Galactic Science with BigBOSS

Galactic Science with BigBOSS

What is the assembly history of galaxies?

Using individual stars and HII regions, it is possible to answer this question for the Milky Way, M31 and other resolved galaxies.

Key question is origin of galactic components (disk, bulge, halo), determine this via kinematic and chemical distribution.
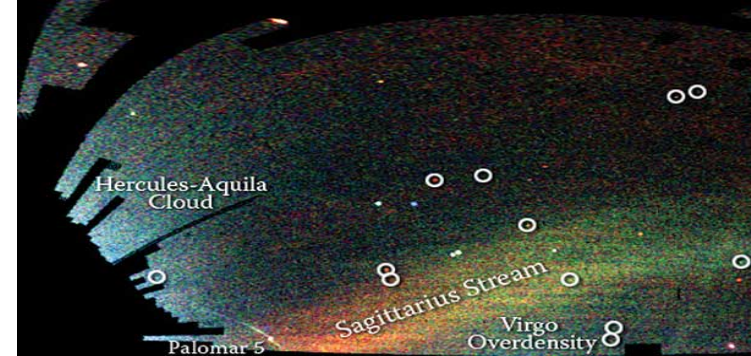
This requires spectra of stars over hundreds to thousands of square degrees

BigBOSS is very well matched to studying the Milky Way and M31.

Milky Way Substructure

Community Fiber Science:

-- Identify MW substructure in velocity space using RR Lyrae from SDSS (5000 stars over 8000 sq deg), but 14-18 mag. Offset fiber?

-- Identify MW substructure in velocity and chemistry space via BHB and RGB/MS stars

Targeted Science:

    -- Internal kinematics of dwarf galaxies (2 km/s doable, 1 km/s is great, not worse)

    -- Search for stars predicted to be associated with Magellanic Stream

    -- Fast reconfiguration project (5-10min) to search for needle-in-haystack objects (e.g., metal-poor stars, hyper-velocity stars, etc)

Technical concern: Radial velocity zeropoint calibration/stability, chemical abundance calibrations.

MW Inner Disk and Bulge

<u>Targeted Science:</u>

BigBoss can surveys of the inner MW thick disk and bulge with samples an order of magnitude greater than any surveys in the planning stage.

-- Target open clusters, young star associations. Study recent SFH, including angular momentum and binary fragmentation. Nearby clusters/assc. subtend degrees.

-- Targeting RGB clump (~16 mag) or main sequence turnoff stars (~18-19 mag) can produce unprecedented maps of the structure of the bulge/bar/thick disk/ inner halo as a function of age and metallicity.   This could be done in 10-15 nights.

<u>Technical concern:</u>   Sufficiently accurate astrometry for targeting in these regions?
                             Observing at high airmass (>2)

M31 Disk and Halo

Targeted Programs:

S/N = 3 spectra to determine velocities of RGB stars in M31. Map halo substructure. 25 3-hour pointings, map out to ~100 kpc.

Single pointing on M31 center.   Multiple exposures to target HII regions (bright) and OB associations.   Fill outer fibers with RGB stars.

Technical concern: Requires good throughput, pushes faint limit.

Specific Concerns for BigBOSS Team

1. <u>Astrometry:</u> Community fiber proposers must be provided astrometry reference systems of BigBOSS main survey targets.

2. <u>Bright Stars:</u> The BigBOSS reduction pipeline should include option for optimal data reduction of high S/N targets.

3. <u>Extreme Blue Response:</u> Galactic science group strongly recommends a blue cutoff of the BigBOSS system to be **blueward of 3650Å** to include higher order Balmer line of zero redshift objects (e.g. determine stellar log g). Increased PSF size is acceptable to achieve this.

4. <u>Wavelength Calibration:</u> Time stability of absolute zero point of wavelength solution.

Specific Concerns for NOAO

1. <u>Targeting Software</u>: For targeted projects, NOAO will need to provide software to prepare targets, guide stars, sky fibers for successful observing.

2. <u>Calibration requirements for targeted programs</u>: Create a 'standard observer mode', with explicit requirements for calibration, observing for which the BigBOSS pipeline will work well. No guarantees if not followed.

3. <u>Community Fibers for Targeted Programs</u>: Many user science programs will not fill full BigBOSS fiber count-- mechanism for filling these fibers with other programs?

4. <u>Stellar Parameters</u>: Develop SSP-like code?