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# Potential Future Astrophysics Projects at SLAC

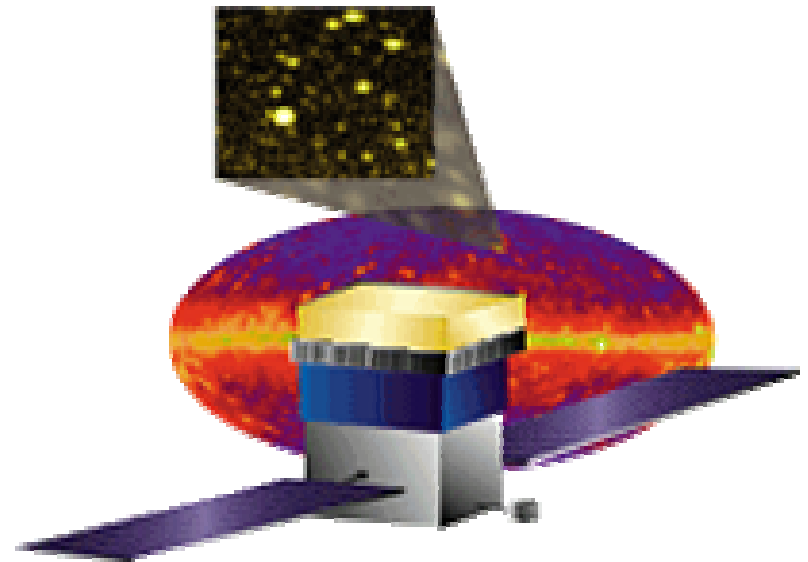
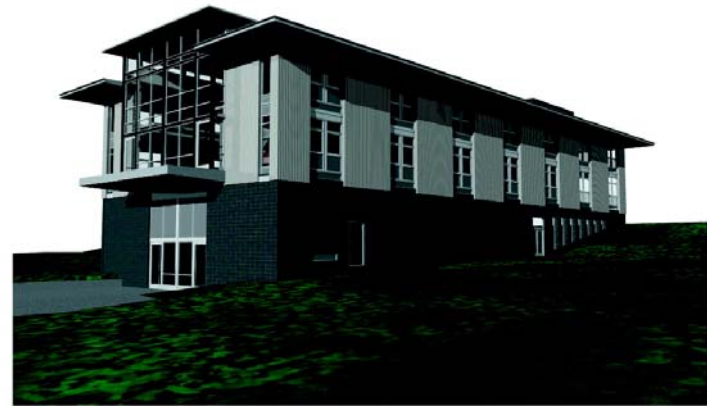
S.M. Kahn for the SLAC Scenarios Study

SLUO Meeting - July 11, 2002

# Astrophysics at SLAC

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- \* The recent establishment of the Kavli Institute is an indication that particle astrophysics and cosmology are viewed as key components of the future research program for SLAC and its user community.
- \* GLAST has been a precedent-setting project for these fields in several important ways:
  - Introduced astrophysical science to SLAC.
  - Established viable a interagency collaboration between NASA and DOE.
  - Harnessed core technical competencies at SLAC for astrophysical projects (e.g. electronics, data handling and S/W, project management, large-scale integration and testing).



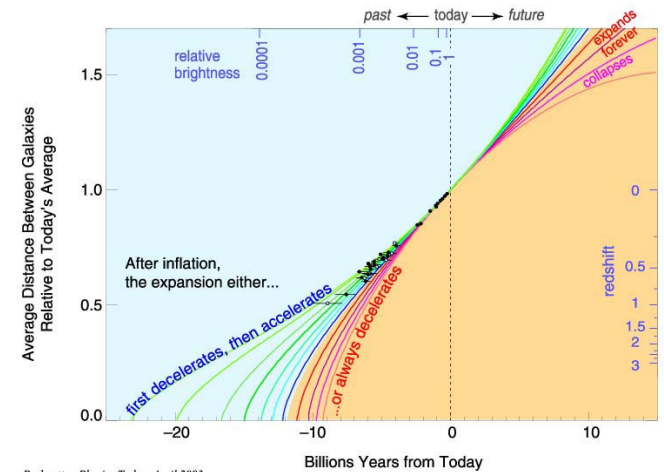
# Astrophysics at SLAC - Programmatics

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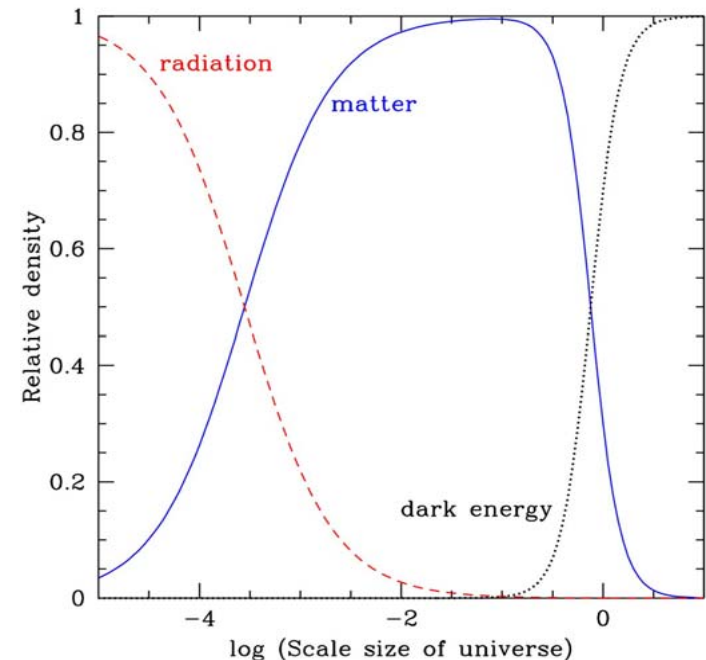
- \* In thinking about future astrophysics projects as key components of the SLAC research program, important considerations will involve relevance to HEP science objectives and synergy with the technical capabilities of SLAC and its user community.
- \* There has been a clear coalescence of interest around fundamental cosmological questions:
  - What is Dark Energy?
  - What is Dark Matter?
  - How does Inflation work?
  - Is GR the correct theory of gravity?
- \* To help us explore these questions, we held a “cosmology day” at SLAC on June 13, 2003. The speakers were **C. Hogan (UW), E. Linder (LBNL), G. Bernstein (Penn), R. Mushotzky (NASA/GSFC)**.

# Near-Term Focus on Dark Energy

- \* The discovery of Dark Energy is viewed by many as one of the most important developments in physics in the past half-century.
- \* The inferred value of  $\Omega_{\text{DE}}$  presents key questions for all of physics:
  - Why is the apparent energy scale of the vacuum so small?
  - Why should  $\Omega_{\text{DE}}$  be  $\sim \Omega_{\text{M}}$  in the present Universe?
- \* Multiple experimental approaches to further constraining DE:
  - $d_L$  vs  $z$  (Type 1a SNe)
  - $\theta$  vs  $z$  (SZ Effect)
  - $T$  vs  $z$  (growth of structure - WL, clusters, mass power spectrum)
  - $dV/dz d\Omega$  vs  $z$  (cluster counting)



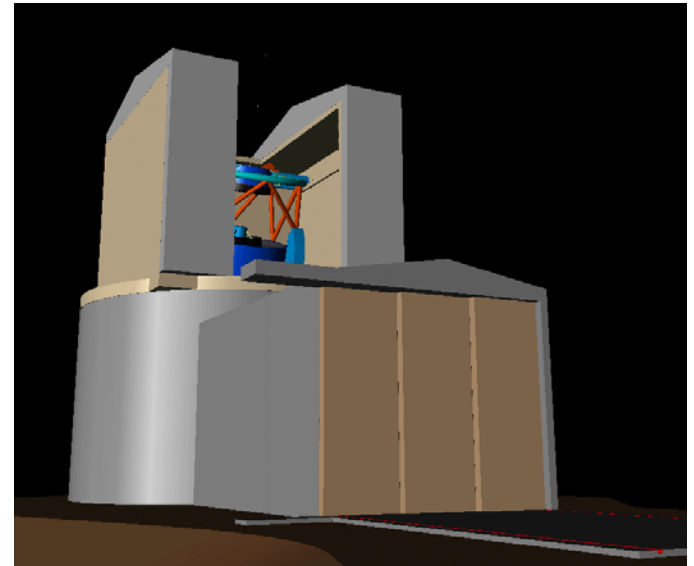
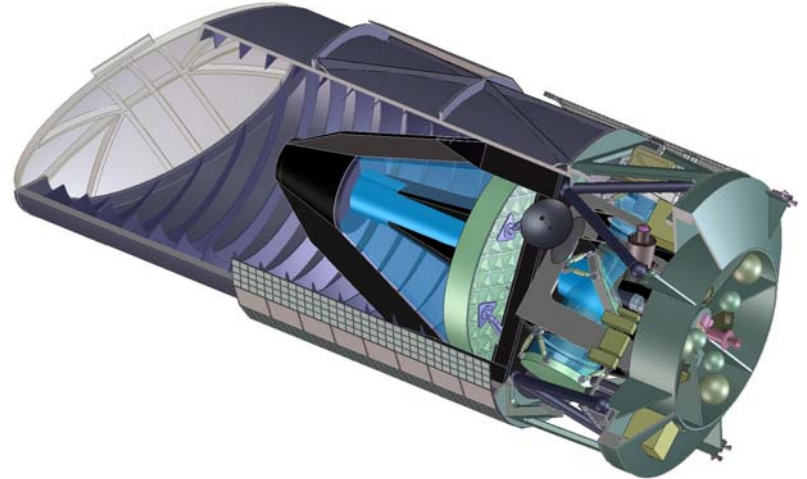
Perlmutter, Physics Today, April 2003



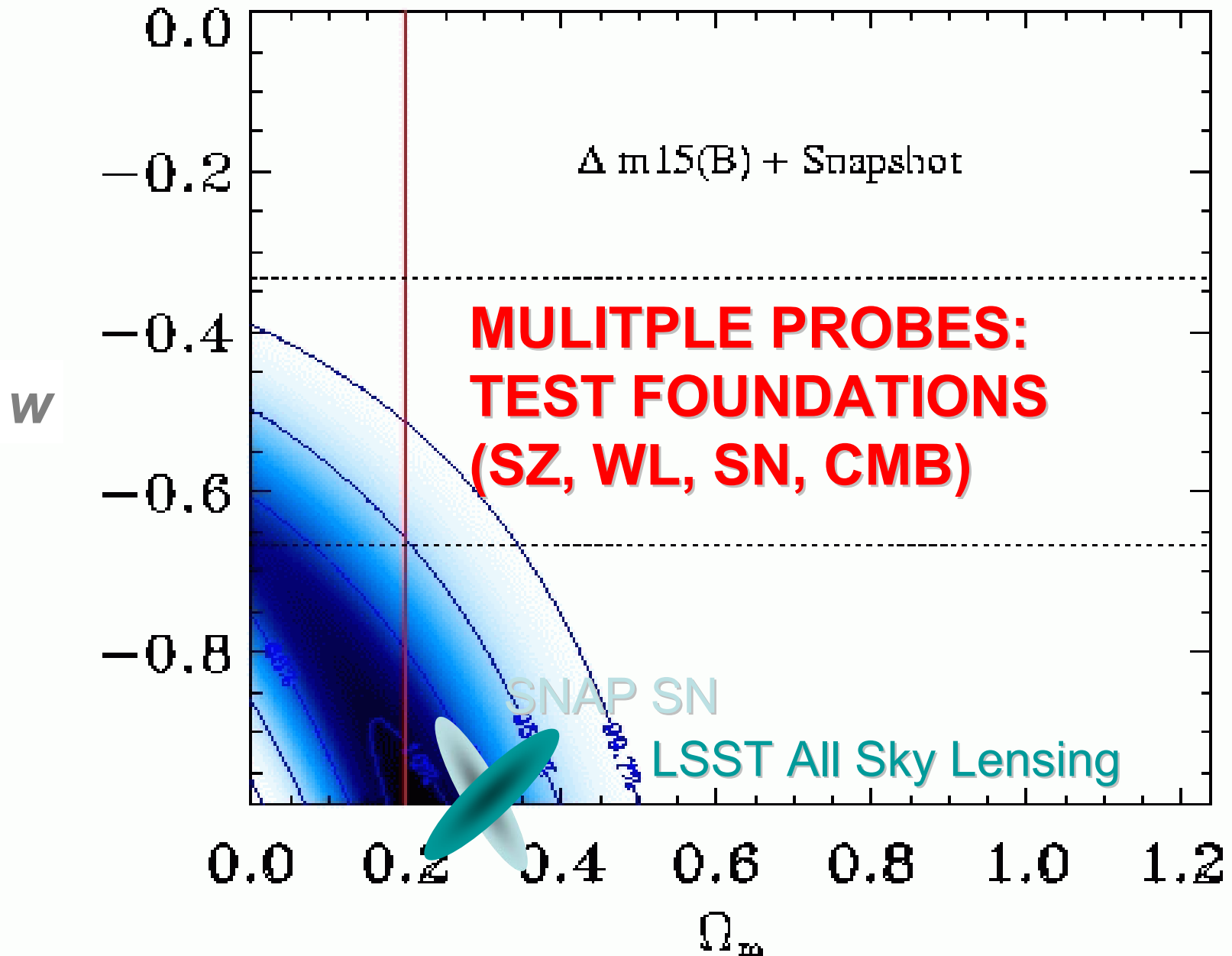
# Potential New Projects for SLAC Involvement

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- \* **Supernova Acceleration Probe (SNAP)** - A 2 m, wide-field telescope in space, which will provide a large sample of Type 1a SNe out to  $z \sim 1.7$ , as well as useful data for other forms of cosmological probes (weak lensing, strong lensing, ...)
- \* **Large Survey Synoptic Telescope (LSST)** - An  $\sim 8$  m wide-field ground-based telescope which will perform a sensitive weak lensing survey over 30,000 sq. degs of sky.
- \* **Wide-Field X-ray Sky Survey (a la DUO or DUET)** - Will provide find all clusters out to  $z \sim 1.3$  and complement existing SZ surveys on the ground.



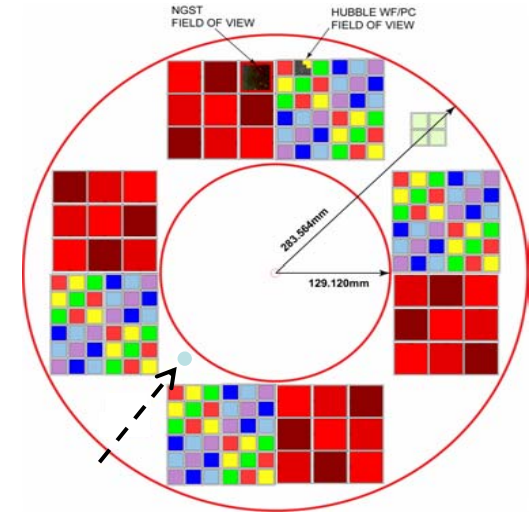
# High-Z Supernova Search Team



# Technical Synergies with SLAC Core Competencies

## \* SNAP

- Space electronics and flight S/W.
- Integration and test.
- Project management in a joint NASA/DOE environment.



## \* LSST

- Data acquisition, high-speed computing (18 Tbytes per night!)
- Precision assembly, alignment.
- Systems engineering.

