

# The Yale/ODI Survey: Variability

- Repeated images allow exploration of the time domain
  - Photometric variability (periodic, aperiodic, transient)
  - Astrometric variability (including solar system)
- Depth of individual images comparable to LSST - exploration of variability parameter space
- Deep “pencil beam” (more properly: “broad felt tip”) survey
  - Not ideal for very rare kinds of sources
  - Pushes to much greater distance or fainter limits
- **Challenge: most effective cadence?**

# The Yale/ODI Survey: Variability Examples

- RR Lyrae stars (see Bob Zinn)
  - Excellent standard candles (7% in distance)
  - Little contamination from other sources
  - Effective probes of galactic halo substructure
  - ODI survey probes distances to 500 kpc (current limits 120 kpc)
  - BUT statistics may be quite small
- Faint CVs
  - SN Type Ia precursors - evolution/demographics poorly understood
  - periodic and aperiodic variability on many timescales
  - color selection also very helpful (and  $H\alpha$ )
  - faint end of luminosity function poorly probed
  - evolution predicts pileup  $P \geq 81m$  (**not** confirmed!)
  - survey will probe white dwarf + red dwarf binaries out to 1 kpc
- Astrometry (Terry Girard will discuss)

# The Yale/ODI Survey: Variability Challenges

- Specific timescales favor specific, possibly mutually incompatible cadences (SNe, RR Lyr, microlensing)
- General “variability” searches should sample all available timescales (not typical approach)
- Relatively small area loses statistics
- Transients requiring turnaround  $< \sim 2$  days not easily handled

# The Yale/ODI Survey: Strawman Cadence

- Individual exposures ~2m (high efficiency, comparable depth to LSST)
- Main overhead is setting on field - efficient to take multiple images
- "Good seeing" visit (10 per field over survey)  
12 x 2m i, 3 x 2m r, 6 x 2m g (dark) or z (bright)
- "Median seeing" visit (20 per field over survey)  
3 x 2m i, 6 x 2m r, 12 x 2m g (dark) or z (bright)
- Total: 6 hrs i, 5 hrs each g,r,z
- 26 visits in one season (separated by hours, days, weeks)
- 2 visits in each of the other two years