



HIGHLY MULTIPLEXED SPECTROSCOPY  
WITH BigBOSS  
ON THE MAYALL TELESCOPE

# BigBOSS Community Workshop at NOAO

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**BERKELEY LAB**

LAWRENCE BERKELEY NATIONAL LABORATORY

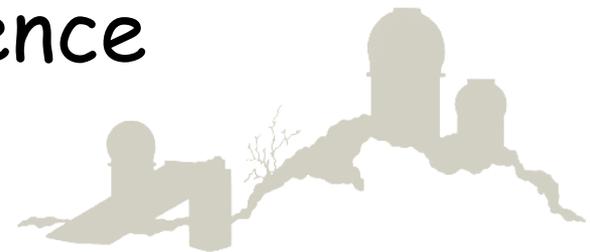


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# BigBoss Community Workshop

- Tucson, Sept. 2011
- 70 participants
- Goal: Explore astrophysical impact through community science
- Four breakouts: Galactic Science, Science of Transients, Extragalactic Science, Diffuse Media Science





# New Science with BigBOSS: It's the huge samples!

## Extragalactic

- Growth of galaxies
- Galaxy evolution
- Cluster surveys

## Galactic Science - Assembly history of nearby galaxies

- MW substructure
- Inner Disk and Bulge
- M31

## Transient Science

- Before, During & After  
the Transient
- Discovering transients  
with BigBoss

## Diffuse Media

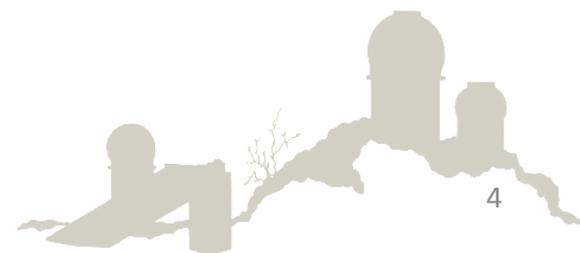
- Flows of matter and  
energy into/out of  
galaxies and black holes
- Improving BAO





# Observing Modes

- *Synchronous Observing*
  - Tied to survey strategy
    - Survey pointing strategy known in advance:  $\Delta t < -1$  day
  - Good for targets distributed across survey footprint
  - Could influence baseline survey strategy
  - Still TBD: 14,000 deg<sup>2</sup> each year or 1/5 of footprint each year
- *P. I. - driven projects*
  - Small: folded in through the BigBOSS Survey Queue
  - Large: (i.e., other surveys) - supported by proposing teams
- *Archival data projects*
  - Based on public release of data





# Observations of Transients

- During the Transient
  - Dynamic Scheduling
- After the Transient
  - Community Fibers
- Time resolved spectroscopy





# During the Transient

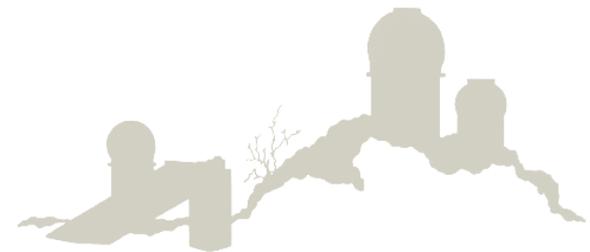
- Sample Science: GRB follow-up
  - GRB follow-up is starved for spectra
  - Need quick response (minutes) to triggers
  - Dynamic scheduling to observed target field
- Sample Science: "BigBOSS Transient Factory"
  - Dedicated transient search telescope
  - Observe survey fields 1-2 nights before to find transients
  - Assign fibers to transients
  - ~ 100 transients per night





# After the Transient

- Sample Science: SN host redshifts & metallicities
  - Photometric SN surveys need follow-up
    - PanSTARRS, PTF, DES
    - LSST  $\sim 10^4$  SN yr<sup>-1</sup> (deep fields)
  - Increase the number of host metallicities by  $10^3$
  - Synchronous observing mode





# Time Resolved Spectroscopy

- Sample Science: short period WD+WD pairs
  - WDs are major contaminant in BigBOSS QSO selection
  - Detect WD+WD pairs with 2 consecutive 10-minute observations
- Sample Science: PI Survey to determine binary fractions, distribution of binary separations from a large sample
- Sample Science: Variables included in calibration fields





# Community Science Needs - Hardware

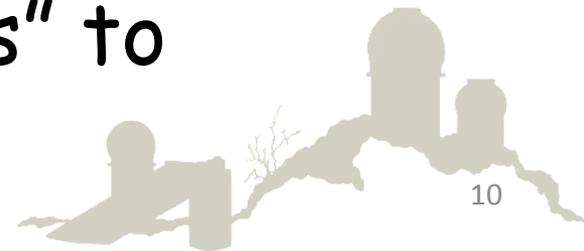
- Maintain blue response (3646A, if possible - even w/ degraded PSF)
- Maintain current sensitivity/throughput
- Allow observations at airmass = 2
- Allow observations of bright targets





# Community Science - Software

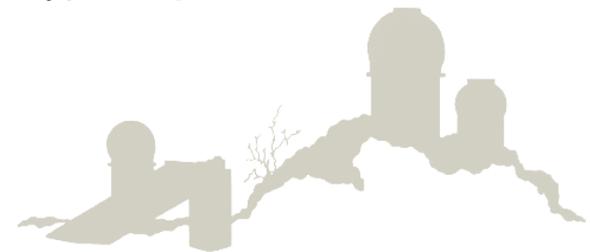
- Quick-look reduction software
- Timely public release of data in a usable archive
  - Including useful meta data (e.g. guider images)
- Facilitate community “plugins” to software pipeline





# Community Science - Operations

- Dynamic Scheduling
- Target selection & astrometry
- Calibration (RV, high S/N ratio, metallicity, flux)
- Exposure time/sub-exposures





# Community Science -Interface

- Well-defined and public astrometric reference frame & database for synchronous community fibers
- Dynamic intelligent scheduler for community /transient targets
- Calibration requirements
- Community time from year 1
- Proposal process for PI & synchronous programs

*Insert Community into Planning!*





# NOAO's Role in BigBOSS

- Enable an unprecedented spectroscopic capability for US astronomy
- Facilitate the community BigBOSS science program
- Provide interface between BigBOSS and the astronomical community (i.e., represent the astronomy community's interests to BB and vice versa)
- Collaborate with BigBOSS to ensure hardware/software performance to maximize science output





# What Comes Next?

- Workshop report available soon at NOAO
- Future NOAO+LBNL+Community Workshops will detail scheduling / software / hardware requirements
- Establish a community-based working group to guide BigBOSS community science

