LECTURE 28:
A TALE OF 3 TELESCOPES, PART II

28.1 THE SLOAN DIGITAL SKY SURVEY (SDSS)

Being built in New Mexico. Special purpose telescope and instruments designed for a large-scale survey.

Main mirror: 2.5-meter diameter.

Instruments:

Camera with **30** large CCDs $\longrightarrow$ image large area at one time.

Spectrograph fed by **600** optical fibers $\longrightarrow$ measure 600 spectra at one time.

Automated data processing system using fast computers.

Telescope will start operation this year. Survey will finish around 2003.

The strength of the SDSS derives from its enormously efficient instruments and data processing software and its dedication to a specific project.

28.2 SDSS OBSERVATIONAL GOALS

Map the universe in unprecedented detail.

Imaging survey: image 1/4 of the sky, in 5 colors. Detect and measure properties of about 50 million galaxies, 100 million stars.

Galaxy redshift survey: measure redshifts of the million brightest galaxies, to construct 3-dimensional map of the galaxy distribution.

Quasar redshift survey: select quasars from imaging survey — they are "stars" with unusual colors — and measure redshifts for the brightest 100,000 of them.

Basic data for an enormous range of astronomical science, especially for understanding the formation of quasars, galaxies, and galaxy clusters and superclusters.

Understanding galaxy and cluster formation should also help us understand what the universe was like just after the big bang, what the dark matter is, and whether the universe will expand forever.

28.3 SUMMARY

CCDs: 100 times more sensitive than film, enormous advance in optical astronomy.

HST: above atmosphere $\longrightarrow$ high angular resolution.
Sample science: distant galaxies, faint stars.

Keck: 10-meter mirror $\longrightarrow$ light gathering power, especially crucial for measuring spectra.
Sample science: abundances of rare elements, quasar absorption lines.

SDSS: powerful instruments $\longrightarrow$ unprecedented map of universe — imaging and redshift surveys.