GALACTIC STRUCTURE AND STELLAR POPULATIONS

Structure of our discussion

- Identified broad science themes
- Considered landscape in 2020
- Identified suite of technical details needed to define spectroscopic capabilities
- For each science theme, drilled down into specific science questions
- Began to populate big table of technical details
- Identified specific questions needing answers
- Maintained a running list of “low hanging fruit”
Discussion in a nutshell

A. Galactic structure
- Bulge
- Disk and inner halo
- HIDs and outer halo

B. Local galaxy
- "Nearby" galaxy
- "Local" galaxy

C. Milky Way
- Local group population
- Star clusters: young remnants
- Known dwarf galaxies
- Galactic light echoes

D. Extended sources
- TSM
- Classification for cooling disc/irps
- Galactic light echoes

- Format: [Name of galaxy] [Type]
- [Data from table]

**Summary**
- "Nearby" galaxy properties
- "Local" galaxy characteristics
- Milky Way system analysis
- Extended source classification

**Table**

<table>
<thead>
<tr>
<th>Galaxy Type</th>
<th>Description</th>
<th>Distance (Mpc)</th>
<th>Stellar Mass (Log10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSM</td>
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<tr>
<td>Dwarf</td>
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</tbody>
</table>
A. Galactic structure

- What is the accretion history of the Galaxy?
- What is the shape of the dark matter halo?
- What does the population of DM subhalos look like?
- How long is the metal-poor tail?
LSST discovery space

RS Lyrae to 400 kpc

MSTO to ~200 kpc
What is the accretion history of the Galaxy?

- Tracers: Giants, HB stars, subgiants, MSTO stars
- Measurements: velocities (<10 km/s accuracy)
- Abundances: [Fe/H], [α/Fe], [C/Fe], individual species
- Proper motions from GAIA and LSST
- Sample size ~10^6?

Questions, comments:
- How hot a tracer can we effectively use?
- What is the sweet spot for v_{err}?
- How to efficiently select targets?
- What different samples are needed?
- Need to push on photometric accuracy
A. Galactic structure

What does the population of DM subhalos look like?
DM subhalos perturb streams
Tracers: all stars in streams, colder better
Measurement: velocities <1 km/s
Need to turn sample size into magnitude distribution
Simulation?
B. Solar neighborhood

LSST: 200 pc volume, 10% parallaxes
B. Solar neighborhood

What are the masses of BDs?
Tracers: Binary BDs
Velocities: <50-100 m/s
R~40-50K

Q: Can we use color as binary selector? Will have distance.

What is the nature of weather on BDs?
Measurement: linked spectral and photometric variability
C. Milky Way and local galaxy populations

- Known and unknown Star clusters

- Known and unknown dwarf galaxies
D. Extended sources

- ISM
  - Stellar classification for aid in creating dust maps

- Galactic light echoes
  - Diffuse light spectroscopy

- Microquasars
  - Spectral study of surrounding low surface brightness features
Technical capabilities discussed

- Depth
- S/N
- Wavelength
- Resolution
- Target surface density
- Survey area
- Minimum sample size
- Desired sample size
- Target selection efficiency
- # visits
- Cadence
- Data needed when?
- Other considerations: overlap with other science areas, potential capability trades, narrowband imaging as complement or replacement for spectroscopy?)
<table>
<thead>
<tr>
<th>Question</th>
<th>Depth</th>
<th>S/N</th>
<th>A (optical)</th>
<th>R ($\text{sp. deg}^{-1}$)</th>
<th>$S_{\text{target}}$ (2$^\circ$)</th>
<th>Area (1000 $\text{sp. deg}^2$)</th>
<th>Min. sample size</th>
<th>Desired sample</th>
<th>E1(2)</th>
<th># vars</th>
<th>Cadence</th>
<th>Data used</th>
<th>Coefficient</th>
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<td>2000-5000</td>
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<td>$10^4$</td>
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