

# IEU and International Research

Bruce Grossan

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# Outline

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- Introduction to IEU
- What Goes on at the IEU?
- What is Different about the IEU and International Research?
- What is Professional Work in Cosmology and Astrophysics?

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- George Smoot leveraged expertise in Experimental Cosmology and Changrim Ahn experience in Theoretical Astroparticle Physics to be Director and P.I.
  - laboratory facilities, projects
  - powerful simulation computers
  - Theory faculty
  - Most Important: funds to hire faculty, postdocs, students, selection of the best people

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  - See Big BOSS neutrino measurements via mapping the universe
- Black Holes & neutron stars have extreme gravity, particle acceleration (Maybe origin of highest energy cosmic ray particles.)

# IEU Projects

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- UFFO
- BigBOSS
- Cosmology Simulations
  - Cosmological simulations
  - Simulations of observations
- Astro-Particle Theory

# UFFO

- Ultra-Fast Flash Observatory
  - X-ray and fast beam-steered optical telescope to make rapid optical measurements of Gamma-Ray Bursts (GRBs)
- To Fly on Lomonosov Spacecraft ~2013 June

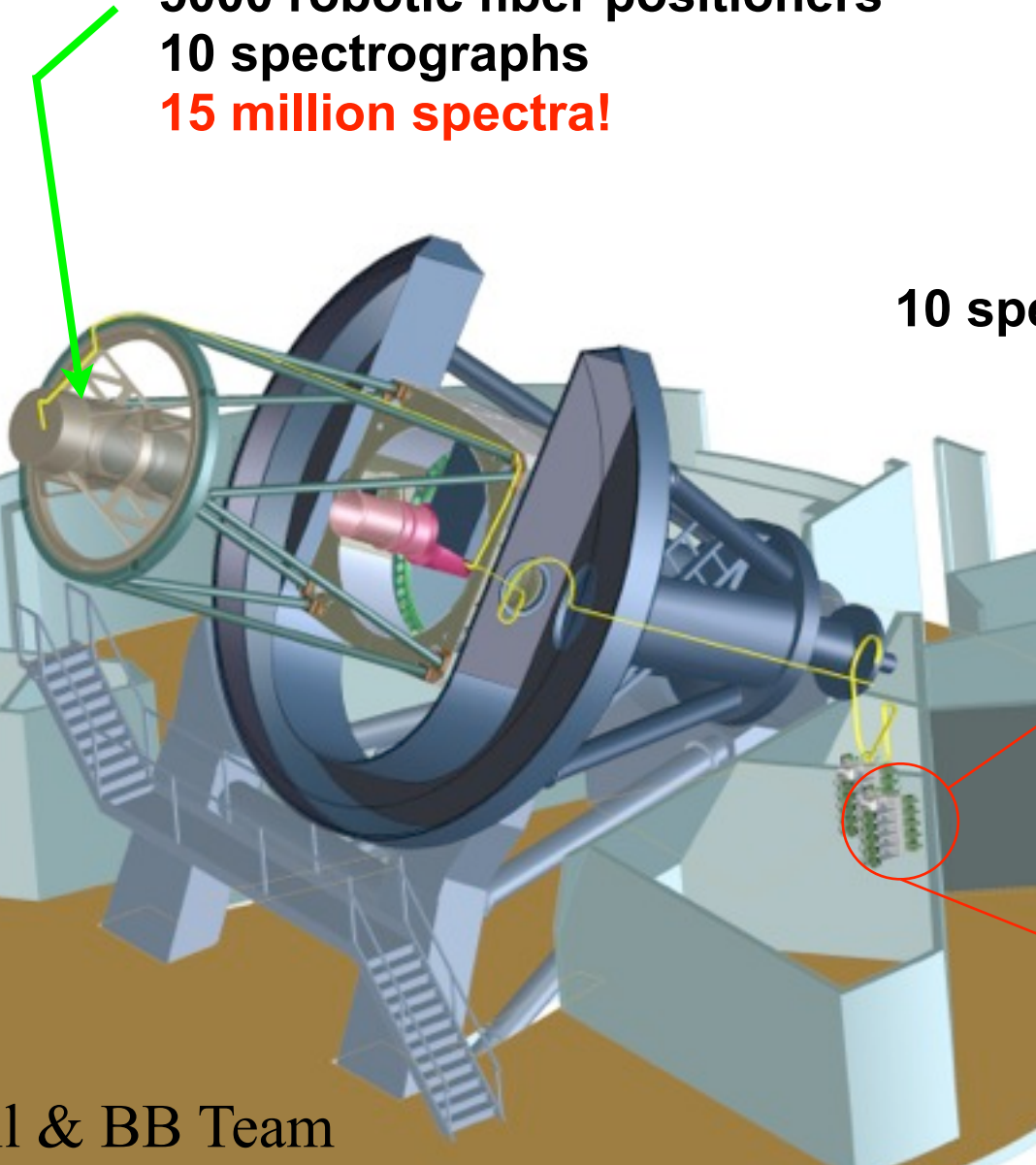


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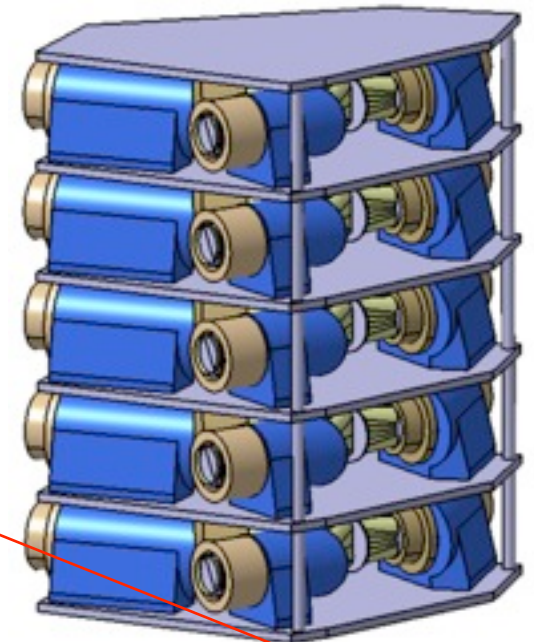
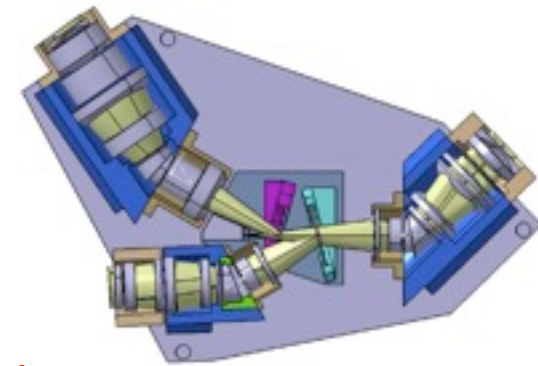
# BigBOSS - Instrument



Huge Volume of universe with 3-degree field  
5000 robotic fiber positioners  
10 spectrographs  
**15 million spectra!**



10 spectrographs



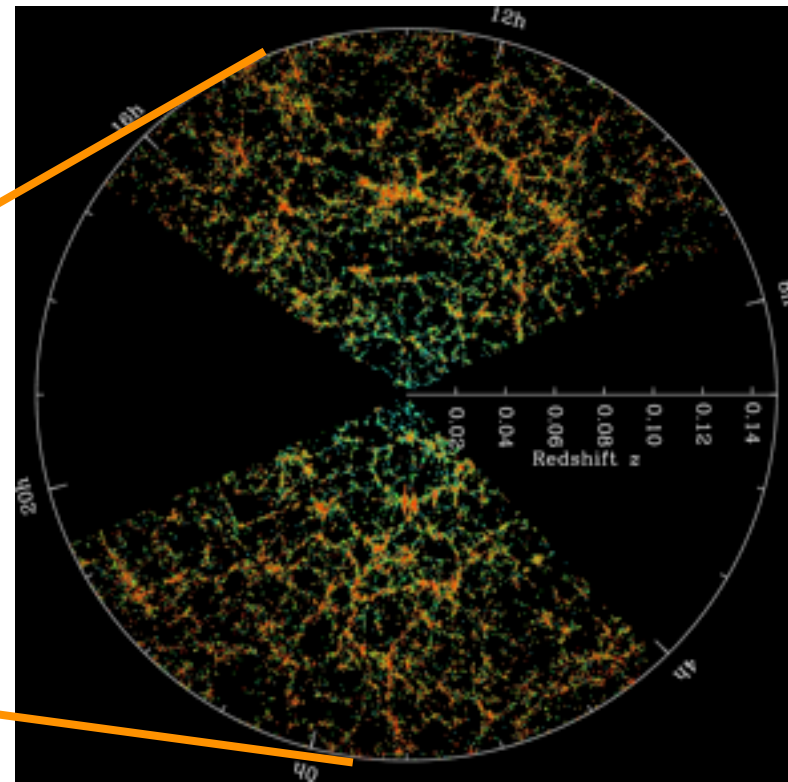
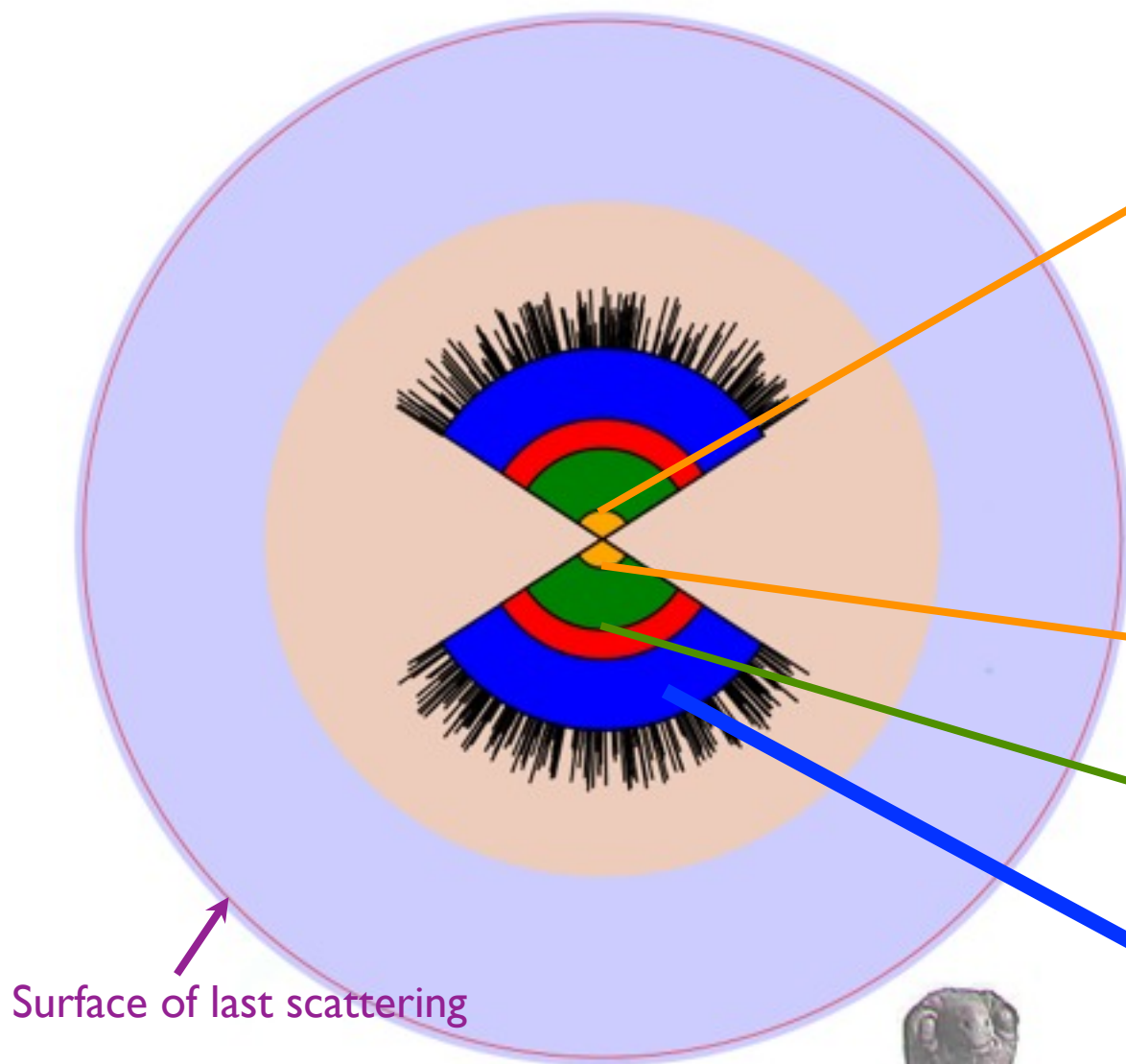


## Science Goals: BAO from 20+ million redshifts

Sensitivity to new physics scales as volume surveys -- # of modes

**Our observable Universe**

Volume mapped by SDSS + SDSS-II

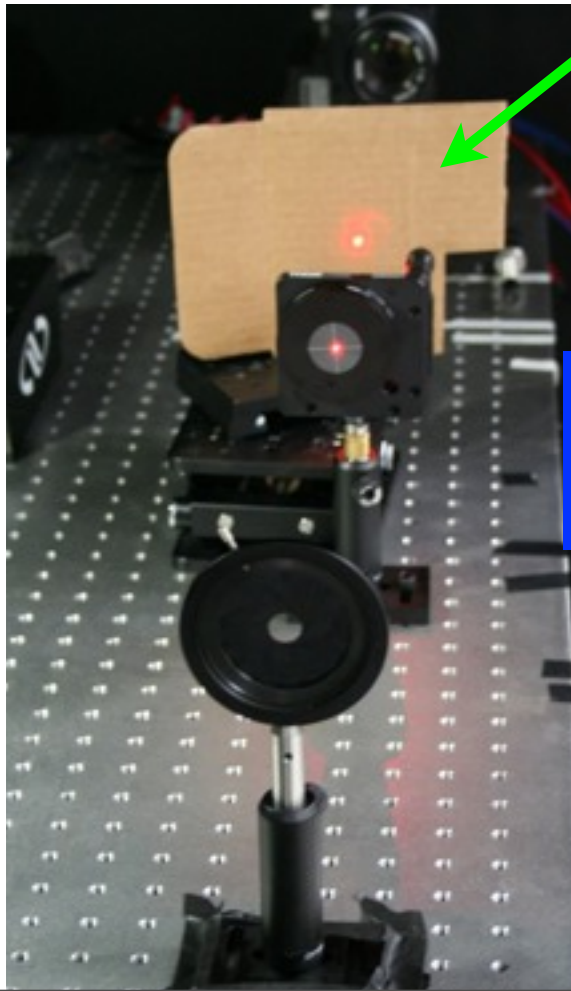
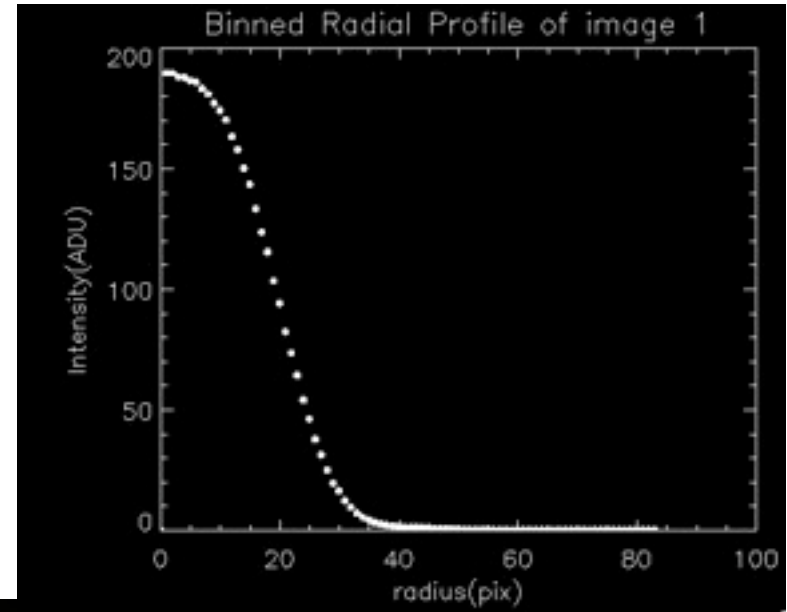
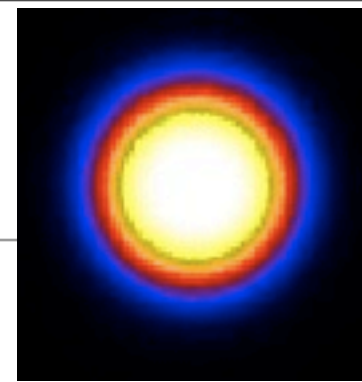


Volume to be mapped by SDSS-III/BOSS  
(ca. 2014)

**BigBOSS @NOAO**

# BigBOSS in IEU Lab

- Precision Testing of optical Fibers
- Automation for 5000



Original  
"Custom"  
Instrument

Appearance  
when Lens off-  
center

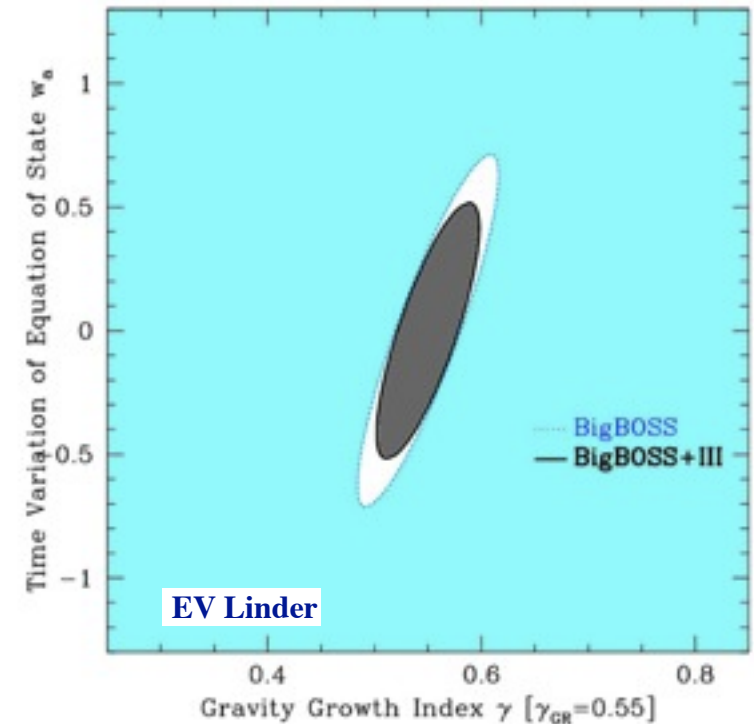


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# Cosmology and Simulations

- Eric Linder works on Cosmology theory and the interaction of that theory with measurements, in particular Dark Energy and cosmology.
- Uros Seljack works on Galaxy Clustering, Lensing, CMB anisotropies, and developed a code for perturbing standard CMB theory for predictions.





# High-Energy Cosmic Rays and Particles

- Jongman Yang is involved in Cream, the Sam Ting Experiment (AMD) on the ISS, and high-altitude cosmic ray balloon measurements.

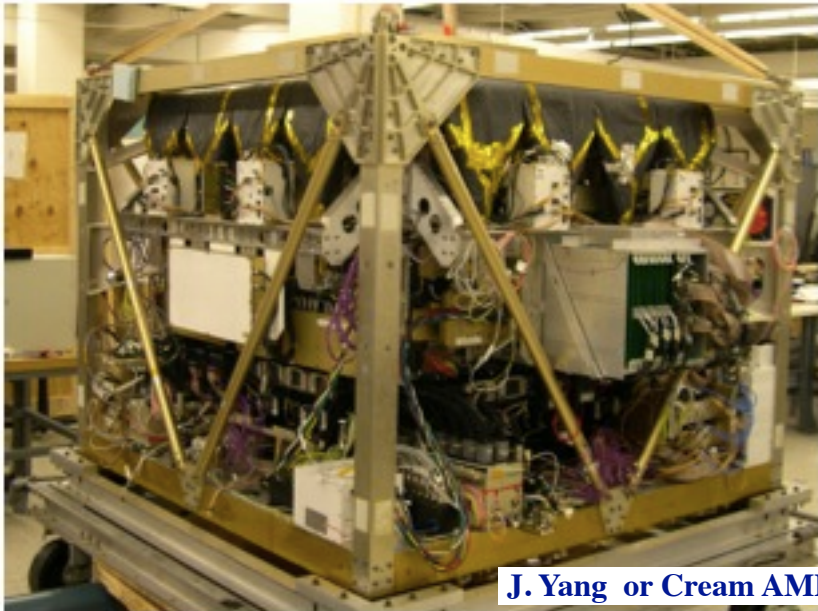


Figure 1. Photo of the CREAM Instrument during integration.

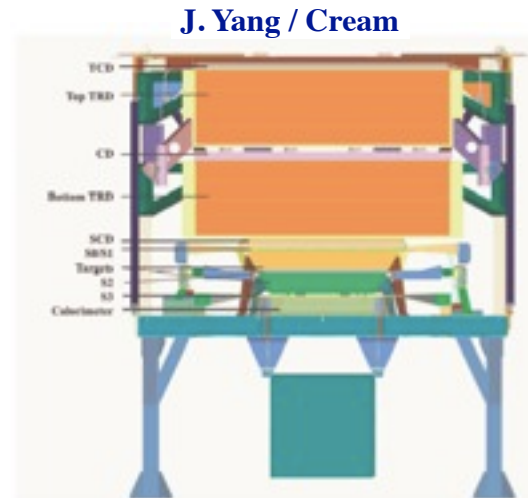


Figure 2. Schematic cross section drawing of major CREAM detector systems.



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- **Don't ignore work just because it's not in your country!**



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    - building on the work of others with references