

Astrophysical Objects

Multi-messenger astrophysics

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**SCHOOL OF
PHYSICAL SCIENCES
AND NANOTECHNOLOGY**

Archival data

- There is a lot of Astrophysical data available for free online.
- The important part is to know where to find it and how to use it.
- There are many data bases for all kinds of astronomical data.
- There are also some websites which use astronomical data, but have the goal of education and outreach.

Archival data

Wikisky

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

Digital Sky Survey (DSS) - optical image

The screenshot shows a dark, star-filled background with a prominent spiral galaxy, NGC 4321, highlighted by a white rectangular box. The coordinates of the galaxy are listed as (12^h26^m16.69^s, +16°01'59.3"). A sidebar on the right lists various astronomical objects under the heading "The Attractive Spots of the Universe".

SKY-MAP.ORG

HOME GETTING STARTED TO SURVIVE IN THE UNIVERSE INHABITED SKY NEWS@SKY ASTRO PHOTO THE COLLECTION FORUM BLOG FAQ PRESS LOGIN

(12^h26^m16.69^s, +16°01'59.3")

▼ The Attractive Spots of the Universe

- + Hoag's Object (Ring Galaxy)
- + M83: New view from Hubble
- + HST RELEASE: Stephan's Quintet
- + Refreshed Hubble: Carina Nebula
- + Hubble Opens New Eyes: NGC 6302
- + Hubble: The Universe is expanding
- + Two Tails of Comet Lulin
- + Through gas and dust - The IC 342 Galaxy
- + Large Magellanic Cloud (PGC 17223)
- + The Crescent Nebula (NGC 6888)
- + Scorpions heart - Antares (α Sco)
- + Lace Work Nebula - The Cygnus Loop
- + Barred Spiral Galaxy (NGC 1300)
- + War and Peace - The NGC 6357 Nebula.
- + Bode's Galaxy (M81)
- + Hubble's Galaxy Triplet Arp 274
- + Happy Valentine Day!
- + Big Bada Bum in Centaurus A
- + NGC 253
- + A Bubble in Cygnus
- + New Clue to Dark Matter
- + Globular cluster M5
- + Feeding the Monster
- + Remnant from 1006 A.D. Supernova
- + Helix Nebula
- + Carina Nebula
- + Coma Cluster of Galaxies (Hubble)
- + Hubble Interacting Galaxy NGC 3690
- + Hubble Interacting Galaxy NGC 6670
- + Hubble Interacting Galaxy Arp 148
- + Hubble Interacting Galaxy UGC 8335
- + Boomerang Nebula
- + NGC 6334: The Cat's Paw Nebula
- + IC 1613
- + Searching for Dark Matter
- + Dark Matter Ring Detected by Hubble
- + Long Stem Rosette
- + 12.8 billion light-years away...
- + A Ghostly Presence
- + Mysterious Galaxy

Contribution API Groups Privacy Policy About Project Contact Us

Search for data - quick information from a few basic large sky surveys

Example: NGC 4321 a galaxy in the Virgo cluster

GALEX - UV image

The screenshot shows a dark, star-filled background with the same spiral galaxy, NGC 4321, highlighted by a white rectangular box. The coordinates are listed as (12^h24^m26.24^s, +15°58'43.4"). A sidebar on the right lists various astronomical objects under the heading "The Attractive Spots of the Universe".

SKY-MAP.ORG

HOME GETTING STARTED TO SURVIVE IN THE UNIVERSE INHABITED SKY NEWS@SKY ASTRO PHOTO THE COLLECTION FORUM BLOG FAQ PRESS LOGIN

(12^h24^m26.24^s, +15°58'43.4")

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- + Carina Nebula
- + Coma Cluster of Galaxies (Hubble)
- + Hubble Interacting Galaxy NGC 6050
- + Hubble Interacting Galaxy NGC 3690
- + Hubble Interacting Galaxy NGC 6670
- + Hubble Interacting Galaxy Arp 148
- + Hubble Interacting Galaxy UGC 8335
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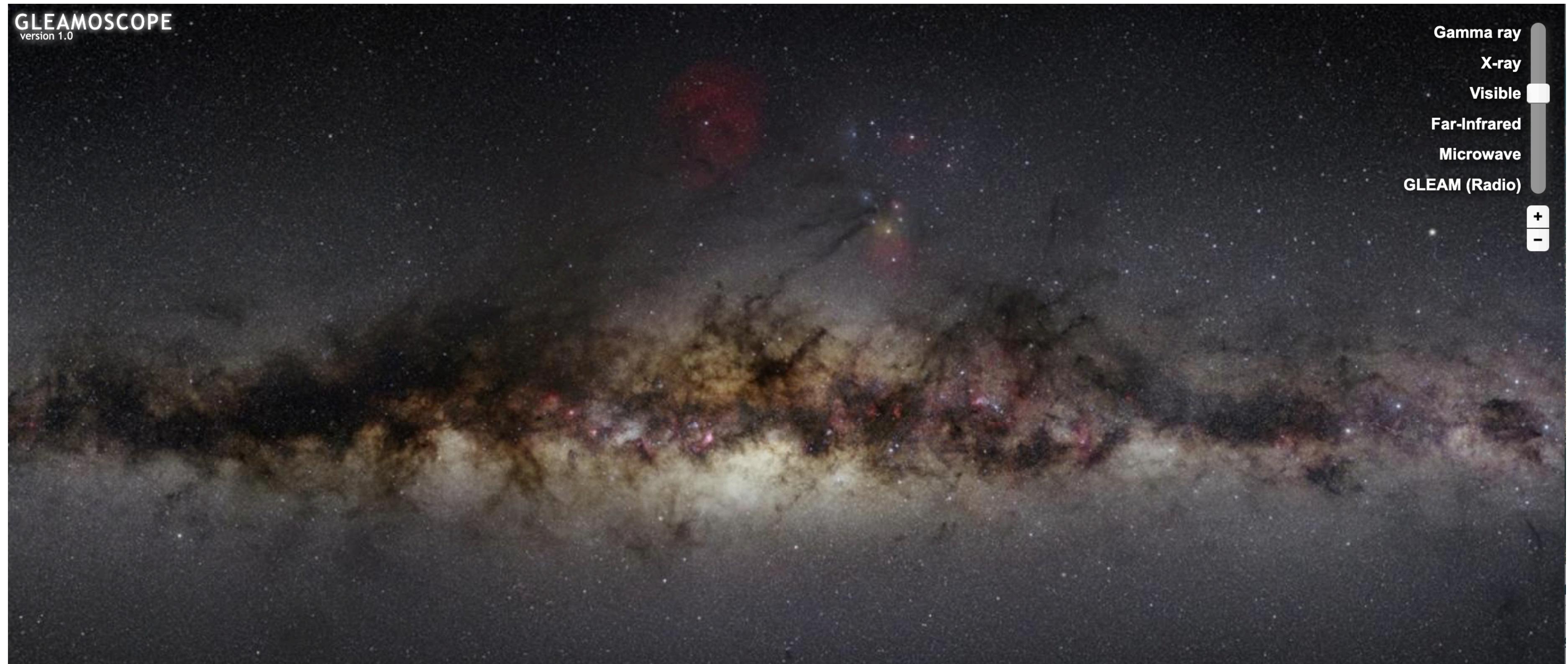
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Archival data

Gleamoscope

Explore the sky in different wavelengths

<https://gleamoscope.icrar.org/gleamoscope/trunk/src/>



Archival data

Skyview

Search and download data from sky surveys

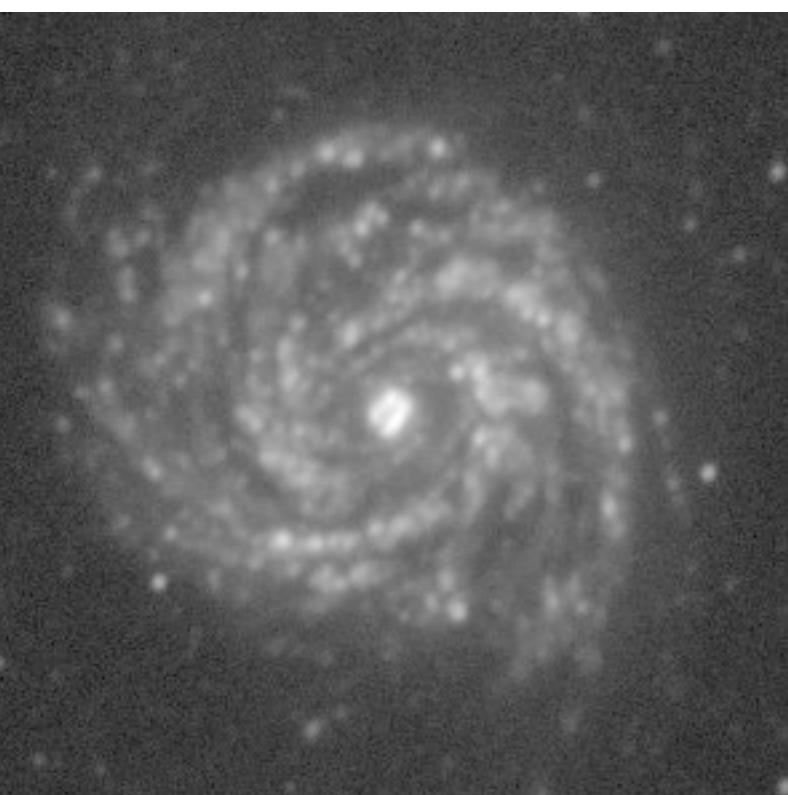
Example: NGC 4321 a galaxy in the Virgo cluster

<https://skyview.gsfc.nasa.gov/current/cgi/titlepage.pl>

<https://skyview.gsfc.nasa.gov/current/cgi/query.pl>

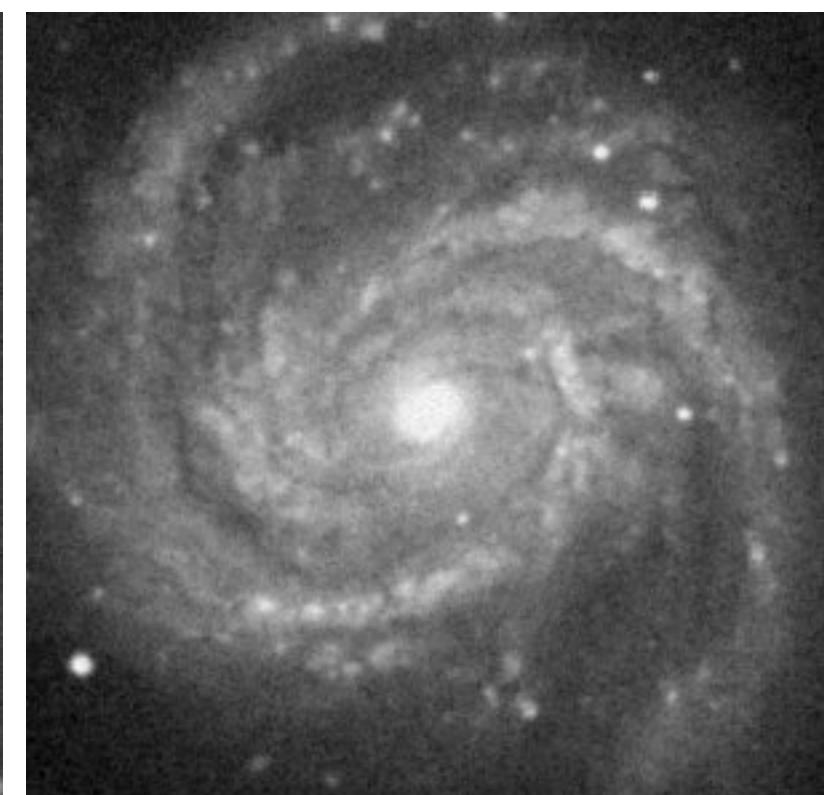
GALEX

Near UV



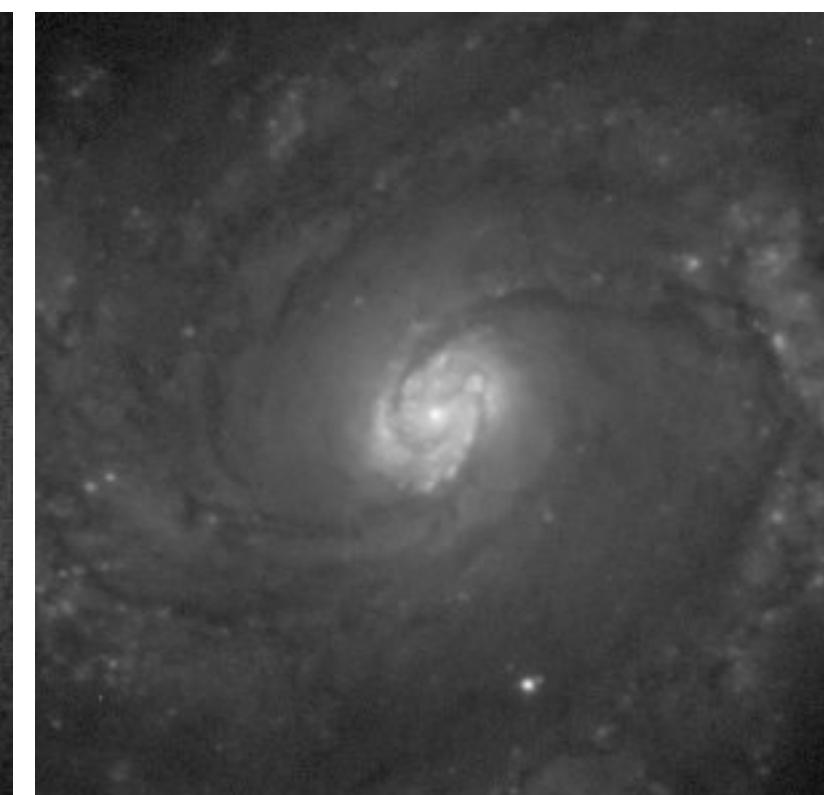
DSS 2 blue

Optical blue



SDSS r

Optical red



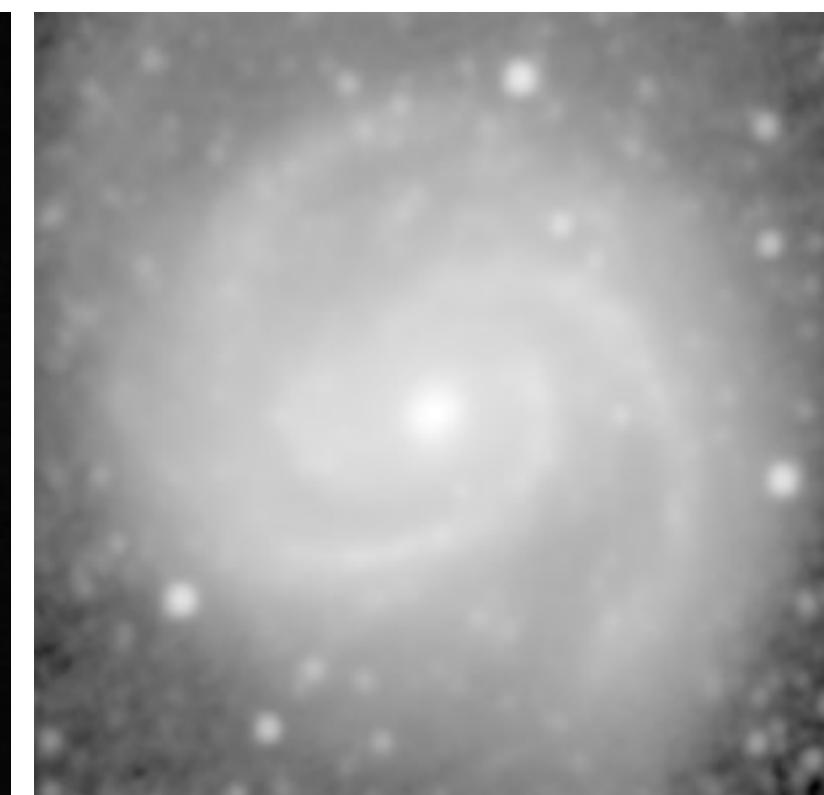
2MASS

Near infrared



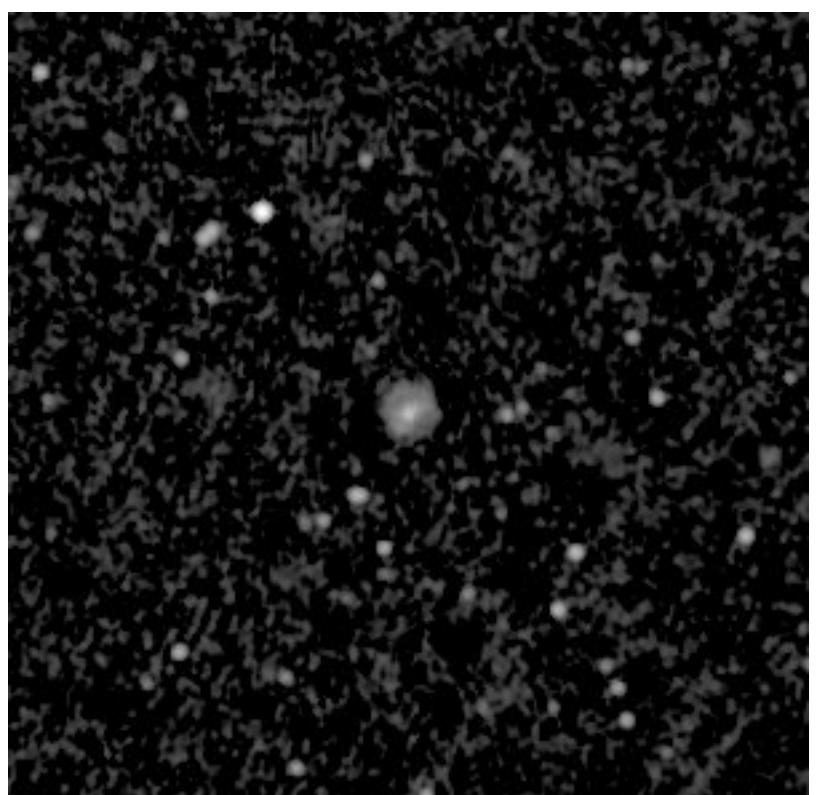
WISE 3.4 micron

Infrared



NVSS

Radio



Archival data

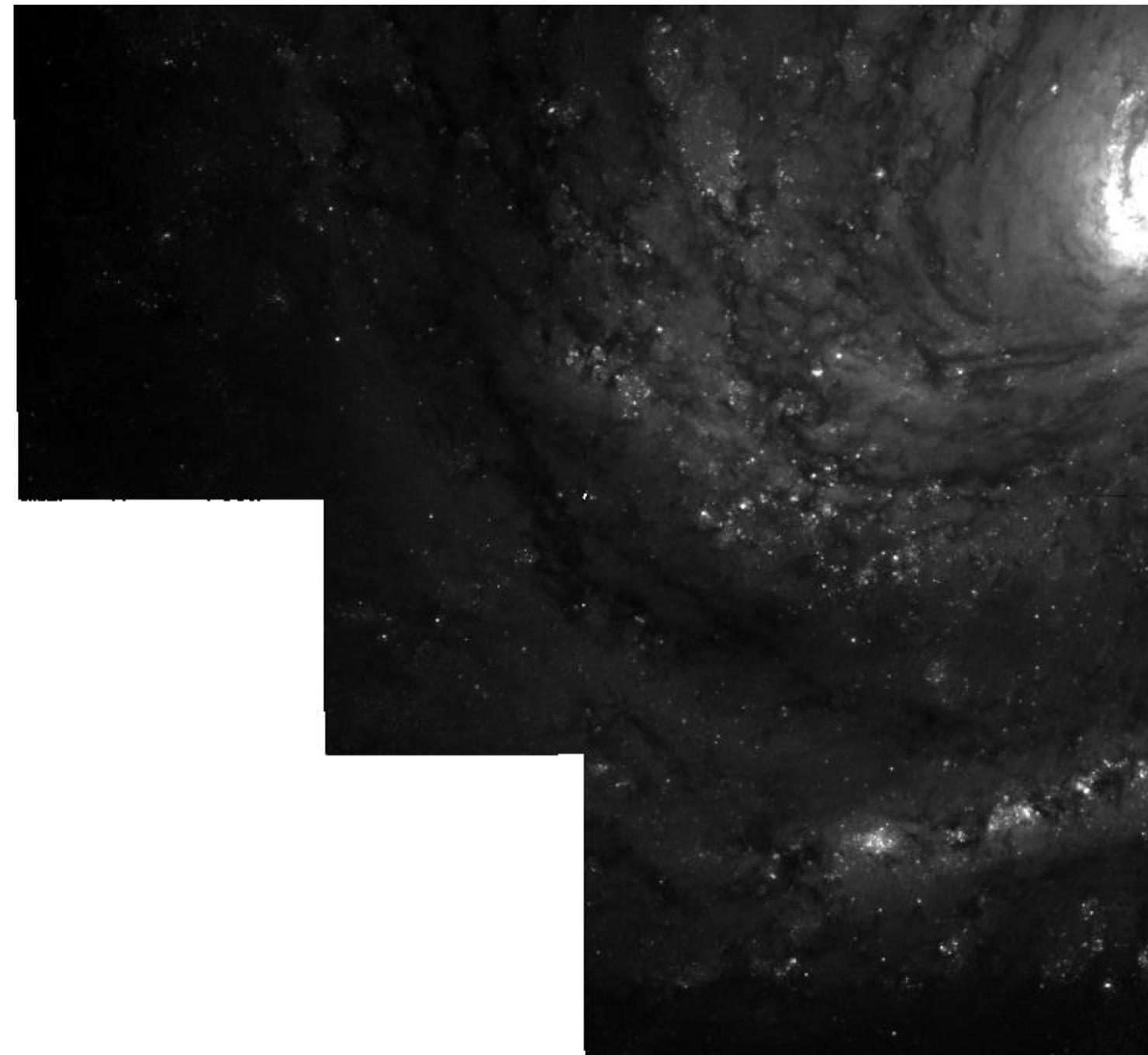
Hubble Space Telescope - Hubble legacy archive

<https://hla.stsci.edu/>

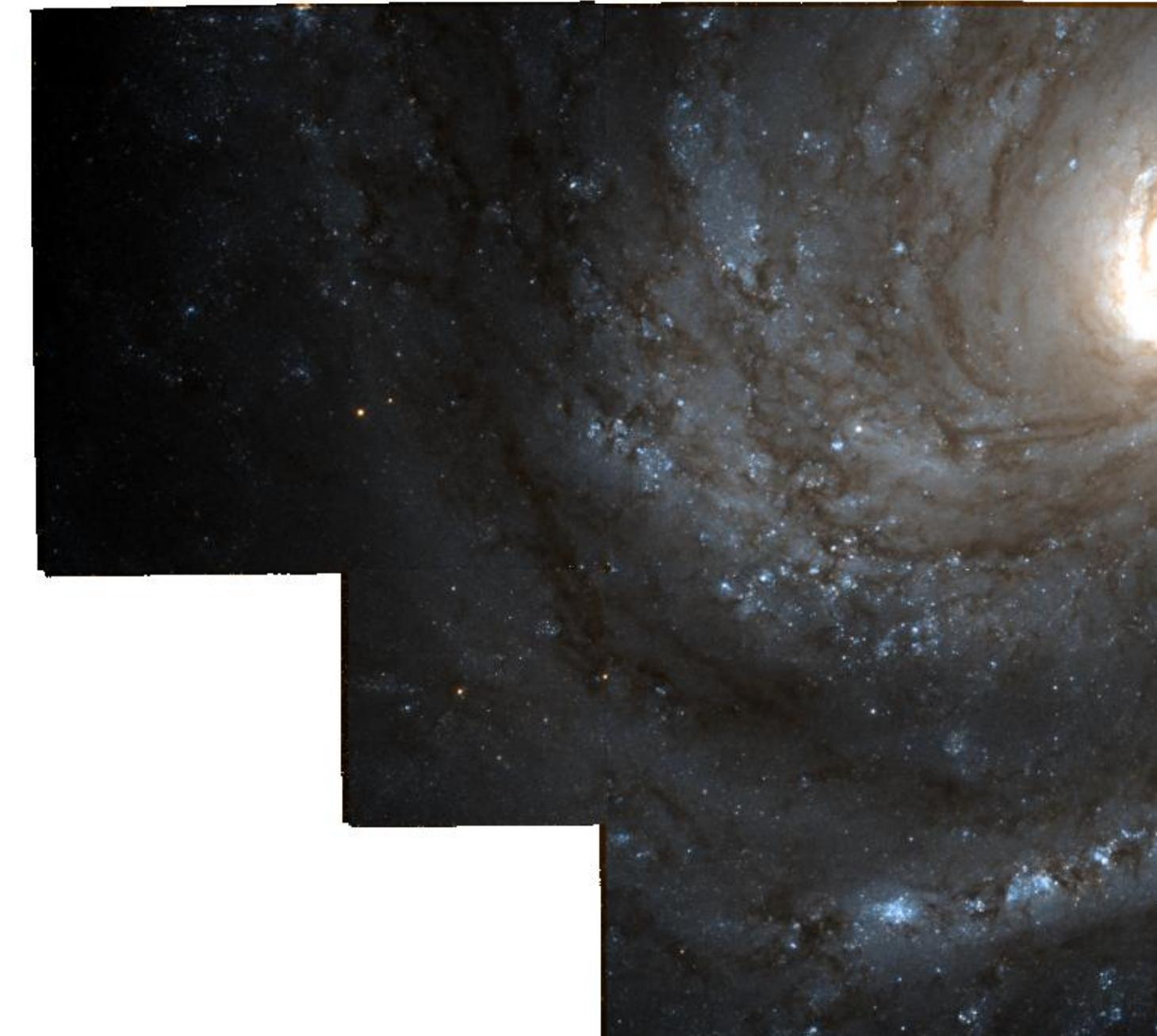
Search + download data

Example: NGC 4321 a galaxy in the Virgo cluster

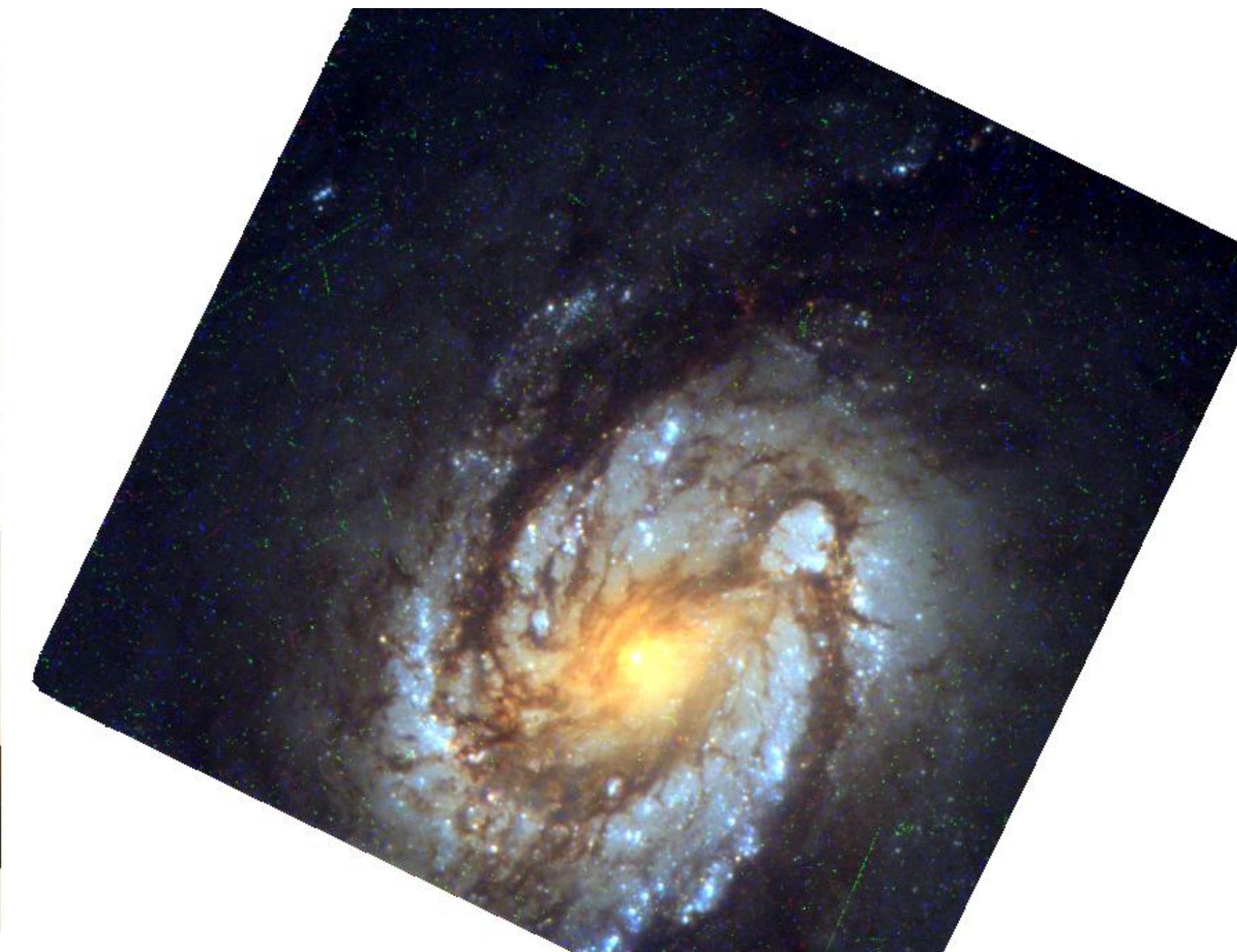
One filter/wavelength -> black and white image



3 filter composite



3 filter composite
Different detector/camera



Archival data

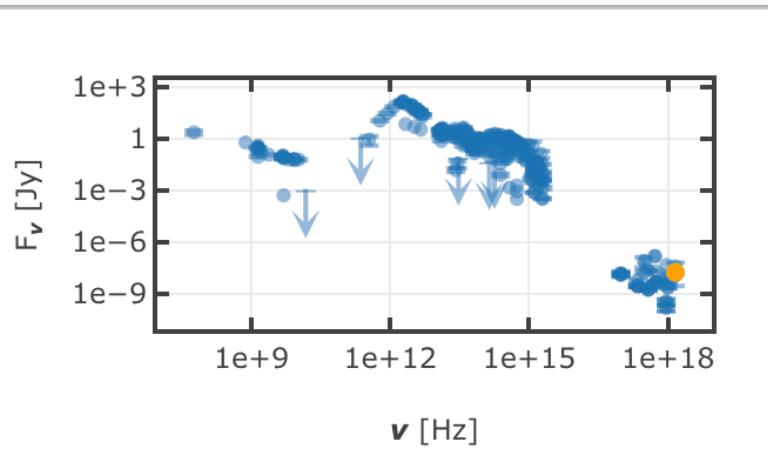
NASA Extragalactic Database (NED)

<https://ned.ipac.caltech.edu/>

Quick information on galaxies

Results for object MESSIER 100 (NGC 4321)

Overview Cross-IDs (65) Coordinates (117) Redshifts (50) Distances (69) Classifications (111) Galactic Extinctions Notes (38) Diameters (13)
Photometry & SED (324) Spectra (32) Images (166) References (1648) External Links Survey Coverage

 POSS-II F (North), AAO-SES/SERC-ER (South), Red image
[View in IRSA Finderchart](#)
Image Credit: Caltech or AAO/ROE

Selected data and derived quantities for MESSIER 100†. More information in the tabs above.

Cross-identifications	Essential note				
MESSIER 100; NGC 4321; UGC 07450; KUG 1220+160; VCC 0596					
Coordinates for Preferred Position					
Equatorial (J2000)	Galactic				
RA, Dec	RA, Dec [Deg]	Unc Semi-major,minor ["]	Unc PA [deg]	Reference	Lon, Lat [deg]
12h22m54.831s, +15d49m18.54s	185.728463, 15.821818	4.70E-01, 4.70E-01	0	2010ApJS..189...37E	271.136430, 76.898288
Preferred Redshift & Derived Quantities [$H_0 = 67.8 \text{ km/sec/Mpc}$, $\Omega_{\text{matter}} = 0.308$, $\Omega_{\text{vacuum}} = 0.692$]	Redshift-independent Distances				
z (Helio)	V (Helio) [km/s]	Reference	V (CMB) [km/s]	Hubble Distance (CMB) [Mpc]	# Measurements
0.00524 +/- 0.00000	1570.912700 +/- 0.899378	2014MNRAS.440..696A	1896 +/- 23	27.97 +/- 1.99	69
Classifications					
Object Type	Morphology	Reference	Activity Type	Reference	Other
G	SAB(s)bc	1991RC3.9.C...0000d			SAB(s)bc;LINER HII
Quick-look Angular & Physical Diameters	Foreground Galactic Extinction (2011ApJ...737..103S)				

Archival data

Centre de Données astronomiques de Strasbourg (CDS)

<https://cds.unistra.fr/>

<https://vizier.cds.unistra.fr/viz-bin/VizieR>

VizieR: Catalogues



VizieR

Simple Target List Of Targets

Target Name (resolved by [Sesame](#)) or Position: J2000 arcmin

Target dimension: arcmin

NB: The epoch used for the query is the original epoch of the table(s) Radius

Keywords

- V/139
- NGC 4321

Tables

- [V/139](#)
- [..sdss9](#)

Preferences

max: 50

All columns Compute

Distance q Position angle 0 Distance (x,y) Galactic J2000 B1950 Ecl. J2000 default Sort by Distance + order - No sort

Position in: Sexagesimal Decimal Truncated prec.

Mirrors

Simple Constraint List Of Constraints

Query by [Constraints](#) applied on Columns (Output Order: + -)

Show	Sort	Column	Clear	Constraint	Explain (UCD)
<input checked="" type="checkbox"/>	<input type="radio"/>	mode	<input type="radio"/> =1	[1,2] 1: primary (469,053,874 sources), 2: secondary (324,960,076 sources). (qualified to =1 by default) (meta.code.class)	
<input checked="" type="checkbox"/>	<input type="radio"/>	q_mode	<input type="radio"/>	(char) [+]' indicates clean photometry (105,969,748 sources with mode 1+) (meta.code.qual;instr.setup)	
<input checked="" type="checkbox"/>	<input type="radio"/>	cl	<input type="radio"/>	Type (class) of object (3=galaxy, 6=star) (Note 1) (src.class)	
<input checked="" type="checkbox"/>	<input type="radio"/>	SDSS9	<input type="radio"/>	(char) ⓘ SDSS-DR9 name, based on J2000 position (meta.id)	
<input checked="" type="checkbox"/>	<input type="radio"/>	m_SDSS9	<input type="radio"/>	(char) [*] The asterisk indicates that 2 different SDSS objects share the same SDSS9 name (meta.code.multip)	
<input checked="" type="checkbox"/>	<input type="radio"/>	Im	<input type="radio"/>	Image from SDSS-server (meta.ref.url)	
<input type="radio"/>	<input type="radio"/>	SDSS-ID	<input type="radio"/>	(char) ⓘ [0-9 -] SDSS object identifier (Note 2) (meta.id)	
<input type="radio"/>	<input type="radio"/>	objID	<input type="radio"/>	(char) ⓘ SDSS unique object identifier (2) (links to SDSS-DR9 details) (Note) (meta.id;meta.main)	
<input type="radio"/>	<input type="radio"/>	Sp-ID	<input type="radio"/>	(char) ⓘ Spectroscopic Plate-MJD-Fiber identifier (Note 7) (meta.id)	
<input type="radio"/>	<input type="radio"/>	SpObjID	<input type="radio"/>	Pointer to the spectrum of object, or 0 (7) (Tip: to select SDSS spectroscopic sources, enter the condition *[1-9]*) (Note) (meta.id)	
<input type="radio"/>	<input type="radio"/>	parentID	<input type="radio"/>	Pointer to parent (if object deblended) (meta.id.parent)	

Fast Xmatch with large catalogs or Simbad

The SDSS Photometric Catalog, Release 9 (Adelman-McCarthy+, 2012) [Similar Catalogs](#) [2012ApJS..203...21A](#) [ReadMe+ftp](#)

1.V/139/sdss9 Data Release 9 (469,053,874 primary sources plus 324,960,076 secondary sources); 2,674,200 spectroscopic targets. Data Release 9 is the first release of the spectra from the SDSS-III's Baryon Oscillation Spectroscopic Survey (BOSS). The photometric part contains the same sources as the Data Release 8, with a corrected astrometry. ([Note](#)) (794013950 rows) SDSS is also available from <http://www.sdss3.org/dr9/>

Submit Reset All

VizieR

Search Criteria Save in CDSportal [Back](#)

Keywords ▪ V/139 ▪ NGC 4321 [Tables](#) [Add](#) [Choose](#)

Constraints ▪ NGC 4321 (arcmin 2) [Modify Query](#)

Preferences max: 50 [HTML Table](#) [All columns](#) [Compute](#) [Submit](#)

Mirrors CDS, France

Show target form Show constraint information

The 6 columns in color are computed by VizieR, and are not part of the original data.

Note: SDSS is also available from <http://www.sdss3.org/dr9/>

V/139/sdss9 The SDSS Photometric Catalog, Release 9 (Adelman-McCarthy+, 2012) [Post annotation](#) [2012ApJS..203...21A](#) [ReadMe+ftp](#)

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Full	r	RAJ2000	DEJ2000	mode	q	cl	SDSS9	m	Im	RA	ICRS	DE	ICRS	ObsDate	Q	umag	mag	gmag	mag	rmag	mag	imag	mag	zmag
1	0.8656	12 22 55.24032	+15 50 12.0372	1	6	J122255.24+155012.0	Im	185.730168	+15.836677	2003.4090	3 21.725	0.218	21.105	0.060	21.282	0.101	21.321	0.171	21.6					
2	0.8791	12 22 55.19304	+15 50 12.9048	1	3	J122255.19+155012.9	Im	185.729971	+15.836918	2003.4090	3 21.471	0.260	20.470	0.052	20.866	0.112	20.553	0.131	20.42					
3	0.9115	12 22 54.56976	+15 50 14.7372	1	3	J122254.57+155014.7	Im	185.727374	+15.837427	2003.4090	3 21.046	0.118	20.347	0.030	20.189	0.038	20.469	0.077	20.62					
4	1.0480	12 22 54.20568	+15 50 22.3044	1	3	J122254.20+155022.3	Im	185.725857	+15.839529	2003.4090	3 21.005	0.135	19.982	0.026	19.749	0.030	19.636	0.043	19.5					
5	1.0881	12 22 55.84968	+15 50 24.2160	1	3	J122255.85+155024.2	Im	185.732707	+15.840060	2003.4090	3 30.981	0.329	14.809	0.007	14.331	0.007	13.827	0.007	14.28					
6	1.1506	12 22 53.13408	+15 50 24.2808	1	3	J122253.13+155024.2	Im	185.721392	+15.840078	2003.4090	3 22.414	0.411	20.833	0.047	20.266	0.042	19.901	0.049	19.91					
7	1.2044	12 22 55.86408	+15 50 31.2936	1	6	J122255.86+155031.2	Im	185.732767	+15.842026	2003.4090	3 25.212	1.120	23.642	0.425	22.133	0.179	20.843	0.098	21.68					
8	1.2145	12 22 52.72728	+15 50 25.8648	1	3	J122252.72+155025.8	Im	185.719697	+15.840518	2003.4090	3 21.313	0.164	20.213	0.030	19.941	0.033	19.661	0.041	19.95					
9	1.2322	12 22 52.80264	+15 50 27.5532	1	3	J122252.80+155027.5	Im	185.720011	+15.840987	2003.4090	3 21.531	0.190	20.233	0.029	20.202	0.034	19.950	0.050	20.58					
10	1.2718	12 22 54.48168	+15 50 36.3300	1	3	J122254.48+155036.3	Im	185.727007	+15.843425	2003.4090	3 20.160	0.063	20.013	0.024	19.633	0.025	20.405	0.076	20.82					
11	1.3257	12 22 52.30368	+15 50 30.2280	1	3	J122252.30+155030.2	Im	185.717932	+15.841730	2003.4090	3 21.741	0.220	20.637	0.038	20.318	0.041	20.182	0.059	20.12					
12	1.4225	12 22 52.18368	+15 50 35.8836	1	3	J122252.18+155035.8	Im	185.717432	+15.843301	2003.4090	3 21.428	0.167	20.647	0.038	20.498	0.047	20.433	0.072	20.88					

Archival data

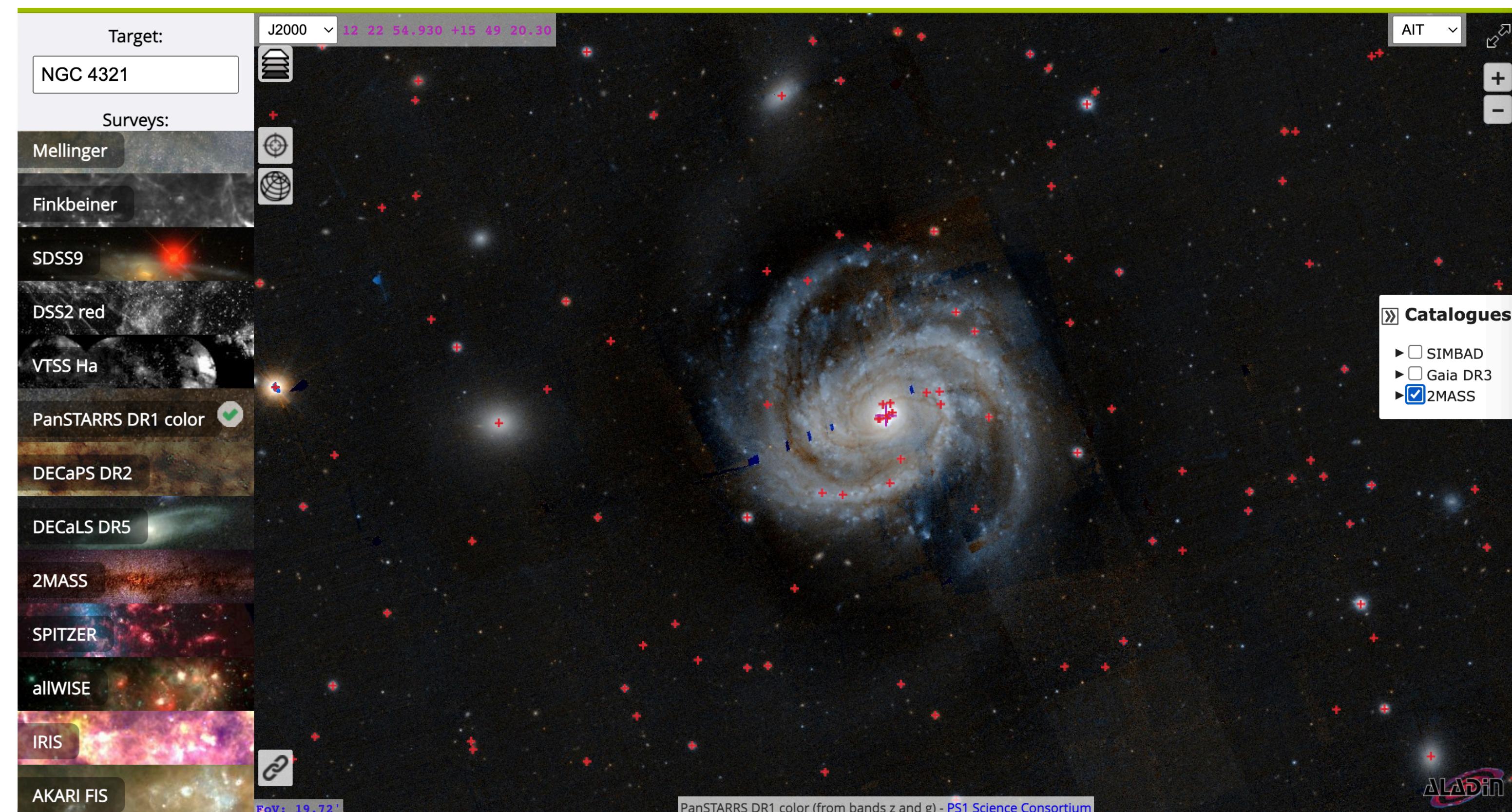
Centre de Données astronomiques de Strasbourg (CDS)

<https://cds.unistra.fr/>

<http://aladin.cds.unistra.fr/AladinLite/>



Aladin: Images + Catalogues



Virtual Observatory

What is a virtual Observatory (VO)?

Virtual Observatory

- The **Virtual Observatory (VO)** is the vision that astronomical datasets and other resources should work as a seamless whole.
- The International Virtual Observatory Alliance (IVOA) is an organisation that debates and agrees the **technical standards that are needed to make the VO possible**.

<https://ivoa.net/>



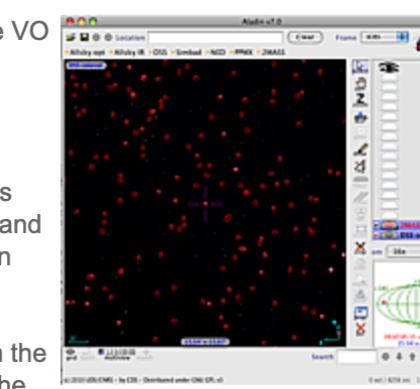
- The goal is to have a unified online data repository with free to access astronomical data.
- There are several Software tools that can be used for this.
- These days most astronomical surveys aim to release their data sets in a VO format, so that it is easy to find and use for astronomers.

Getting Started

Here are three simple blow-by-blow examples of using VO tools and services : [browsing images](#), [searching catalogs](#), and [finding available data for an object](#).

Browse all sky images

Several image analysis tools, such as DS9, Aladin, and Gaia, can browse VO image services, as well as loading local files. As an example, try Aladin.

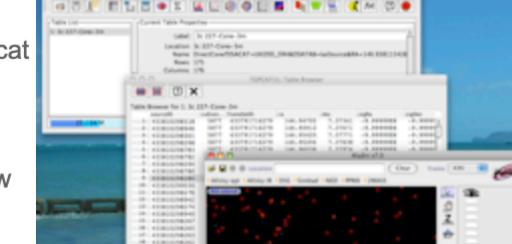


1. If you don't already have it, [download](#) it and start it up.
2. Type "3c 227" into the box at the top and press return. That text string is sent to the Simbad name resolver which returns the RA/Dec of 3c 227 and you get a DSS image of the region surrounding 3c227. You can zoom in and out, and pan over the whole sky.
3. Next, from the row below, click on "2MASS". This overlays objects from the 2MASS catalog. If you click on one of these, you get information from the 2MASS catalog. Leave this displayed while you try the next example.

Getting a UKIDSS catalogue with Topcat

Topcat is a tool for fetching, manipulating, and plotting tables of data. If you don't have it already, [download](#) it and start it up.

1. Go to the "VO" menu and choose "cone search". Around the world, thousands of different datasets are set up as cone search services, and listed in registries of VO services. Topcat can find the one you want and then search it.
2. In "keywords" type "UKIDSS" and then click "submit query". Topcat returns a longish list of conesearch services with a UKIDSS connection.
3. Scroll down to UKIDSS DR4 and click on that. The window below lists several different tables available within UKIDSS DR4.



Archival data

World Wide Telescope

<http://worldwidetelescope.org/webclient/>

