Australian Survey Data Overview

Optical Data

AAL/eROSITA Workshop 2024

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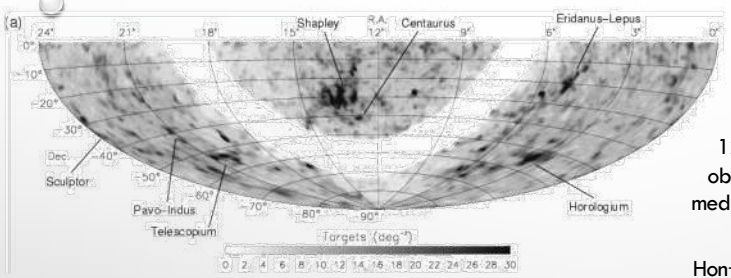
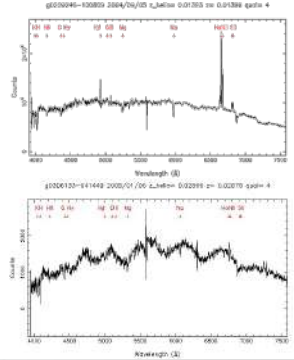
Overview

1. Spectroscopic samples
   - Available now: galaxies and AGN (hemispheric vs special / deep fields)
   - Galactic sources
   - Forthcoming: Hector galaxy IFUs
2. General-use optical/IR imaging surveys
   - Available now: SkyMapper Southern Survey DR4
   - Forthcoming: DREAMS JH survey with weekly cadence

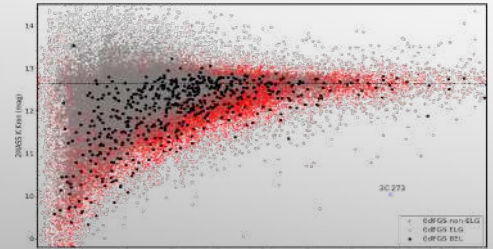
SOUTHERN SKY: 6DF GALAXY SURVEY



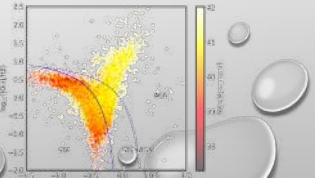
Jones+2009
17,000 □°area
125,000 galaxies
observed 2001-06
median redshift 0.05



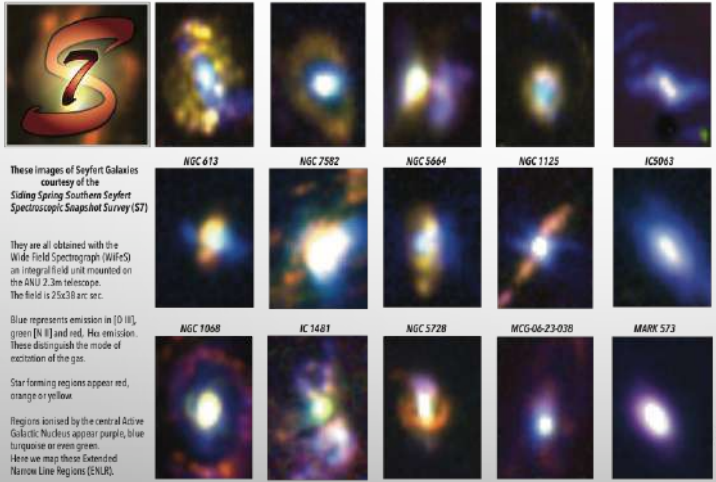
Hon+2024
Suresh+2024
E-line fitting +
visual inspection !



167 – type1.0
391 – type1.2
541 – type1.5
29 – type1.8
270 – type1.9
762 – High – zBELAGN
66 – type ≤ 1.9 with problematic Hβ region that leads to unclear AGN typing
3 377 – type2.0 determined through BPT analysis
5 257 – composite galaxies
17 600 – starforming galaxies



Siding Spring Southern Seyfert Spectroscopic Snapshot Survey ("S7")



131 objects at dec < +10° and z < 0.02

WiFeS@ANU2.3m telescope
IFU 25" x 38" with 1"x1" spaxels
Dopita+2015, Thomas+2017

Now extending to 600+ Sy 1-1.9 at dec < 0° and z < 0.1 from 6dFGS atlas (Amrutha+2024)

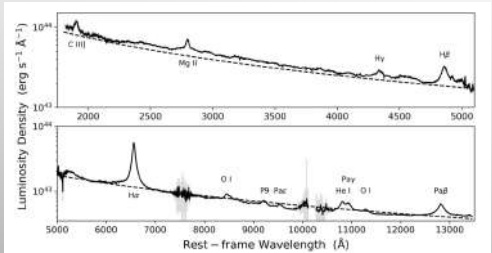
see talk by Neelesh Amrutha

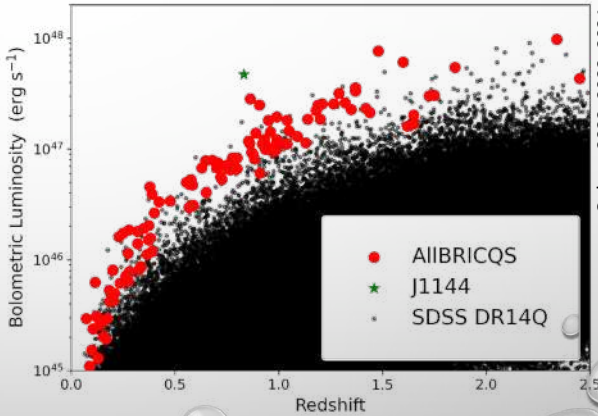
see talk by Chris Onken

AllBRICQS: All-sky Bright Complete Quasar Survey

Team: Onken, Lai, Wolf (ANU), Hon, Webster (Melbourne), Tisserand (IAP), Chang, Im (SNU) Fu, Wu (PKU)

- Gaia Bp < 16.5 or Rp < 16, |b|> +10°
- ANU 2.3m, Yunnan 2.4m, BOAO 1.8m
  - Extend to known bright QSOs without good literature spectra
  - IR spectra in selected z range
  - Close mag gap with SDSS-V, 4MOST





MNRAS 527, 3912–3931 (2024)
Advance Access publication 2023 November 10
https://doi.org/10.1093/mnras/stad3474

XQz5: a new ultraluminous $z \sim 5$ quasar legacy sample

Samuel Lai [1★] Christopher A. Onken [1,2] Christian Wolf [1,2] Fuyan Bian [3] and Xiaohui Fan [4]
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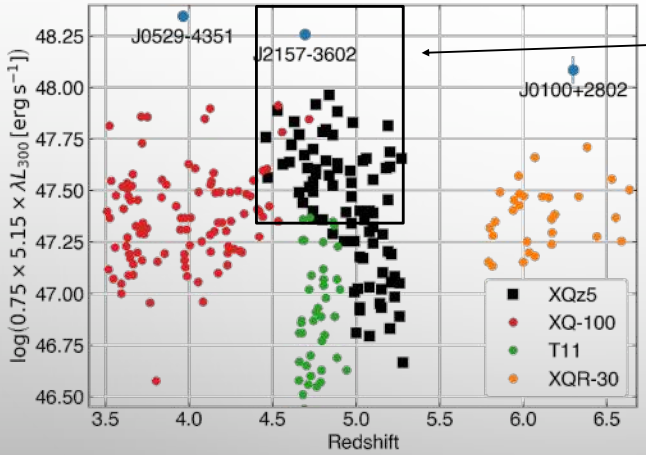


QSO sample at $z_{AB} < 18.7$ and $4.4 < z < 5.3$, dec $< 0°$ and $|b| > 10°$ is 90%+ complete (Onken+2020)

All have ANU 2.3m optical spectra

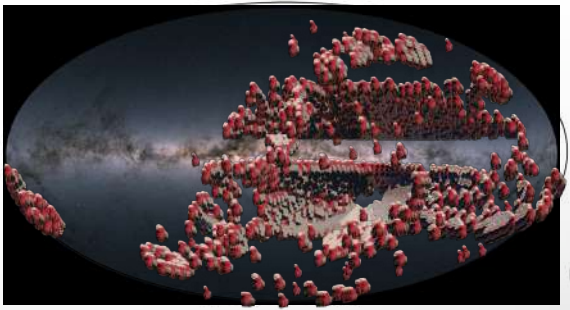
- have VLT/X-Shooter optical-IR spectra

Various Southern Surveys

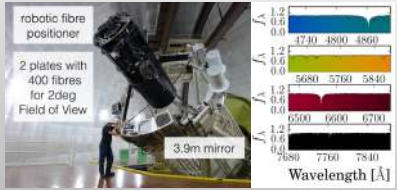
- 2QZ+6QZ (2dF+6dF, Croom+2004)
  - ~700 deg^2 area, 85% complete
  - 23,660 QSOs at $16 < g_{AB} < 21$, with redshift $0 < z < 3$
- OzDES (2dF@AAT, Lidman+2020)
  - Monthly spectra of 771 QSO over 6 years in DES SN fields ~30 deg^2 (also non-Oz DES repeat imaging)
  - ~30,000 redshifts at $r_{AB} < 24$
- GAMA (Driver+2009, Liske+2015)
  - 238,000 redshifts over 286 deg^2, (https://www.gama-survey.org/dr4/)
- 2dFLenS (Blake+2016)
  - 70,000 redshifts over 730 deg^2, (https://2dflens.swin.edu.au)
- DEVILS (Davies+2024)
  - 19,000 redshifts at $z < 1$ over 5 deg^2

data central
(https://datacentral.org.au)

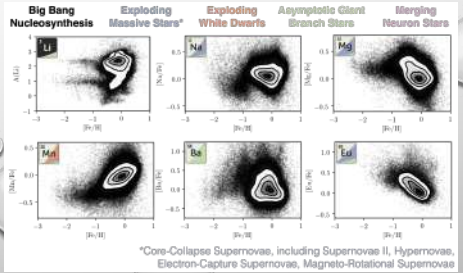
Galactic Archaeology with HERMES (GALAH)



How? 400 fibers of 2dF positioner @AAT
& optical HERMES spectrograph (R~28k)



Where? 589k stars in Data Release 3 (Buder et al., 2021): arXiv:2011.02505
or
http://galah-survey.org
+ ages + exquisite *Gaia* DR3 dynamics!

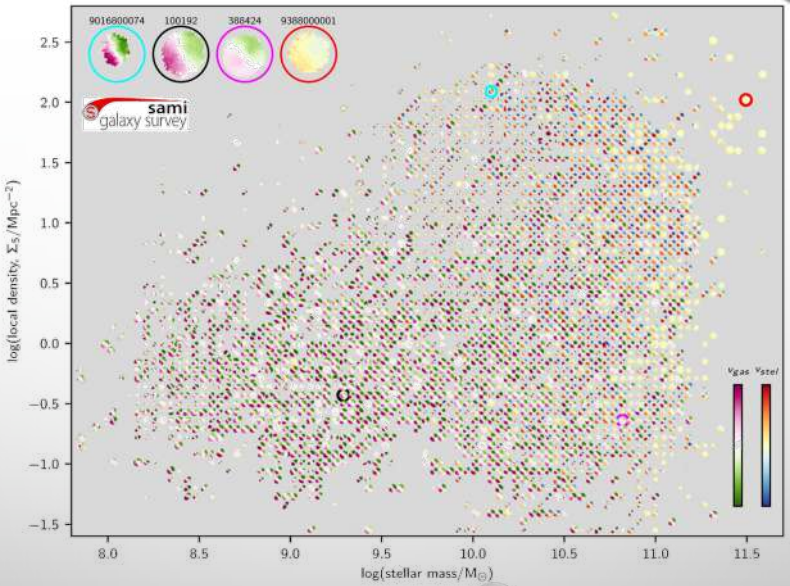


Integral-field Spectroscopy Of Galaxies

Final DR3 (Croom+2021)
~3,000 z<0.1 galaxies
GAMA fields 09,12,15h
including galaxy clusters

370-570 nm (R~1800)
630-740 nm (R~4300)

data central

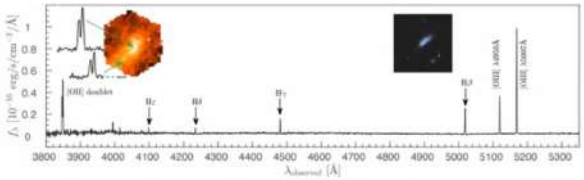


SAMI = **S**ydney-Australian-**A**stronomical-Observatory
Multi-object **I**ntegral-Field Spectrograph

HECTOR Galaxy Survey

IFS data for 15,000 galaxies at z<0.1

Currently: 2,000 galaxies observed

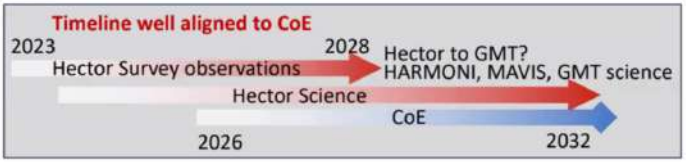


1. How do misalignment and complex kinematics of the gas and stars affect and are affected by galaxy assembly?
2. How does the environment on all scales influence galaxy assembly by the accretion and outflows of gas regulating formation of stars, build-up of stellar mass and of angular momentum?
3. How does the spin of a galaxy depend on its evolution through large scale structure?

Gas physics from small to large scales with Hector + ASKAP
Gas accretion and dynamics within 30" = 1 spatial resolution element of WALLABY
Targets selected to maximize fraction with HI.

Broad range of environments – field to cluster galaxies, and detailed environments from 4MOST WAVES

SUBARU HSC and EUCLID imaging: Detailed structural decomposition to be coupled with Hector kinematics.



Large statistical power + highest spectral resolution + big field-of-view IFUs + environmental fidelity = Unique science

The SkyMapper Southern Survey

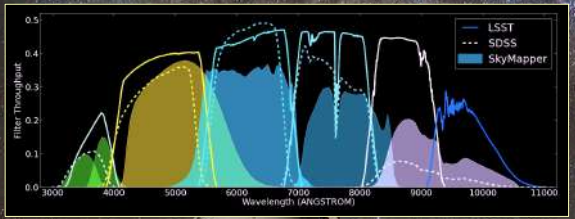
DR4 (Onken+2024)

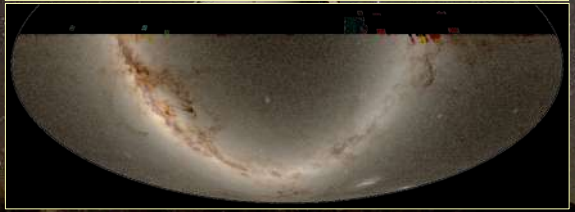
420,000 images of 5.7 deg^2

13 billion detections

700 million objects

Australian National University





Warrumbungle Dark Sky Park
Siding Spring Observatory
land traditionally owned
by Gamilaroi people

1.35m Primary
16k x 16k CCD
fully robotic
u-v-g-r-i-z

Area 24,000+ deg^2
Imaging 2014 to 2022
Dynamic range 9-22 mag
VO-compatible services
skymapper.anu.edu.au

Cone Search Service

Editing request 4JV1ZXLE

This service allows you to query the master table of mean photometry and object parameters around a given position. Please specify either Equatorial/Galactic coordinates or a SIMBAD-resolvable object name as well as a search radius in arcseconds (maximum 3,600° or 2,000 rows). You may increase the number of columns returned by increasing the metadata verbosity parameter. This service is also accessible through VO-aware clients like TOPCAT using the IVOA Cone Search standard. See the How To Access page for more information.

Note: By using SkyMapper data, you agree to observe the SkyMapper policies published on this website.

▶ Data Release

▶ Search Parameters

Please input either a set of coordinates **or** a SIMBAD name.

Coordinate system: HA/Dec (ICRS)

Coordinates:

Sexagesimal longitude & latitude with space(s)
Valid coordinate types, e.g.:
4h39m15.82s
4:39:15.82
4 39 15.82
69d30m15.82s
69.504
Colons/spaces separated values interpreted as HMS for longitude, DMS for latitude

OR

Target name: NGC 1566

A SIMBAD-compatible target name

Search radius: 60.0

Arcseconds

Metadata verbosity: Minimum metadata

Detail in returned metadata

Cross-match against spectrum sources:

Cross-match against available spectrum catalogues?

Perform Cone Search

Mara Salvato 1:02 am

Re: One object?

To: Christian Wolf, Arne Rau

hi Christian,
I put Arne in CC as probably he has this kind of Object.
Arne, would be the object in the paper of Adam ?
Mara

Cone Search Results

Edit this request | Use as basis for a new request

▶ Search Parameters

You can sort and filter the table (e.g. <, >, 1..70, OR) using the arrows and the input boxes in the header row.

53 results found (showing 53)

Store table in... | Filtered rows/cols only | Send table to TOPCAT | Reset row filters | Show/hide columns | Reset row filters

			r_cntr ▲	object_id ▲	ngood ▲	flags ▲	ames_j ▲	raj2000 ▲	dej2000 ▲	e_raj2000 ▲	e_dej2000 ▲	mean_epoch
			arcs					deg	deg	mas	mas	d
			0.49	502151340	29	3	042000.45-545818.7	65.001885	-54.971978	48	45	58058.1868
			2.84	2719344140	5	19	042000.70-545815.5	65.00293	-54.937659	922	703	56783.2094
			5.36	2719344141	0	19	041959.78-545819.6	64.999104	-54.937677	36	36	57701.7021
			8.35	502151339	5	3	042001.36-545816.3	65.005667	-54.937857	36	36	56969.9834
			12.58	2719344152	0	19	041958.90-545814.5	64.995854	-54.937303	36	722	57693.7534
			13.74	502151341	15	3	042001.99-545816.5	65.008295	-54.937892	36	36	57938.7672
			15.73	2719344151	0	16	041958.59-545819.0	64.99414	-54.938837	420	619	59153.5311
			23.9	502151336	9	3	042002.88-545827.6	65.011928	-54.94099	79	45	57946.9144
			25.88	2719344132	3	513	042002.18-545837.4	65.009105	-54.943727	192	63	59172.8894
			26.58	502151337	7	3	042003.41-545822.5	65.014157	-54.939658	48	258	58226.2671

Next click on

DR4: Object 502151340 (SMSS J042000.45-545616.7)

Find on | Cone Search nearby

Data release	DR4
RA (deg)	65.002
Dec (deg)	-54.938
Galactic lon. (deg)	264.310
Galactic lat. (deg)	-43.393
E(B-V) (SFD98) (mag)	0.009
Nearest DR4 source	**2719344140** (2.5 arcs away)
2nd-nearest DR4 source	**2719344141** (5.8 arcs away)
3rd-nearest DR4 source	**502151339** (7.9 arcs away)
Times observed	29
Total bad pixels	0
Observing flags	3

Magnitudes

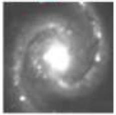
Filter	u	v	g	r	i	z
PSF mag	14.562 ± 0.200	14.395 ± 0.144	12.652 ± 0.180	12.101 ± 0.218	11.296 ± 0.209	10.957 ± 0.331
Petrosian mag	14.424 ± 0.122	14.110 ± 0.119	12.067 ± 0.151	11.283 ± 0.068	10.640 ± 0.043	10.490 ± 0.092

Spectra

Source	X-match	ID/Additional info	Redshift	Quality
MILLIQUAS v8	0.46	NGC 1566	0.004	ARX
2MASS Redshift Survey	0.67	NGC_1566	1504.0 ± 2.0 km / s	

Image cutouts

u v g r i z



See all image cutouts for this object **here.**

Photometry measurements

Filter	Image ID	Magnitude (APC05)	Flags	Exp time (s)	Image Quality (1=best to 3)
u	20141108150445	15.869 ± 0.030	0.0	40	1
u	20141109121837	[illegible]	0.0	40	1
u	20180216105529	14.922 ± 0.012	16.0	40	1
u	20180316094507	[illegible]	0.0	40	1
u	20180828170055	14.173 ± 0.025	0.0	40	1
u	20201031125415	[illegible]	0.0	40	1
u	20201101124137	15.573 ± 0.047	0.0	40	1
u	20201119140739	[illegible]	0.0	100	1
u	20201120114552	15.685 ± 0.021	2.0	100	1
v	20141108150545	15.457 ± 0.027	0.0	20	2
v	20141109121938	15.540 ± 0.041	0.0	20	2
v	20180216105628	14.751 ± 0.016	16.0	20	2
v	20180316094607	14.612 ± 0.026	0.0	20	2
v	20180828170155	14.131 ± 0.017	0.0	20	2
v	20181025141136	14.701 ± 0.019	0.0	20	2
v	20201031125515	15.302 ± 0.037	0.0	20	2
v	20201101124237	15.296 ± 0.040	0.0	20	2
v	20201119140939	15.318 ± 0.013	2.0	100	1
g	20141108150625	14.134 ± 0.012	2.0	5	1
g	20141109122018	14.085 ± 0.013	2.0	5	2
g	20161107132909	14.055 ± 0.007	3.83	100	1
g	20180216105709	14.770 ± 0.018	18.10	5	1
g	20180316094647	13.770 ± 0.013	16.51	5	2
g	20180828170237	13.643 ± 0.012	0.0	5	2
g	20181025141217	13.776 ± 0.009	16.0	5	2
g	20200914145306	13.938 ± 0.008	19.0	100	1
g	20201031125555	13.970 ± 0.011	18.0	5	2
g	20201101124317	14.047 ± 0.010	2.0	5	2
r	20141108150651	13.563 ± 0.013	18.0	5	1
r	[illegible]	[illegible] ± 0.009	2.0	5	2
r	20180216105733	14.775 ± 0.012	16.2	5	1
r	20180316094713	13.236 ± 0.008	18.21	5	2
r	20180828170302	13.099 ± 0.012	2.0	5	2
r	20200914145506	13.407 ± 0.004	19.14	100	1
r	20201031125619	13.457 ± 0.008	18.0	5	2
r	20201101124342	13.511 ± 0.012	2.0	5	2
i	20141108150716	13.112 ± 0.012	2.0	10	1

Gaia DR3 data

	Best match	Second match
Distance (arcsec)	0.51	8.11
GAIA source ID	4779165759875235200	4779165764169857152
B_p mag	14.554	17.210
G mag	16.049	19.956
R_p mag	13.246	16.441
B_p/R_p excess	8.441	19.813
Parallax (mas)	0.139 ± 0.111	– ± –
PM RA (mas/yr)	-1.251 ± 0.133	– ± –
PM Dec (mas/yr)	0.681 ± 0.151	– ± –
A.E.N. (mas)	1.160 ± 78.146	1.103 ± 7.098

UV to IR data

Filter	Magnitude[1]
FUV	– ± –
NUV	– ± –
u	– ± –
g	11.708 ± 0.000
r	– ± –
i	– ± –
z	– ± –
Y	– ± –
J	12.205 ± 0.001
H	11.593 ± 0.001
K	11.082 ± 0.001
W1	8.667 ± 0.012
W2	8.601 ± 0.008
W3	5.704 ± 0.015
W4	3.389 ± 0.018

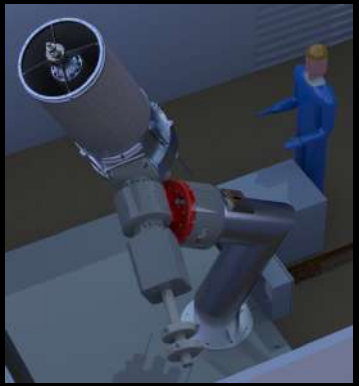
click here for image cut-outs

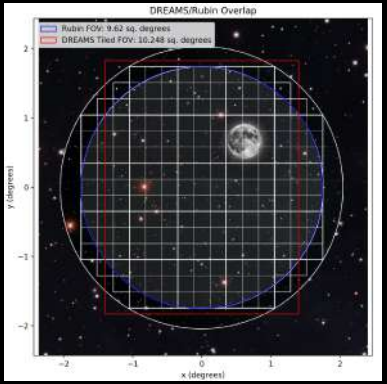
Nov 2014: u=15.9 | Aug 2018: u=14.2 | Nov 2020: u=15.6

DREAMS = Dynamic REd All-sky Monitoring Survey

https://dreams.anu.edu.au

Nightly cadence on LSST DDFs,
weather permitting
Survey start pending funding





Aperture	0.5m
Wavelength range	0.9 - 1.7 microns
Instrument suite	(Y), J, H-short Imager
Lifetime	> 5 years
Survey Mode	All-sky, Specific, ToO
Other facts	Depth: M_{AB} 17.8 (J-band) All-sky **every 4-7 nights**. Pixel scale: 2.48”/pixel