

# *Exoplanets: From Kepler, to HARPS-N, and Gaia*

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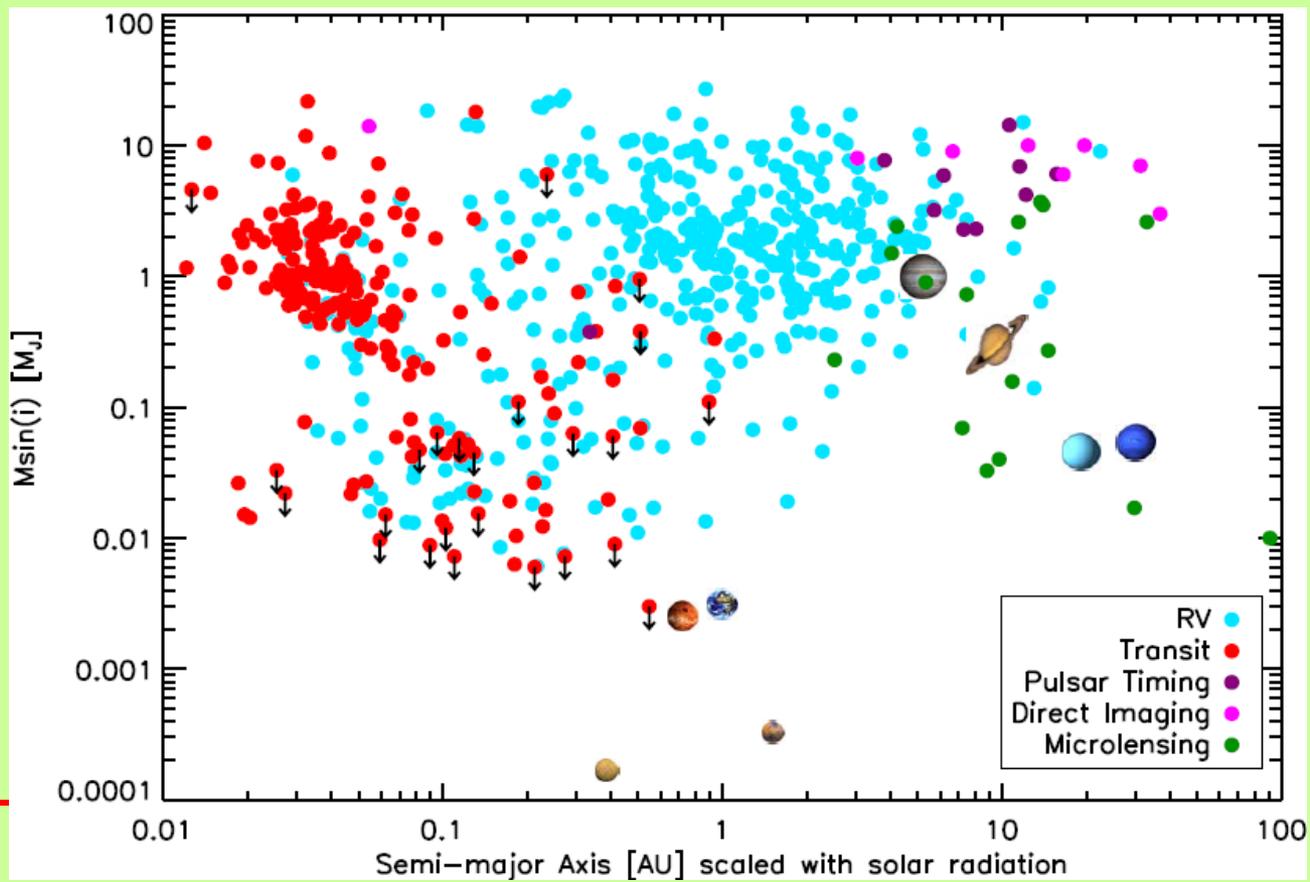
# Detection/Characterization



- Detection (Visible):
  - Doppler spectroscopy (92%)
  - Transit photometry (34%)
  - Gravitational microlensing (2%)
  - Pulsar/pulsation timing (2%)
  - imaging (4%)
- Characterization (Visible/IR):
  - Transit timing
  - Transmission spectroscopy
  - Rossiter-McLaughlin effect
  - Reflected light
  - Infrared emission

864 Exoplanets known today, in 679 systems

129 in multiple-planet systems





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# Transiting Planets: A Treasure Trove

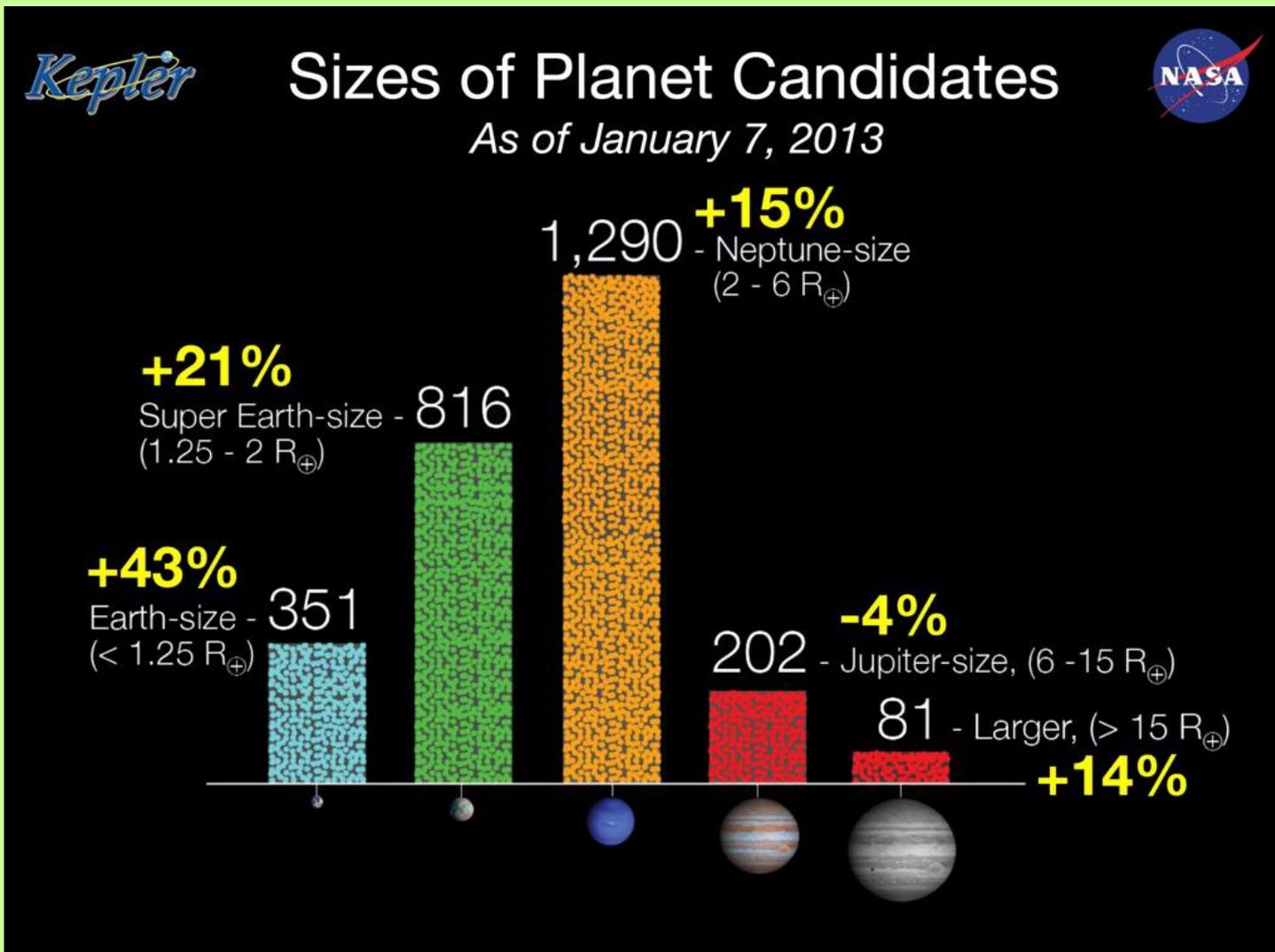


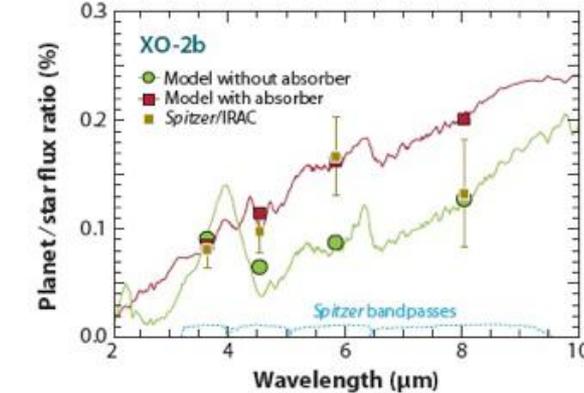
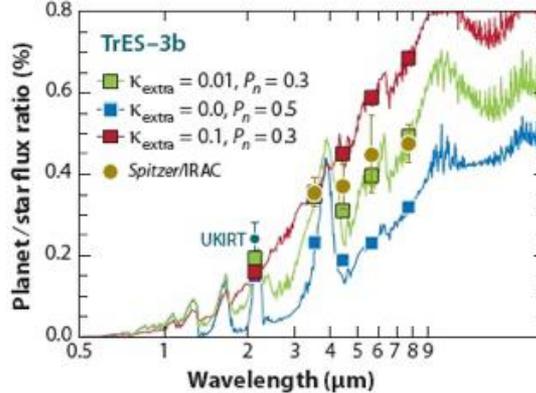
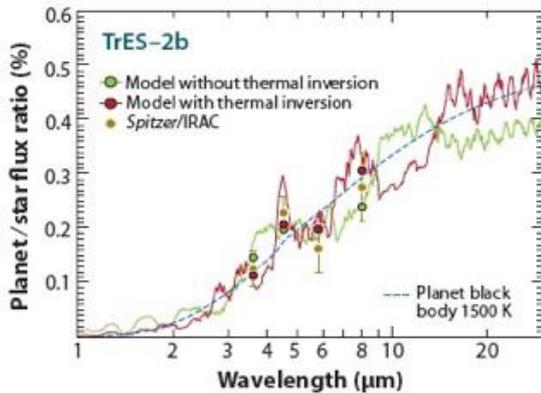
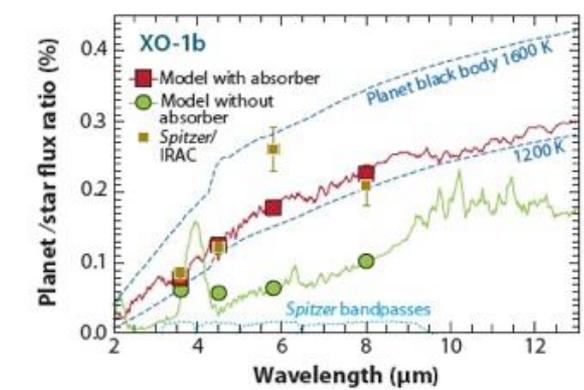
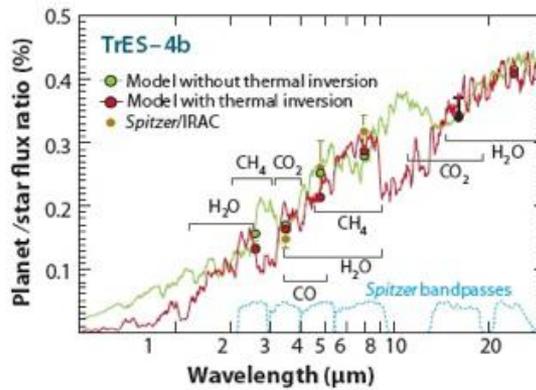
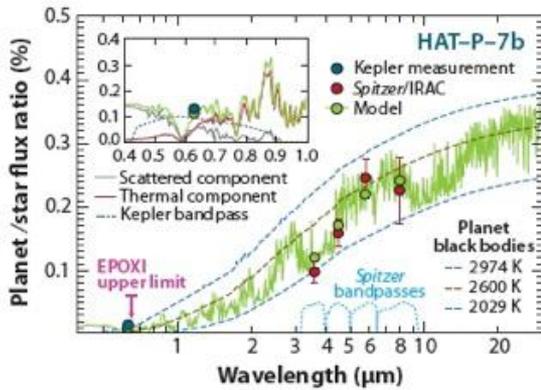
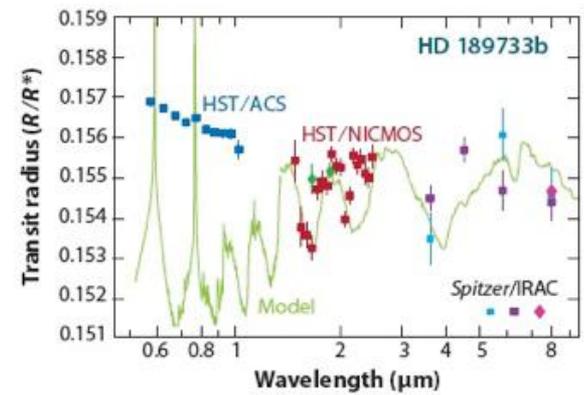
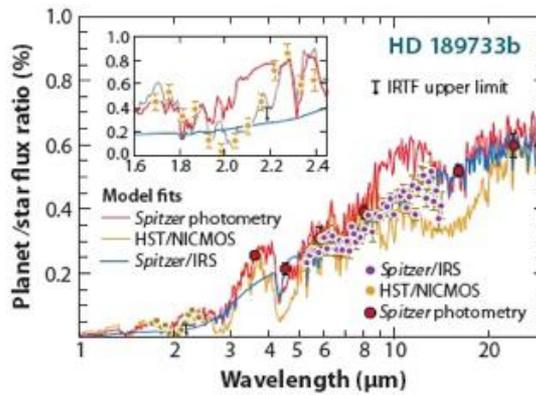
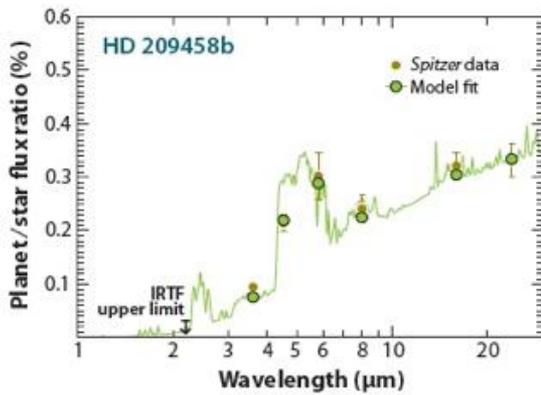
- Learn about the history of planet migration through Rossiter-McLaughlin effect measurements
- Learn about the architecture of multiple systems
- Learn about the physical structure and composition of exoplanets
- Learn about the structure, chemistry, and dynamics of atmospheres



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# Kepler: a $10^{-5}$ mag Precision Machine!



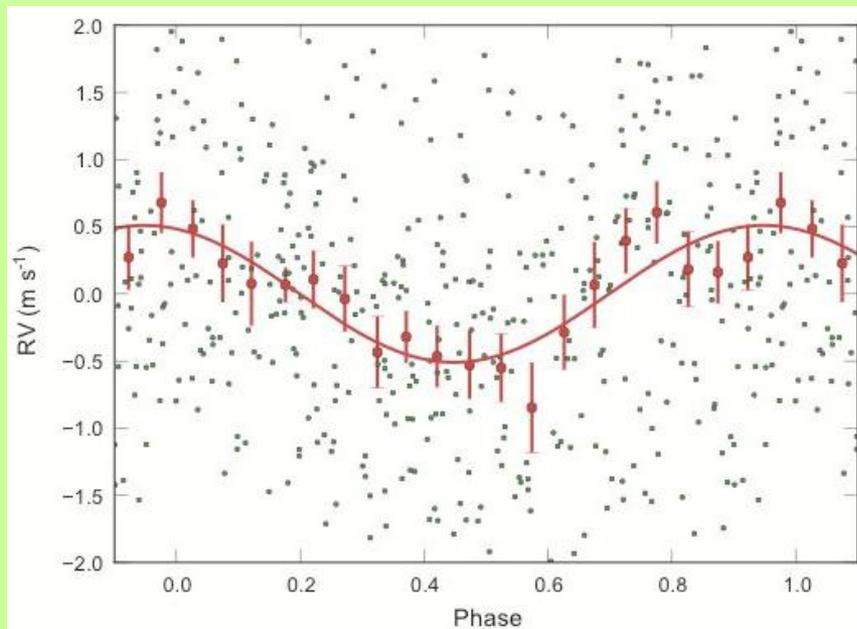
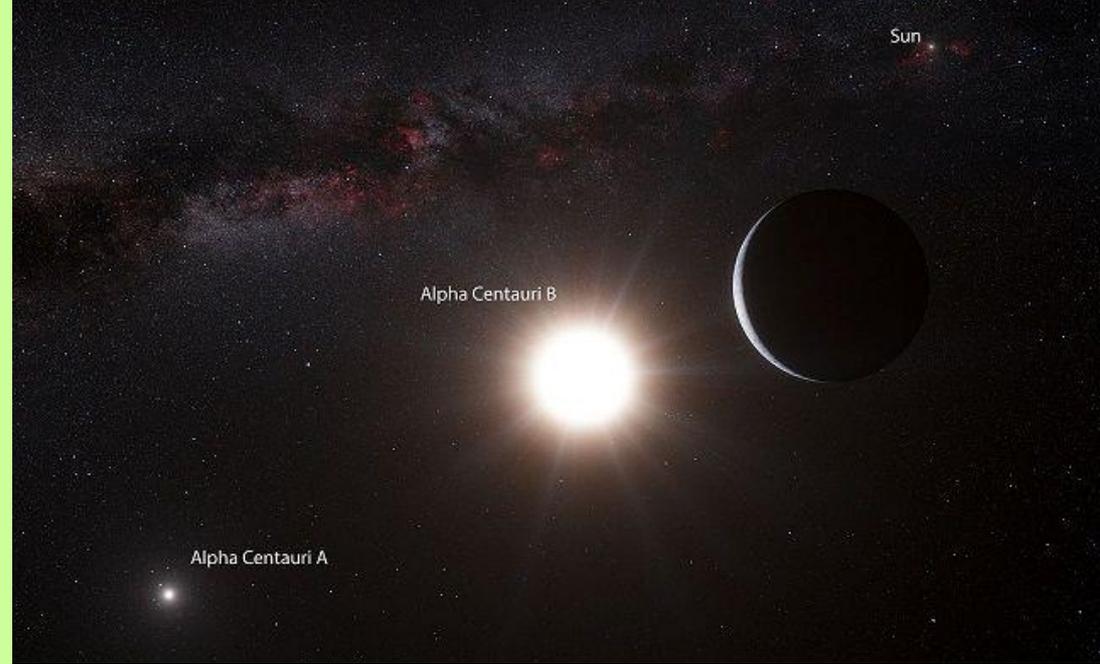




# High-Precision RVs



- 1-m/s precision measurements
- Fundamental for transiting candidates confirmation (mass determination)
- Long-term surveys (e.g. HARPS) critical for uncovering planet properties, frequencies, and correlations with the hosts' characteristics
- The discovery of planets of planets with Earth's mass (not radius) already made!



# $\alpha$ Cen Bb