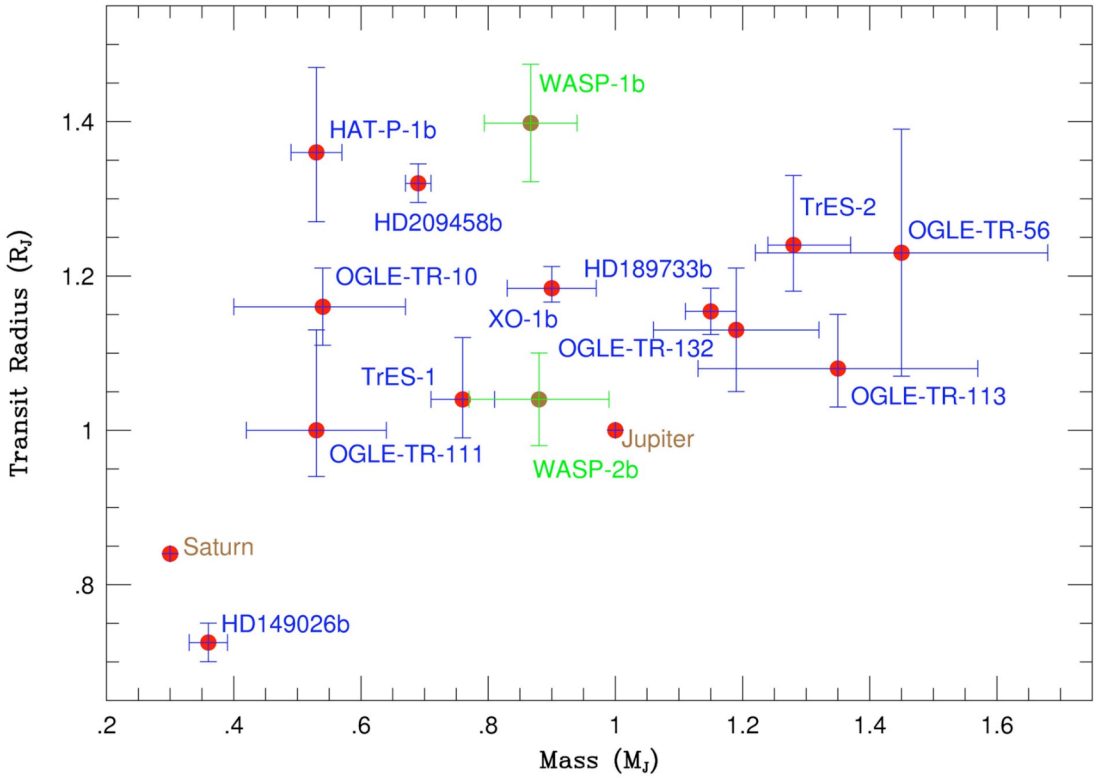

Fig. 1 – Observed masses and radii, in Jupiter units, of transiting extrasolar giant planets, compared with Jupiter and Saturn (figure courtesy of Adam Burrows).

Compositional Measurements of Giant Planets

As Figure 1 shows, there are 14 (as of November 2006) extrasolar giant planets (EGPs) in the Jupiter-Saturn class with measured masses and radii. Radii ~ 100000 km are direct evidence for a major hydrogen component in all of these planets, but the observed scatter in radii is real and is evidence for variations of both interior entropy and metallicity (to an astrophysicist, metallicity is the abundance of elements with $Z > 2$, measured against the abundance of these elements in the Sun). The exoplanet HD149026b, with a mass similar to Saturn's but a significantly smaller radius, has already been modeled to show that it has a major non-hydrogen-helium component, and may thus be analogous to Uranus or Neptune in composition.

Thus, compositional information about EGPs is rapidly emerging from the observational database. Inferences leading to detailed interior compositions will require advanced equations of state and thermal evolution models of highly-irradiated EGPs, work that is in progress. Detailed *in situ* compositional measurements of atmospheric layers in the Solar System's giant planets, at first for Jupiter via soundings from the Juno orbiter, and later for all of our giant planets via entry probes, will play an important role in the new synthesis.

Bill Hubbar, U of AZ, November 8th, 2006