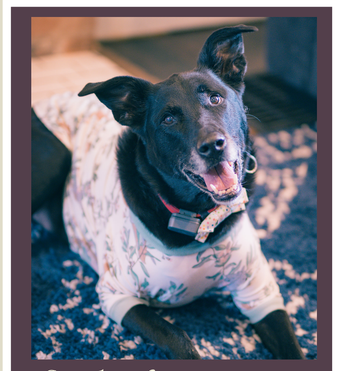
BEBOP - Binaries Escorted By Orbiting Planets

David V. Martin

Tufts UNIVERSITY



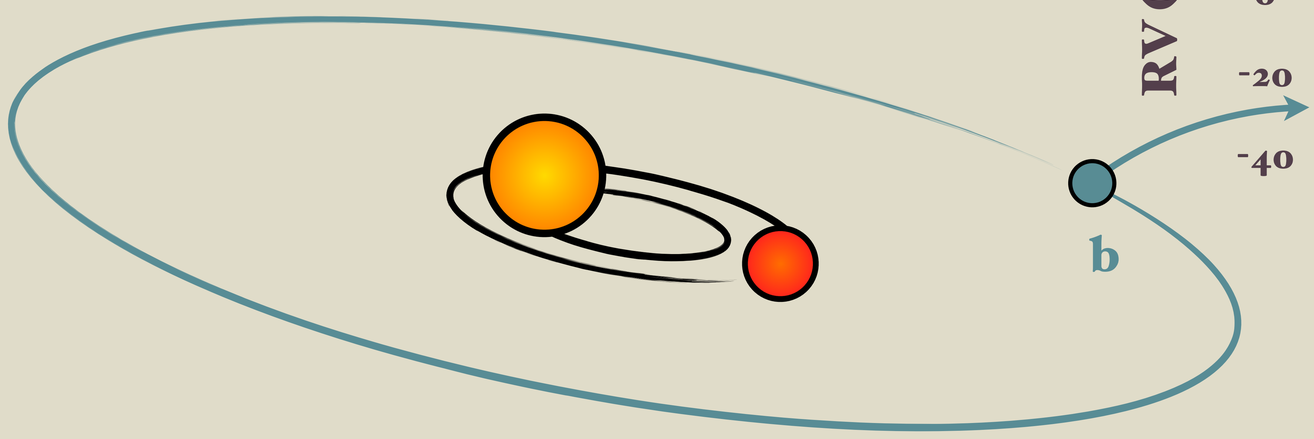
Stanley, for no reason

A radial velocity survey for circumbinary planets

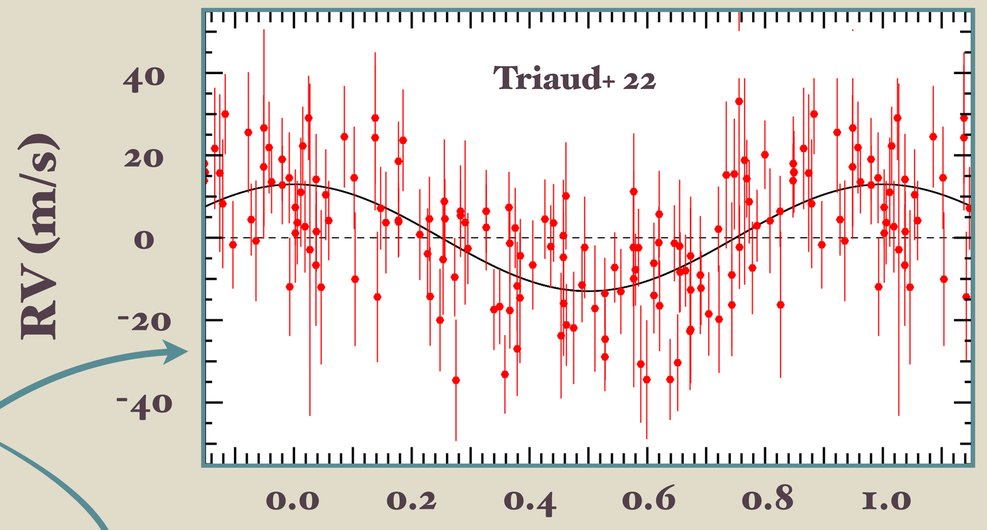
Finding planets around binaries with RVs is hard, because of the whole two stars = two spectra thing. So, to get us started, we observed a known transiting planet (from Doyle+ 11). It took a few years, but we found it! And, the masses and periods match beautifully (Triaud+ 22). BEBOP uses eclipsing binaries from the EBLM survey (F/G/K primary, M secondary). We only see light from one star. It's kind of cheating, but it works.

Mass from ETVs:
0.333 ± 0.016 M_{Jup}

Mass from RVs:
0.345 ± 0.041 M_{Jup}



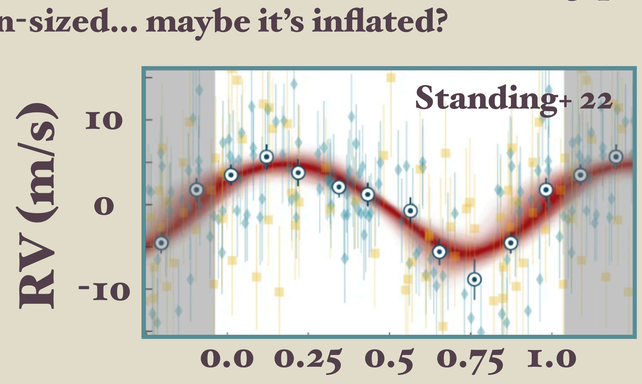
FIRST DETECTION - Kepler 16

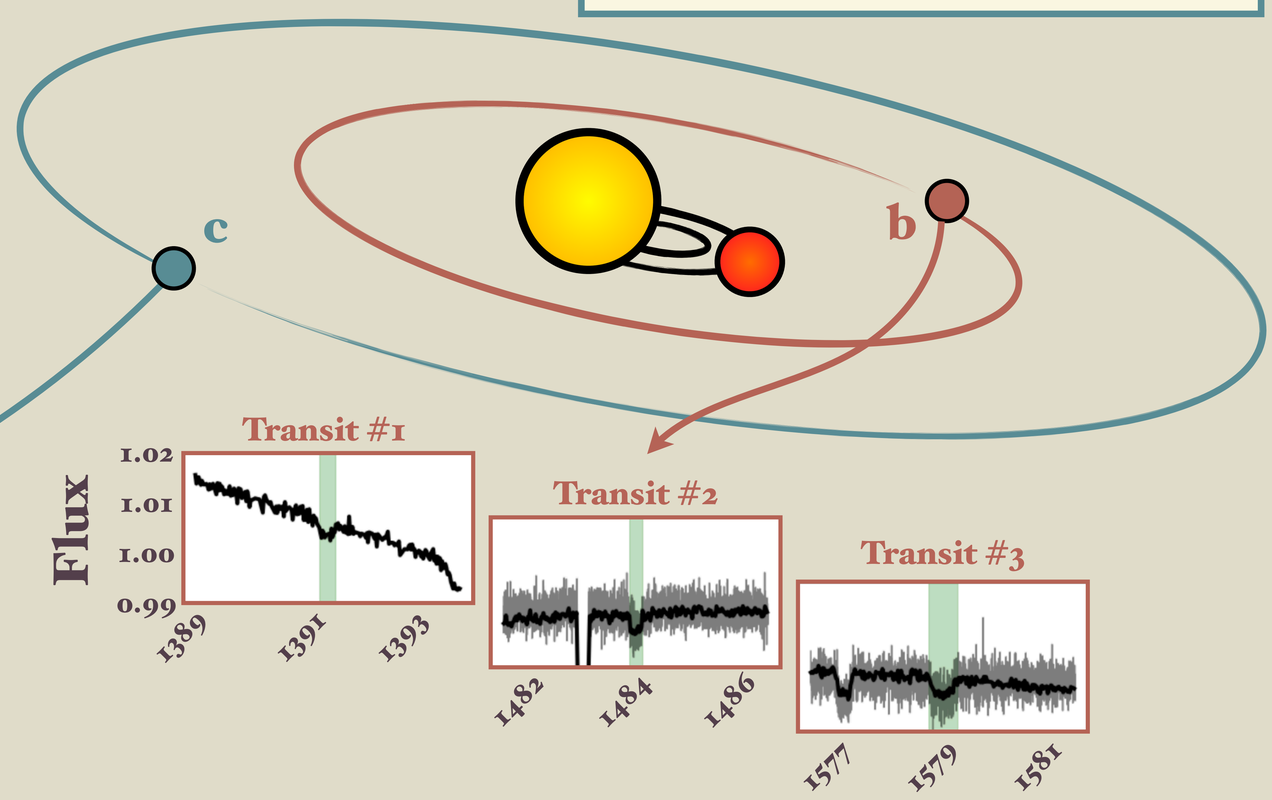


See Thomas Baycroft's talk (Monday 13:30) and Matthew Standing's poster (#750) for even newer, cooler stuff!

FIRST DISCOVERY - BEBOP 1 / TOI 1338

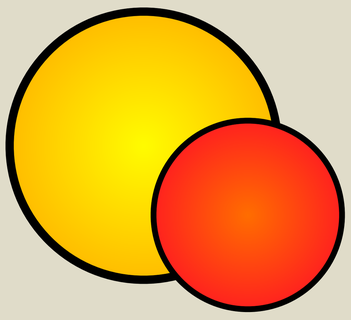
This target has an interesting history! In 2009 it was a candidate hot-Jupiter from WASP. It turned out to be a low-mass eclipsing binary, so it became EBLM J0608-59. We created the BEBOP survey in 2013 and it was one of the first targets. Then, in 2020, a 17 year old found a transiting planet in TESS on his second day on the job! It then became TOI-1338! Consequently, we upgraded the RVs to ESPRESSO and we found something! It just... wasn't the transiting planet at 95 days, but an outer planet at like 210 days or something. It became BEBOP-1, led by Matthew Standing (ESA fellow). We still can't see the transiting planet in RVs despite it being Saturn-sized... maybe it's inflated?





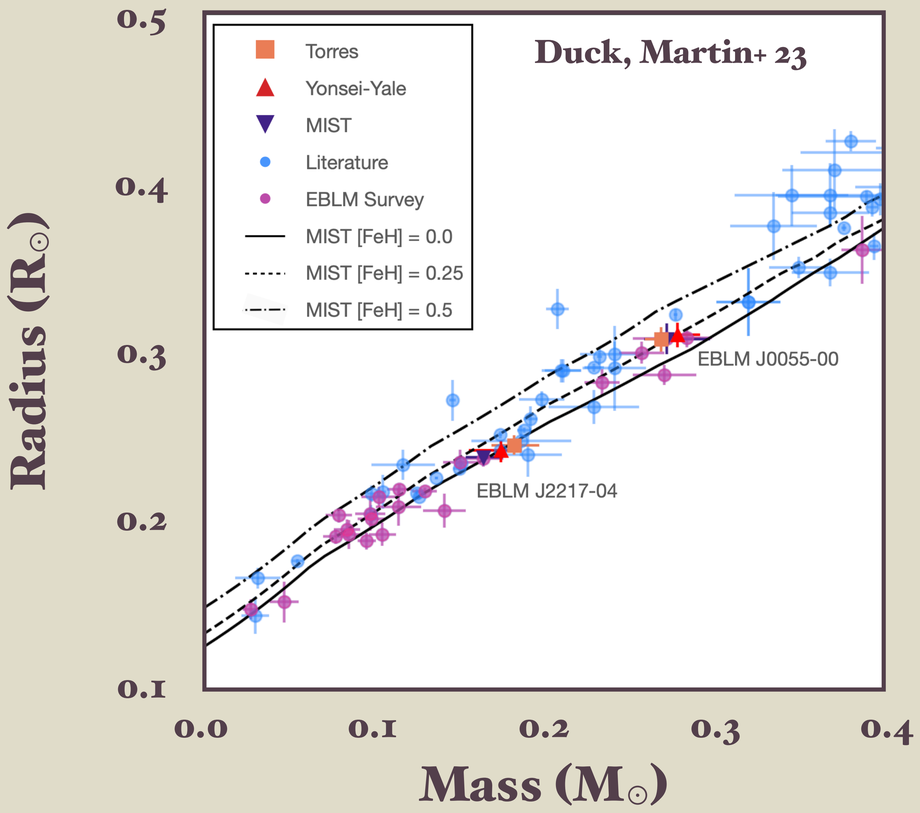
Kostov+ 20

EBLM - Eclipsing Binaries Low Mass



A survey of F/G/K + M-dwarf eclipsing binaries

EBLM has produced a bunch of really well-characterized eclipsing M-dwarfs. They are really nice. Hopefully that'll help folks do M-dwarf stuff like finding planets and such. Alison Duck (Ohio State PhD) found two of our best and is working on dozens more!



Ritika Sethi (MIT PhD student) discovered that tight binaries tend to have clumps of spots ("active longitudes") at the sub-stellar point (phase 0.25). It's something about magnetic fields... I think... I don't really understand magnetic fields.