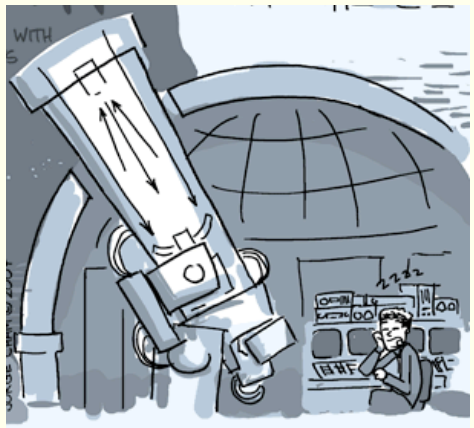
# A Simple Isolation Criterion Based on Redshift Space Mapping

**Oded Spector, Noah Brosch**
**Tel-Aviv University**

# Outline

- Research Project
- Isolation Criterion
- Sample
- Validation



# The Project



- Goal:

  Understanding how galaxies evolve in isolation

- Method:
  - Selecting a sample of Isolated Galaxies (IGs)
  - Imaging in wide bands and $H_\alpha$
  - Calculating star formation rates and evolutionary histories
  - Comparing to results of galaxies in denser environments

# Observational Data

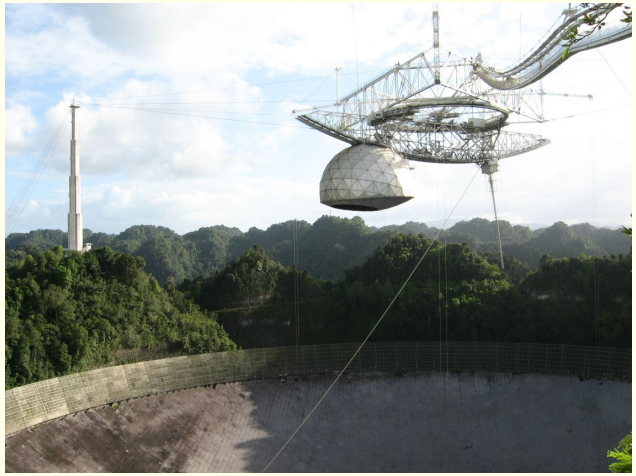


- The Wise Observatory
  (Hα and wide bands)
- ALFALFA (21cm)
- NED, SDSS, GALEX, TAUVEX, etc.

# ALFALFA



- HI blind survey (at Arecibo)
- Sky Area: 7000 $deg^2$
- Redshift: up to 17000 km/s
- Lower detection limit: $10^{7.5}$ $M_\odot$
- Location Accuracy: ~0.1’



# Selecting the Sample



- Redshift space based search (Visual + HI)
  - Advantages: simple, 3D
  - Difficulties:
    - Incomplete redshift databases
    - Peculiar velocities
- Search criterion:
  - No neighbor within 3 $Mpc \cdot h^{-1}$ in redshift space
  - $2000 < c \cdot z < 7000\ km \cdot s^{-1}$

# The Sample



- Search Regions:

| | RA (J2000) | Dec (J2000) | c·z [km/s] |
|---|---|---|---|
| Spring | 7:30 to 16:30 | +4° to +16° | 2000 to 7000 |
| Autumn | 22:00 to 03:00 | +24° to +28° | 2000 to 7000 |

- Spring: 27 IGs out of 2826 (~1.0%)
  - ALFALFA eliminates 9 of these!
- Autumn: 6 IGs out of 244 (~2%)

# Example - UGC 12123

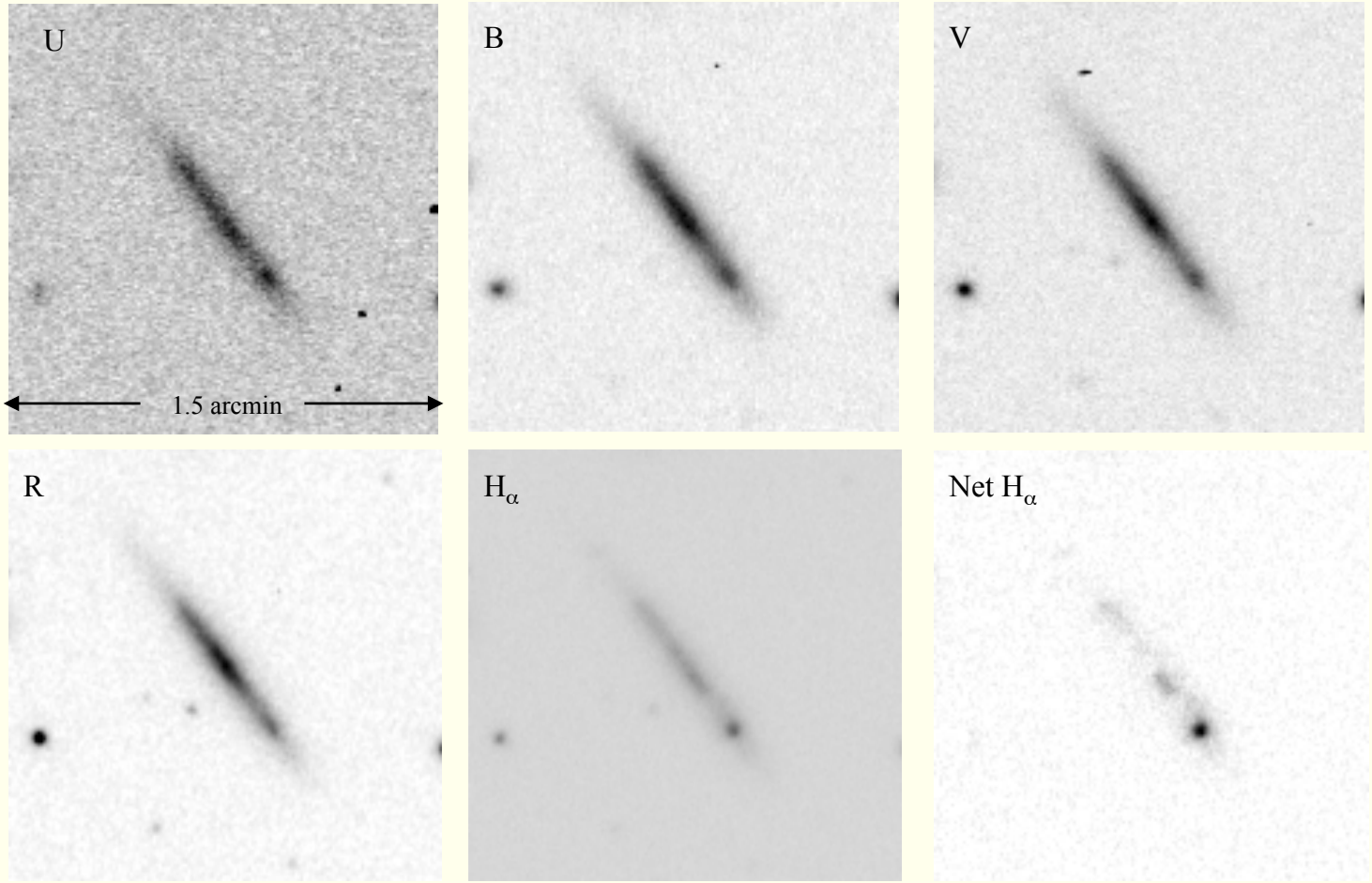
Project

Criterion

Sample

Validation

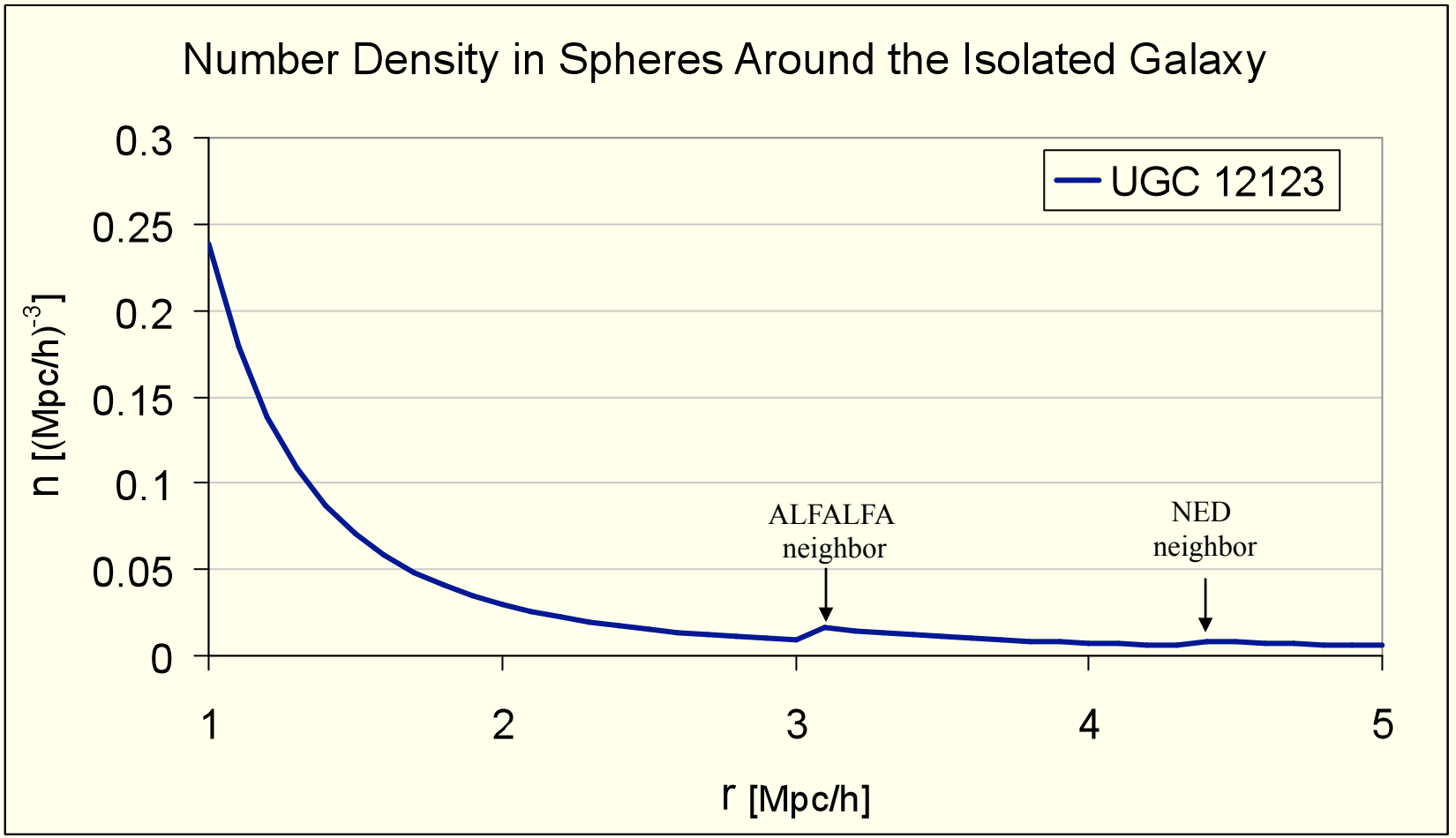
cz =4082 km·s$^{-1}$ , closest neighbor: 3.06Mpc·h$^{-1}$




Images of UGC 12123 in filters U, B, V, R, $H_\alpha$ (line and continuum) and "Net $H_\alpha$" (line only). North is up, East is left.

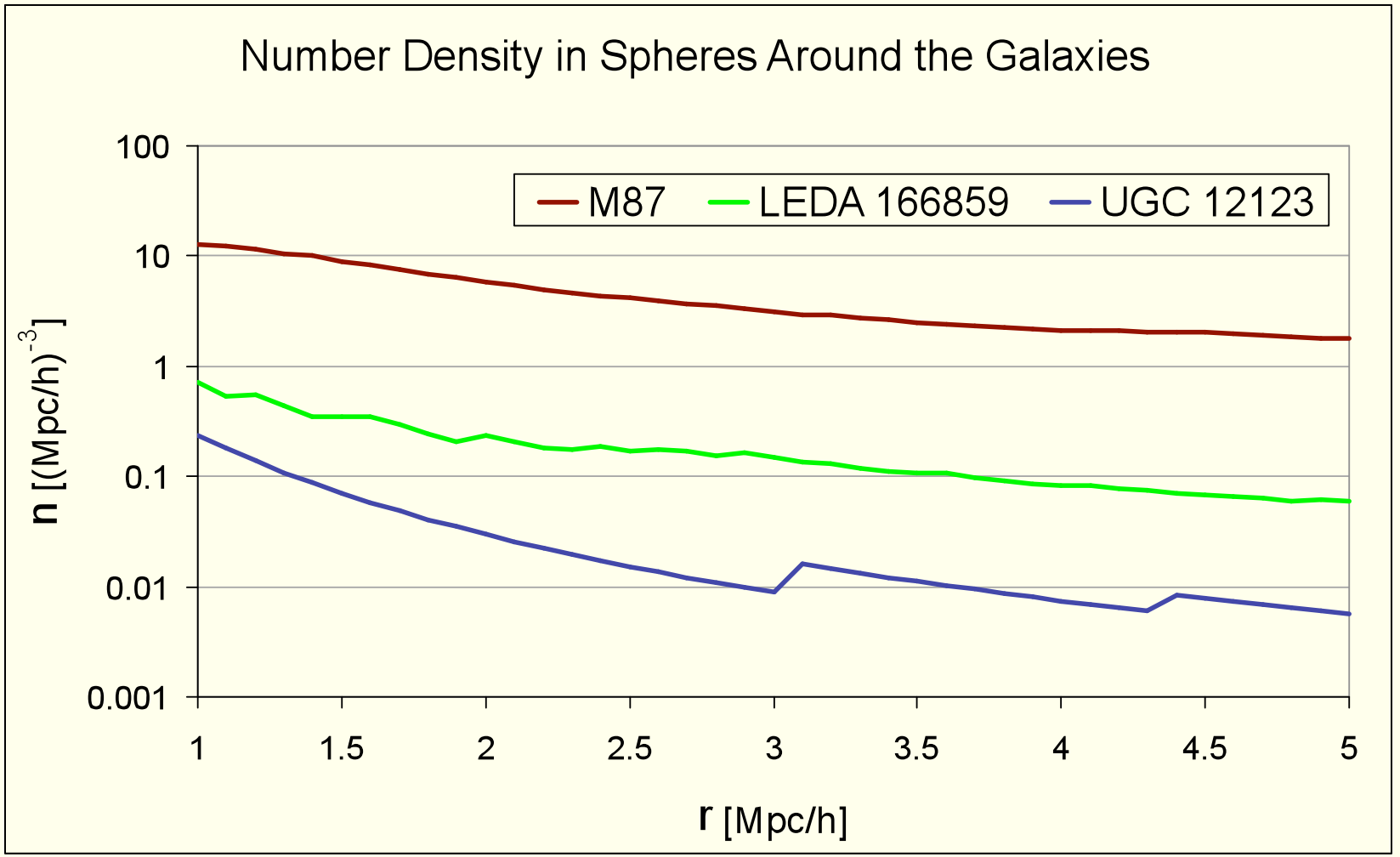
# Example - UGC 12123





# Example - UGC 12123





# Validation



- Using a mock universe:
  - Database with all “true data” (r, v, L)

# Box 160 Simulation
## (Hoffman & Gottlöber)



- Constrained simulation of the local universe:
  - $L_{box}$= 160 Mpc·$h^{-1}$
  - $N_p$= $1024^3$
  - $M_p$= $2.54 \cdot 10^8$ $M_\odot$ ·$h^{-1}$
  - Model: ΛCDM (WMAP3)
- The most important large structures can be observed in this simulation: Virgo, Coma, Local Supercluster, etc.

# Validation



- Using a mock universe:
  - Database with all "true data" (r, v, L)
  - Creating a copy with "observable" data:
    - RA, dec, m
    - c·z - only for some of the galaxies

# Diluting Box 160 data

Project

Criterion

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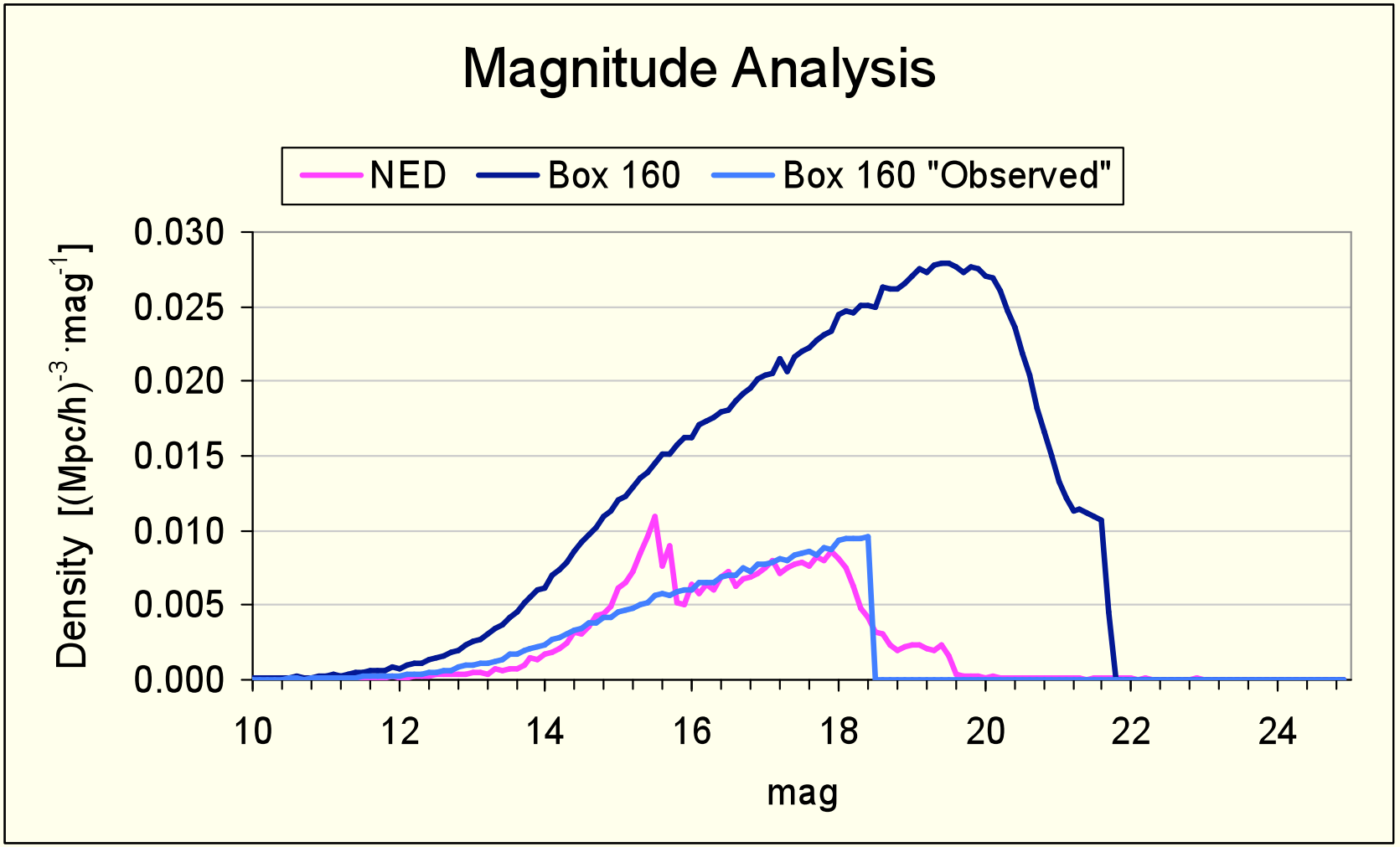
Validation



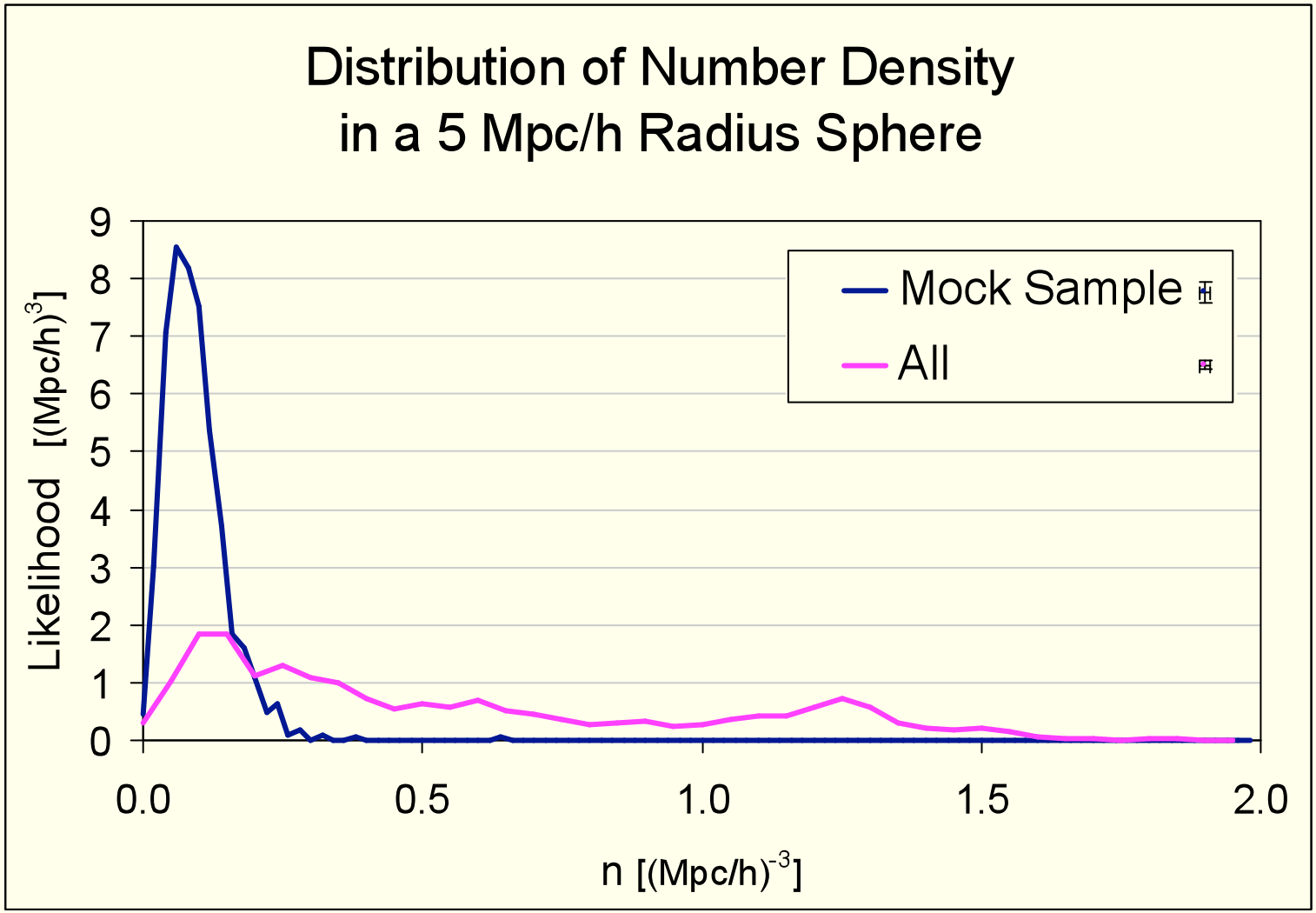
# Validation



- Using a mock universe:
  - Database with all "true data" (r, v, L)
  - Creating a copy with "observable" data:
    - RA, dec, m
    - c·z - only for some of the galaxies
  - Using the search criterion to obtaining a "mock sample" based on the "observable" data.
  - Analyzing the "true neighborhood" using the "true data".

# Box 160 Simulation
## Results

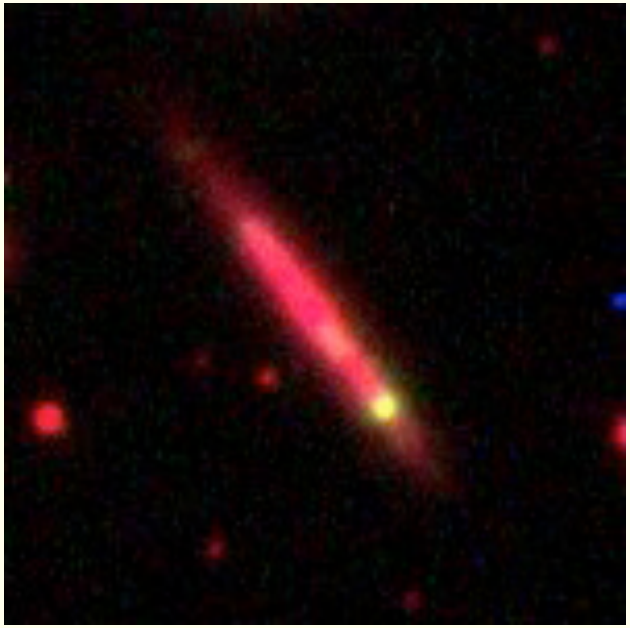




# Conclusions

- Redshift surveys provide enough information for choosing IG samples based on 3D mapping.
- The simple isolation criterion (having no known neighbors within < 3 $Mpc \cdot h^{-1}$) provides a sample of galaxies in the low density regions of the local universe.
- ALFALFA's data is extremely useful in eliminating false positives from the sample due to the redshift data of low luminosity galaxies with high HI masses.

# Questions ?



# Buen Provecho

# Bon Appétit