Detecting and characterizing giant planets beyond Hubble

1. What fraction of stars have giant planets?

2. How do we know any of these are really giant planets?

3. How can individual giant planets be characterized?

Jonathan I. Lunine
Lunar and Planetary Laboratory, The University of Arizona
One of every ten sun-like stars possesses at least one giant planet

Lineweaver and Grether, 2002
4% of sun-like stars show the radial velocity signature of planets

Histogram of extrasolar giant planets
7 Dec 2001; 76 planets, from Marcy et al. web page today
Planetary transits—seeing Earth’s from Kepler
HD209458: First detected planetary transit

Charbonneau et al, 2000
Model I: Isolation, mass=0.69 M$_J$

Model A: HD209458 b; albedo=0.0, $T_{\text{eff}}=1600$ K, mass=0.69 M$_J$

Model B: albedo= 0.5, $T_{\text{eff}}=1200$ K, mass=0.69 M$_J$
Gliese 229B: 950 K/10^5 cm s^{-2}

Brightness Temperature (K)

Wavelength (μm)
SAO Solar System Model at 10 PC

Traub et al.
Detection of Earth & Jupiter

\[ \Delta J_{\text{max}} = 4 \]

Earth's Signal

Jupiter's Signal

Galactic Exoplanet Survey Telescope--Bennet and Rhie