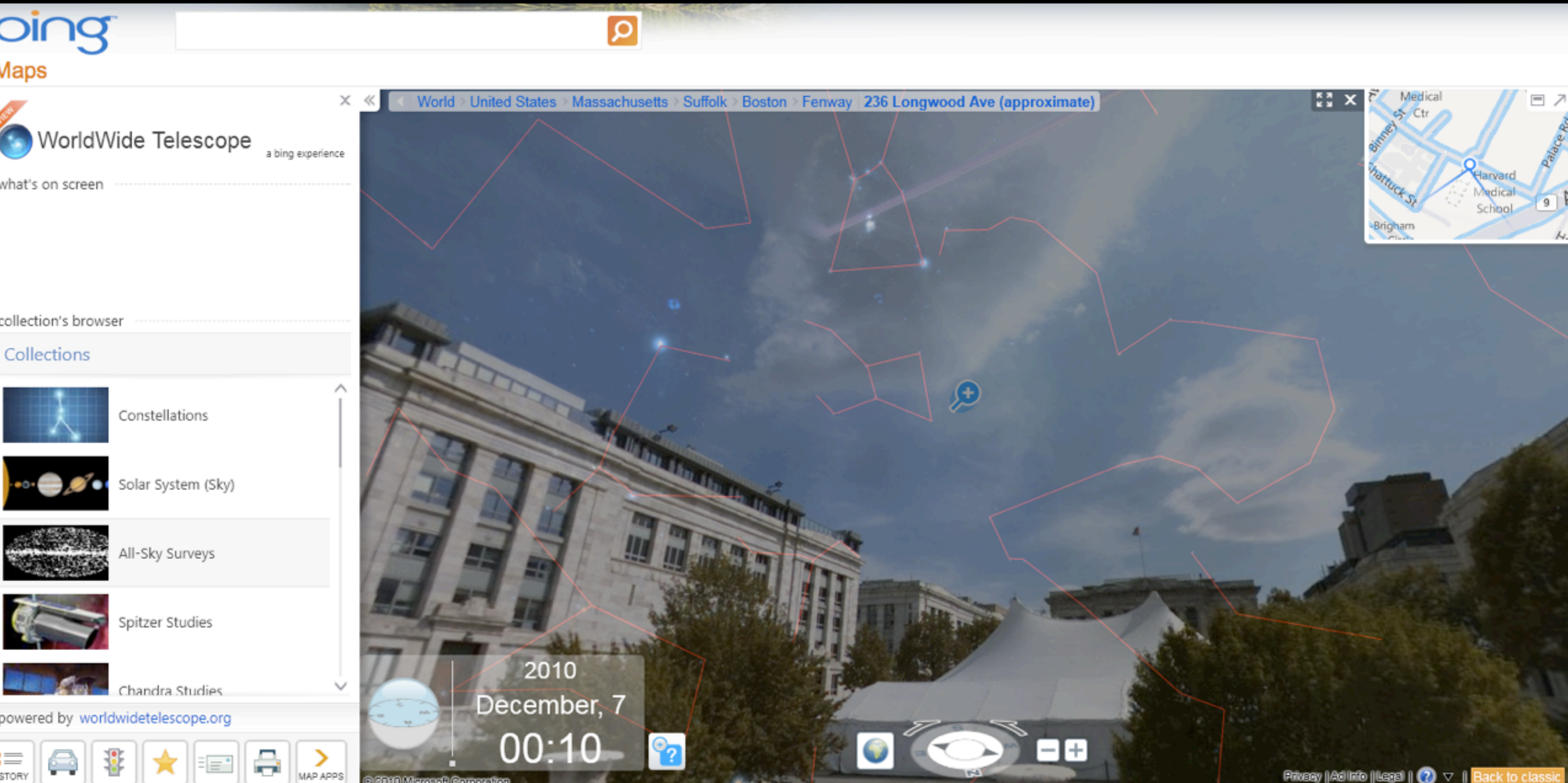

with

Alberto Accomazzi, Douglas Burke, Gus Muench, Michael Kurtz & Alberto Pepe (Harvard-Smithsonian CfA); Eli Bressert (U. Exeter); Tim Clark (Massachusetts General Hospital/Harvard Medical School); Chris Borgman (UCLA); Jonathan Fay & Curtis Wong (Microsoft Research)