Exoplanetary Science at UNSW

Chris Tinney, University of New South Wales

UNSW Exoplanets & Planets

Rob Wittenmyer

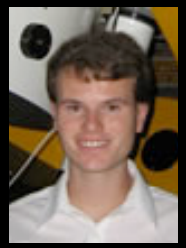
Jonti Horner

Duncan Wright

Jade Carter-Bond

Graeme Salter

Chris Tinney



Brett Addison

Stephen Parker

Jeremy Bailey

Lucyna Chudczer

Daniel Cotton

Forming Planets & Getting them to Survive

Jade Carter-Bond

- Terrestrial Planet Formation & Chemistry
- Host-star abundances

Jonti Horner

- n-body simulations of multiple planets
- Solar System Small bodies

Finding Planets

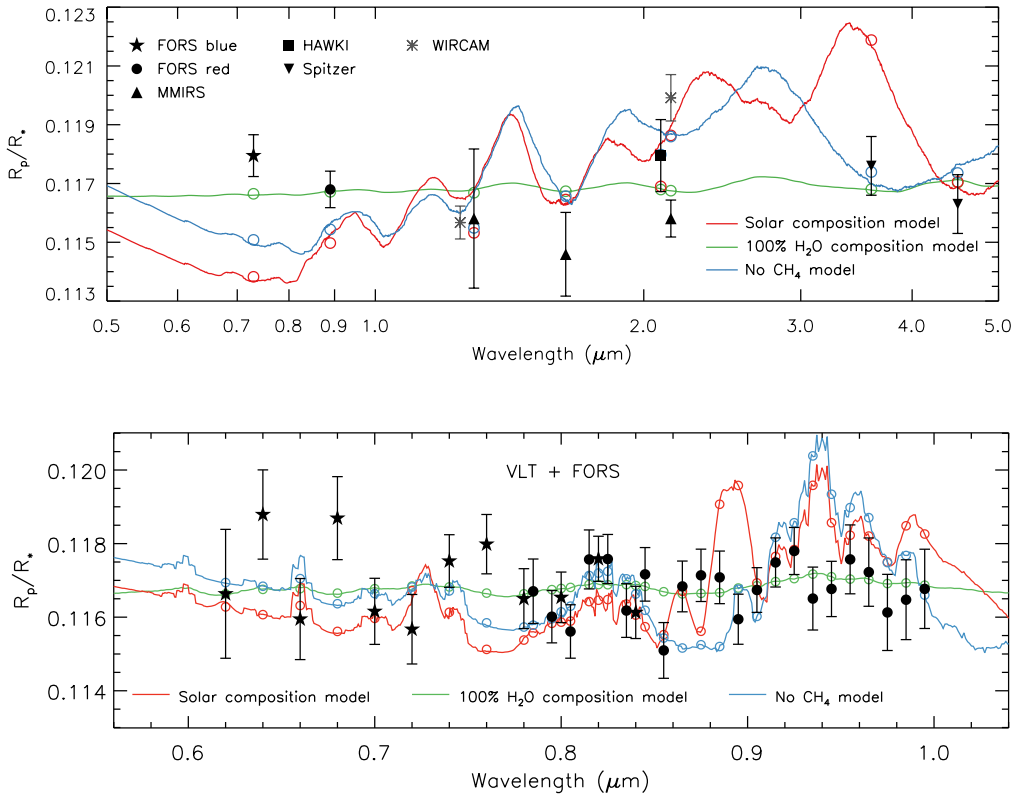
Graeme Salter

- Direct Adaptive Optics imaging

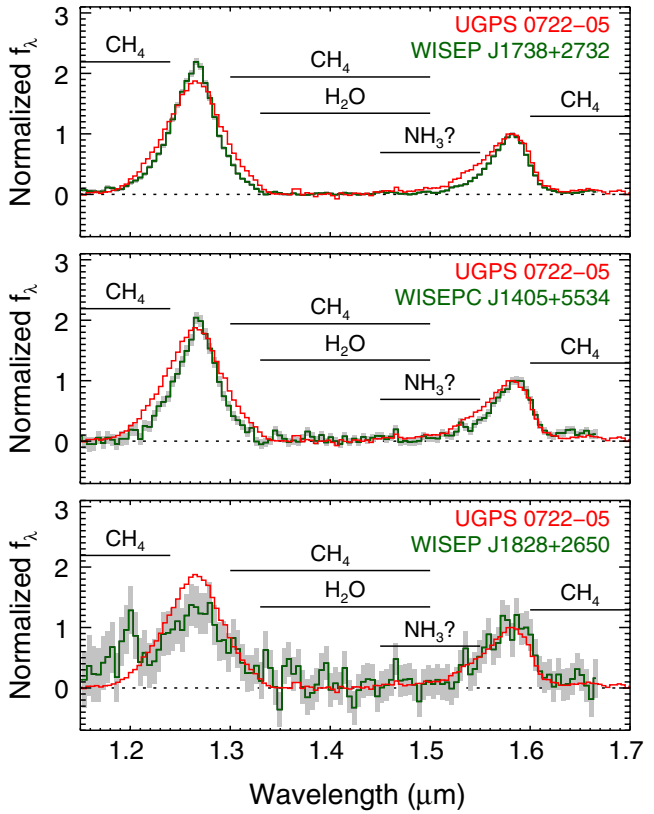
Stephen Parker

- Young cluster searches for planetary-mass objects

Getting decent spectra of "planets"



Bean et al. 2011



Cushing et al. 2011

WISE "planets"

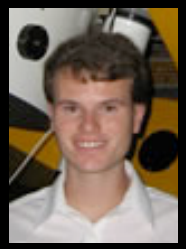
- Are free-floating planetary-mass objects brown dwarfs or planets? (Sumi et al. 2011)
- WISE data will reveal even colder objects in the next few years at d~10pc with J>21
- Gemini GeMS MCAO imaging can measure distances directly!
- Magellan+FIRE can get spectra

Rob Wittenmyer

- Pan-Pacific Planet Search (sub-giants)
- alpha Cen search (Mt John, NZ)
- Anglo-Australian Planet Search

Duncan Wright

- “Iodine-less” velocities
- HAT South Transit Follow-up
- Future M-dwarf searches



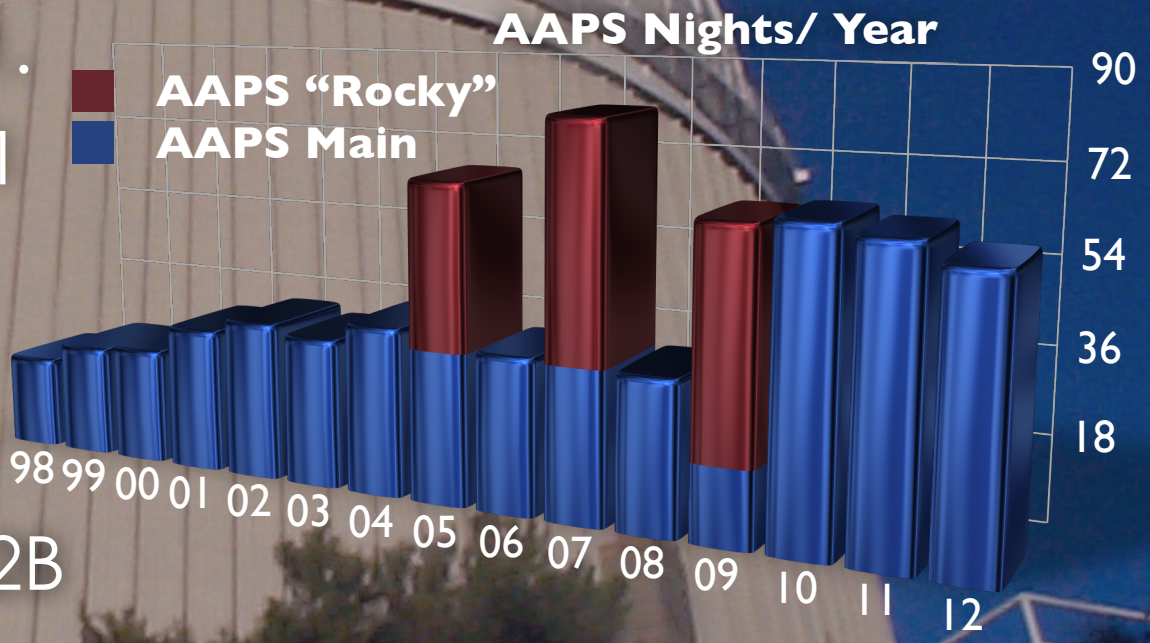
Brett Addison

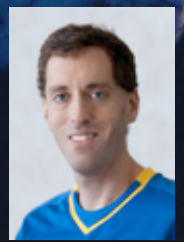
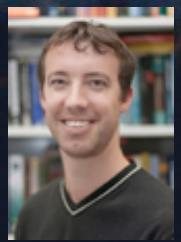
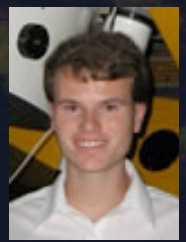
- Transit Follow-up & characterisation
- Rossiter-McLaughlin

Anglo-Australian Planet Search

with Paul Butler, Hugh Jones, Geoff Marcy, Brad Carter, Jeremy Bailey, Simon O'Toole

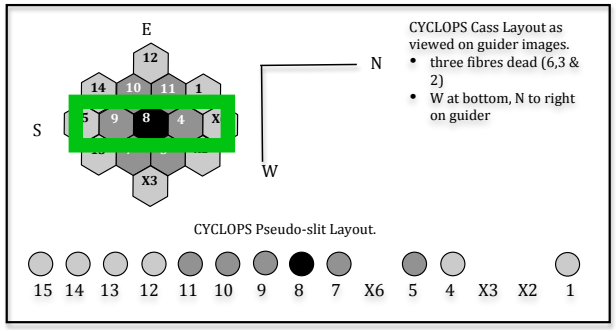
- Established in 1998
- First planet in 2001.
- ~32n/yr since 2001
- "Rocky Planet" campaigns in 05, 07 & 09
- 50n/yr from 09B-12B
- I_2 cell spectroscopy

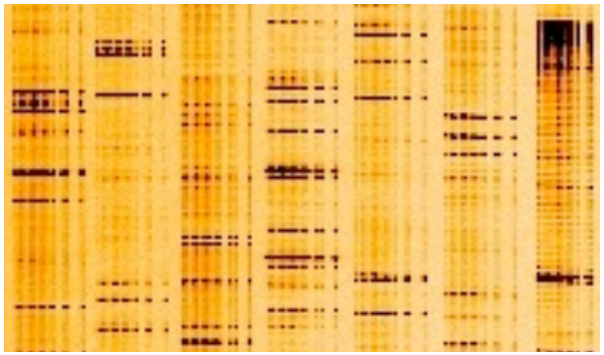


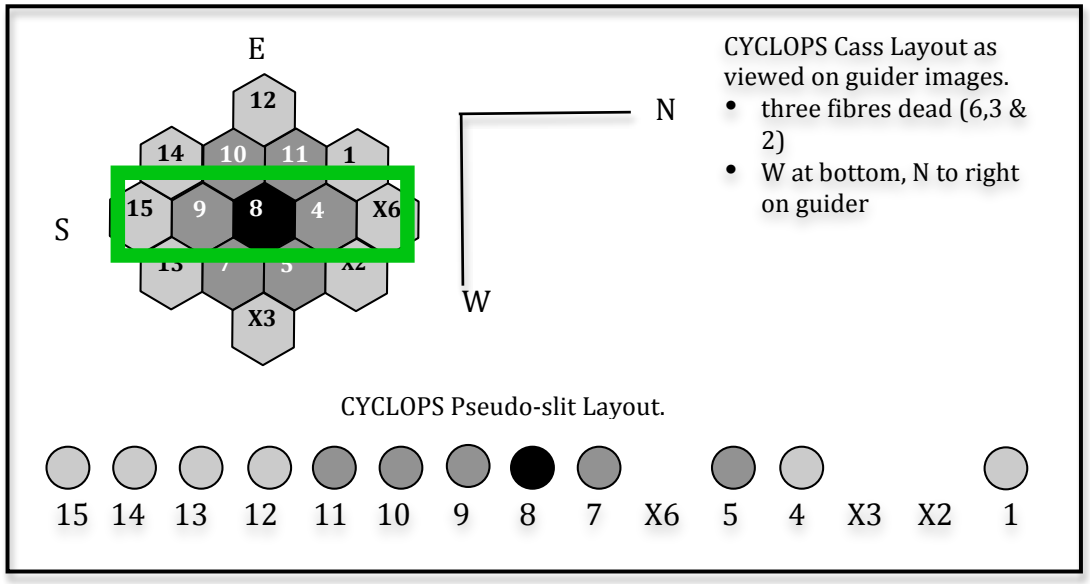
Transit Planets

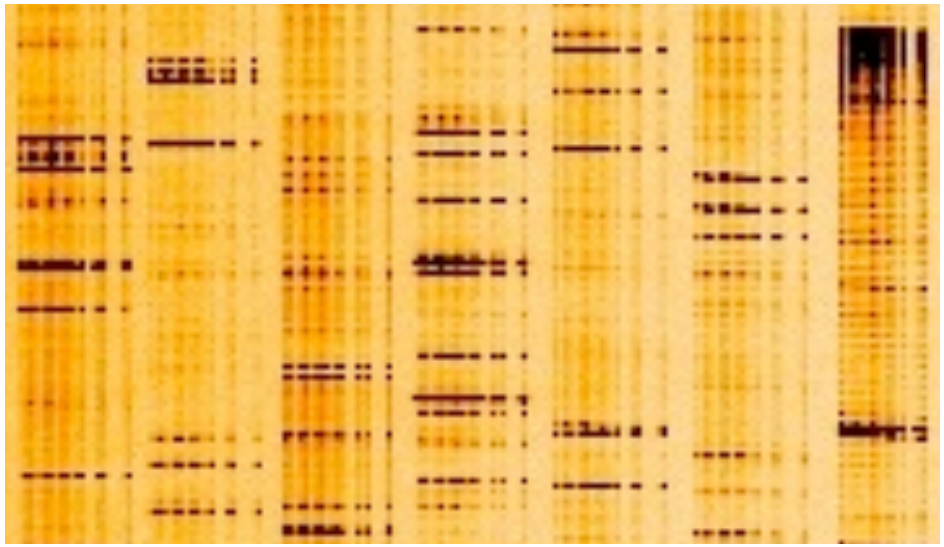
- HAT South (Bayliss et al. at ANU)
- Using CYCLOPS to obtain iodine-less velocities for faint (V=12-14) targets
- delivers data that can be calibrated to 1-2m/s (differential)





CYCLOPS


E
S
N
W
12
14
10
11
1
15
9
8
4
X6
X3
CYCLOPS Cass Layout as viewed on guider images.
• three fibres dead (6,3 & 2)
• W at bottom, N to right on guider
CYCLOPS Pseudo-slit Layout.
15 14 13 12 11 10 9 8 7 X6 5 4 X3 X2 1

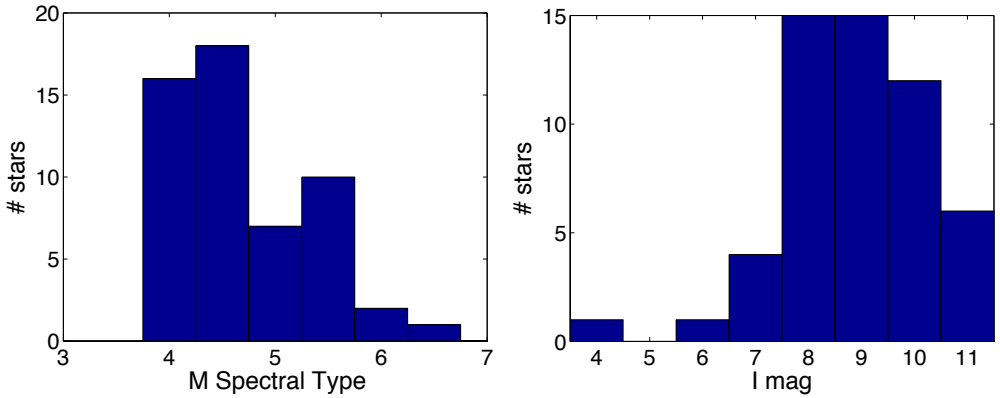


CYCLOPS2

- UNSW-funded new bundle, with all 15 fibres working
- An additional fibre that can deliver a ThXe arc *simultaneously* with data!
    - Deliver 1 m/s iodineless velocities because we can *calibrate* how UCLES changes for every exposure.

M-dwarfs?

- "State of the art" is 105 M-dwarfs at HARPS on 46n over 4 years.
- 42 have more than 10 epochs, and 4 of those are later than M4 (i.e. < 0.5Msun)
- CYCLOPS2+ UCLES+MITLL3 can work at 700-900nm …



- 5Mearth "habitable zone" planets become doable.

The Future

- Its always better to calibrate a *stable* system as well as you can.
- Really should UCLES with a thermally and pressure-stabilised new spectrograph, then apply what we've learned about calibrating UCLES to that!
- We just need to do it for less than the $20m that HARPS cost.

Veloce

- A Kiwi-spec inspired, asymmetric white pupil, near-Littrow design. Thermally and pressure stabilised
- Three cameras
  - R~120,000 at Hbeta-Halpha
  - R~75,000 at 390nm-Hbeta
  - R~75,000 at Halpha-950nm
- 19 element "CYCLOPS" feed + simultaneous calibration
- Contact me if you think the AAO Forward Look should be building one of these!