The Wisconsin Living Galaxies Survey



Differing perspectives

Evolution

Ecology



Linné.

Our local ecosystem



Ecology (from <u>Greek</u>: $O_{LKO\zeta}$, oikos, "house, household, housekeeping, or living relations"; $-\lambda O \gamma (\alpha, -logia, "study of")$ is the interdisciplinary <u>scientific</u> study of the interactions between organisms and the interactions of these organisms with their environment

Wikipedia

M31: The Andromeda Galaxy



M33: The Triangulum Galaxy



The plan: monitor the galaxies



Hasn't this all been done before?

- M31 & M33 are amongst the mostobserved extra-galactic objects
- MegaCam / MegaPrime (CFHT; 3.6m) have already monitored both galaxies
- Hyper Suprime-Cam (Subaru; 8m) will cover 1.5 sq degree
- LSST, Pan Starrs...

Why ODI wins: resolution, coverage & access

- Outstanding image quality
- Narrowband filters (Hα)
- High cadence
- Wide coverage
- Significant time allocation

Observing plan

- High cadence:
 - I full night broadband (Sloan gri) + $H\alpha$
 - 5 full nights broadband
- Low cadence:
 - Single broadband + H α once every 1-2 weeks
- September December; 4-5 year project timeframe
- Exposures down to m~24 (10% precision)

Pulsating Stars

- Classical Cepheids
- Beta Cepheids
- Long-Period Variables



Interacting Binary Systems

- Classical novae
- Recurrent novae
- Supersoft X-ray sources
- Black-hole transients
- Symbiotic stars



Eruptive Stars

- Disk-forming Be stars
- Luminous blue variables
- V838 Mon-like objects
- η Car-like objects



What will we learn?

- Pulsating stars:
 - Help refine distance scales
 - Establish formation ages for differing galactic regions
 - Probe influence of composition on pulsation instabilities
- Interacting binaries:
 - Explore correlations between X-ray and optical properties
 - Constrain alternative outburst theories
 - Determine what sorts of systems are SN la precursors
- Eruptive stars:
 - Gather statistics for Be stars & LBVs
 - Look for spectacular events
- Watch galaxies 'breathe' before our eyes!

Departmental Synergies

- Survey sub-projects are directly relevant to many in the department
- Hα filter will be reusable by other ODI projects
- Good characterization of seeing (variations in image quality) at WIYN
- Expertise in large-field photometry

Education & Outreach

- ODI surveys have great potential for student involvement
 - many sub-projects
 - unexpected discoveries
 - training on analysis of large datasets
 - SDSS produced over 70 PhD theses
- Living Galaxies :The Movie!



Summary

- The Living Galaxies survey will greatly enhance our ecological understanding of M31 and M33
- Science results will emerge quickly
- Needs:
 - Filter(s)
 - People