**The RESOLVE Survey: REsolved Spectroscopy Of a Local VolumE**

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A Comprehensive Census of ~53,000 Cubic Mpc of the SDSS
- multi-scale structure: volume-limited from clusters and filaments down to dwarf galaxies with $M_{\text{baryonic}} \approx 10^{9.2} \, M_{\odot}$, with a redshift campaign for completeness
- dynamical mass: redshifts and new high-res emission & absorption line spectroscopy of all ~1500 galaxies
- stellar mass: SED+spectral fitting using new spectra plus UV/optical/IR surveys
- gas mass: ALFALFA Survey 21cm data, photometric gas fractions, molecular/hot gas strategies under development
- star formation: Hα, deep GALEX UV, FIR

Key Science
- new constraints on missing baryons & dark matter via complete accounting
- dynamical mass and velocity functions across the dwarf/giant threshold, as a function of large-scale structure (LSS)
- relationship of gas flows, consumption, merging, and disk building to LSS

Key Challenges
- cosmic variance
- mass-limited completeness
- tracing multi-phase gas
- S0 galaxies

**Selection on Total Mass**
The R band minimizes scatter in $M_{\text{baryonic}}/L$ (left) due to optimal sensitivity to the combination of stellar and gas mass (right). Note that K-band scatter increases abruptly below $M_{\text{baryonic}} \approx 10^{7}$, corresponding to the gas-richness threshold mass $M_{\text{H}} \approx 9.7$; this mass marks the dwarf/giant divide. On the right filled purple (green) symbols show galaxies more massive than $M_{\text{baryonic}} = 9.2$. ([From Kannappan & Wei 2008](http://resolve.astro.unc.edu))

**Toward Completeness**
Extra Stripe 82 + new redshifts show >20% incompleteness in the main SDSS survey, worst below the dwarf/giant threshold at $M_{\text{H}} \approx 18$. These statistics include previously omitted targets and galaxies mistakenly placed at $z \approx 1$, but do not include galaxies never targeted by SDSS due to fragmented photometry that placed them spuriously below the survey magnitude limit. We use sizes and SEDs of grouped fragments to recover likely RESOLVE galaxies: redshifts for the bright examples are found in older surveys, while the faint ones are targeted for new redshifts with the SOAR, SALT, and WIRO telescopes.

**Cosmic Variance**
RESOLVE is embedded in larger redshift surveys on all sides (SDSS, CfA, 6dF). We are using multiple environment metrics to relate RESOLVE to these larger surveys; see also Hendel poster 334.15.

The spring RESOLVE footprint (red box above) contains a central cluster, shown here within a hybrid CfA/SDSS volume-limited group catalog (Moffett + in prep).

The fall RESOLVE footprint overlaps Stripe 82, offering deeper photometry and extra redshifts, plus many ancillary surveys.

**Initial selection**
SDSS galaxies with redshifts $cz > 4500$ km/s and brighter than $M_{\text{r}} = -17.23$ (SDSS survey limit at $cz=7000$)

**Tracing Multi-Phase Gas**
- H$_{2}$/HI ratios
  - We are exploring indirect techniques for H$_{2}$/HI estimation with new IRAM 30m CO data, based on a newly discovered fueling cycle (Stark + in prep).
  - ALFALFA Survey 21cm data, photometric gas fractions, molecular/hot gas strategies under development
- galaxies missed by SDSS and recovered by ALFALFA
- direct observations
  - RESOLVE has partnered with the ALFALFA Survey (Pis Giovannelli & Haynes) for blind 21cm detection down to masses $\approx 10^{9}$ $M_{\odot}$ at Declinations $> -0.2$: CO observations are planned.

**S0 Galaxies**
We are conducting two NOAO programs involving extra-deep observations of RESOLVE S0s.
1. To include S0s in the velocity function, we are calibrating their equivalent circular velocities as a function of bulge-to-disk ratio, velocity dispersion, and other “cheap” observables (Norris + in prep).
2. To understand disk regrowth in S0s, we are tracking stellar counterrotation as a function of mass and environment (Moffett + in prep); see also Moffett poster 335.46 & Wei talk 309.01 Wed 10am.

**More Information**
http://resolve.astro.unc.edu
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