With the radius of Jupiter, the near-Neptune-mass planet WASP-107 presents a major challenge to planet formation theories. Meanwhile, the system's brightness and planet's low surface gravity makes it a keystone target for spectroscopic characterization, especially in the poorly-probed low-temperature (T_{eq} < 800 K) regime. In this talk, we will present the main results of an extensive follow-up program of WASP-107b using over 2 years of Keck/HIRES radial velocities as well as >60 hours of Spitzer observations. The radial velocity data reveal an even lower planetary mass than previously thought. The inferred 1.8 Neptune mass indicates an extraordinarily high H/He mass fraction of 80% accreted by a core of only 7 ± 3 Earth masses. The resulting lower surface gravity means that all the transmission spectroscopy for this planet has to be reinterpreted. With Spitzer, we furthermore detect the thermal emission of this 720K exoplanet at 3.6μm, indicating substantial eccentricity ($e = 0.129^{+0.028}_{-0.011}$) and making it the best target for eclipse observations with JWST in this temperature regime. A puzzling brightness temperature contrast between the 3.6 and 4.5μm bandpasses presents direct evidence for disequilibrium chemistry, and makes WASP-107b a keystone target to unveil the underlying mechanisms of quenching and atmospheric dynamics. We show that the non-zero eccentricity of WASP-107b could result from the presence a second planet in the WASP-107 system on a highly eccentric ($e = 0.56^{+0.11}_{-0.14}$) and wide (~2000d) orbit, which we also detect in the radial velocity data. Overall, the joint constraints from the secondary eclipse and RV observations shed unprecedented light on the rich dynamics history of this peculiar planetary system offering an intriguing possibility for the origin of close-in exo-Neptunes like WASP-107b.

102.05 — Radial Velocity Discovery of an Eccentric Jovian World Orbiting at 18 au

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We announce the discovery of the longest-period planet with a well-constrained orbit discovered with radial velocities (RVs). HR 5183 b, with P = 75 ± 30 yr, e = 0.84 ± 0.04, and M sin i = 3.23 ± 0.14 M_J, was detected independently in more than two decades of data from Keck/HIRES and McDonald/Tull. The highly eccentric orbit takes the planet from within the orbit of Jupiter to beyond the orbit of Neptune over one period. Because of this high eccentricity, orbital information density is strongly peaked around periastron, which occurred in January 2018. By observing this periastron passage event with high cadence, we were able to place tight constraints on the orbital parameters without witnessing an entire orbital period.

In terms of semimajor axis and mass, HR 5183 b is most similar to a typical directly imaged planet, but its advanced age, extreme eccentricity, and solar-type primary star differentiate it from this population. This discovery probes a previously unexplored population of exoplanets, highlighting the value of long-baseline RV surveys and raising interesting questions about the long-term evolution of planetary systems with massive planets.

102.06 — First Results from the SPIRou Legacy Survey

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SPIRou is the infrared high-resolution echelle spectropolarimeter currently in operation on the Canada-France-Hawaii telescope, an instrument specifically designed and optimized to achieve precision radial velocity at infrared wavelengths. SPIRou features a unique polarimetric capability, high resolving power (70,000) and a very broad simultaneous wavelength coverage between 0.98 to 2.5 microns. SPIRou has two main science goals: detect small planets around nearby low-mass stars and explore the impact of