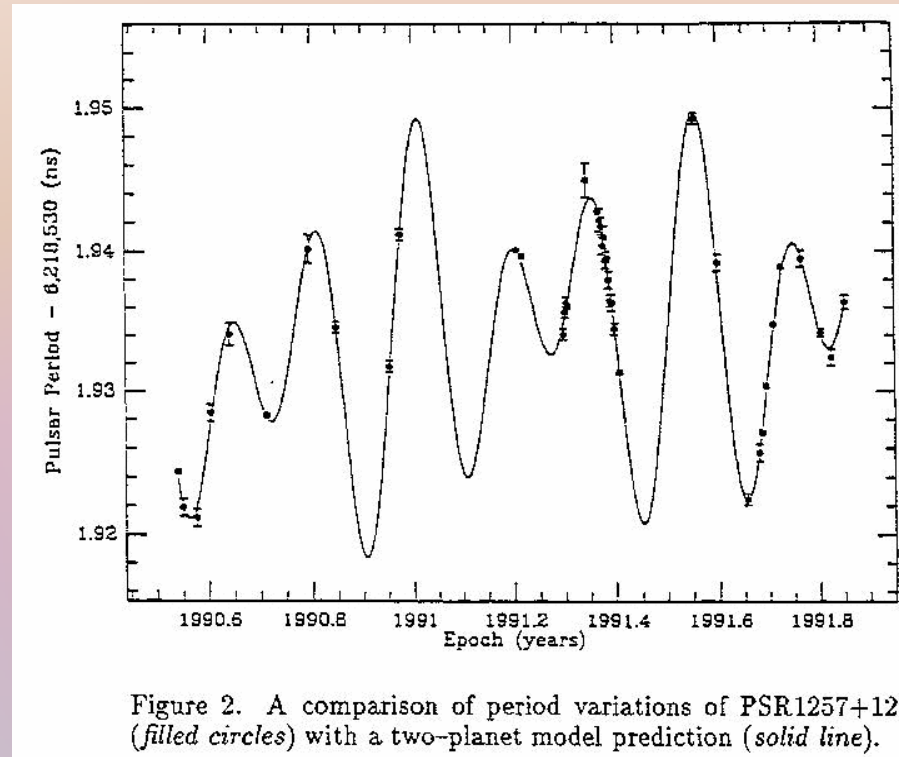




Czy można zobaczyć planety poza Układem Słonecznym?

Wojtek Pych
Centrum Astronomiczne M. Kopernika
Warszawa

Pierwsze odkrycie Aleksander Wolszczan 1991 r.



A planetary system around the millisecond pulsar PSR1257+12

1992, Nature vol. 355, str. 145-147

1000 light-years from the Sun

Pierwsze odkrycie Aleksander Wolszczan 1991 r.

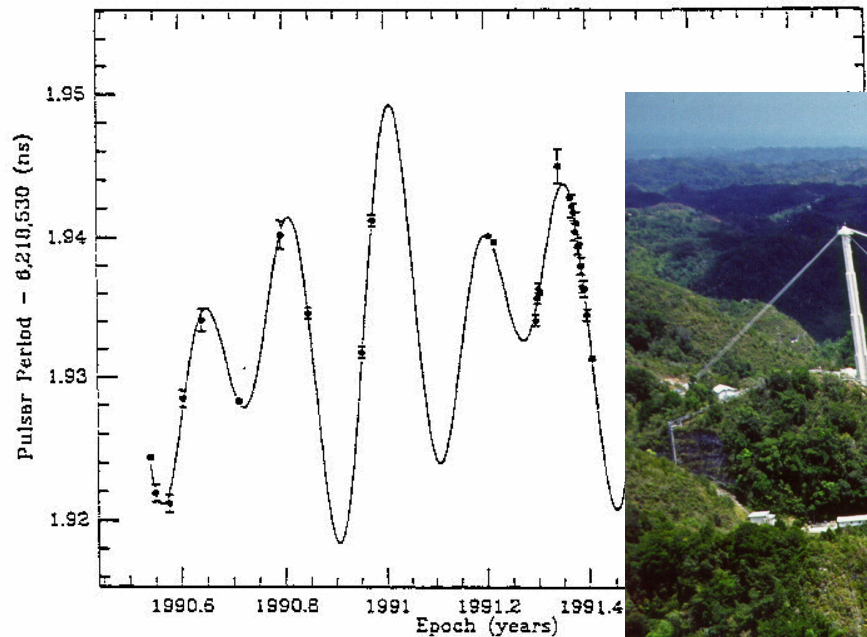
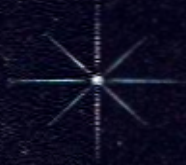


Figure 2. A comparison of period variation (filled circles) with a two-planet model pre



Pulsar
1257+12



Planet 1
0.19 AU
 ≥ 0.015 Earth

Planet 2
0.36 AU
 ≥ 3.4 Earths

Planet 3
0.47 AU
 ≥ 2.8 Earths

50,000,000 km

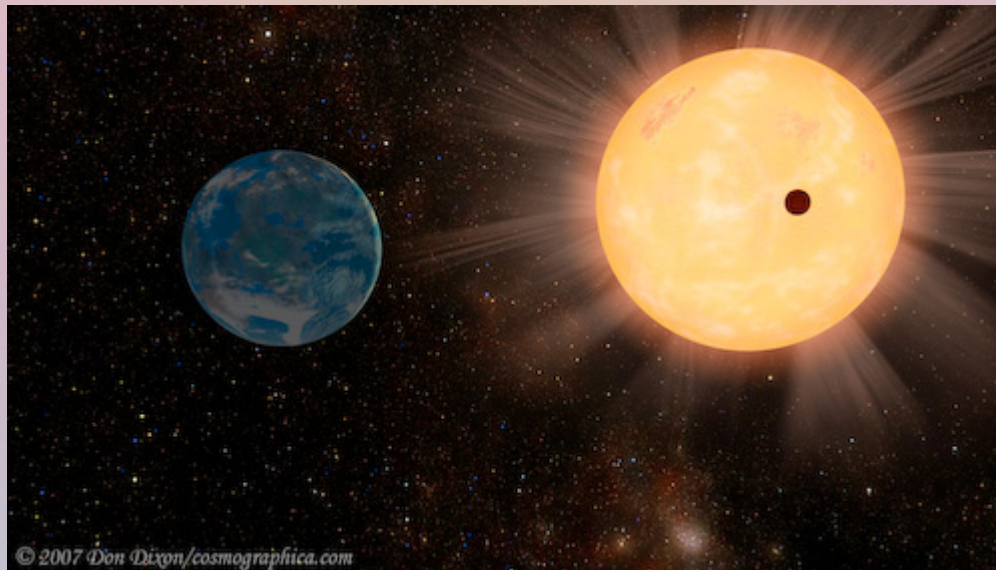


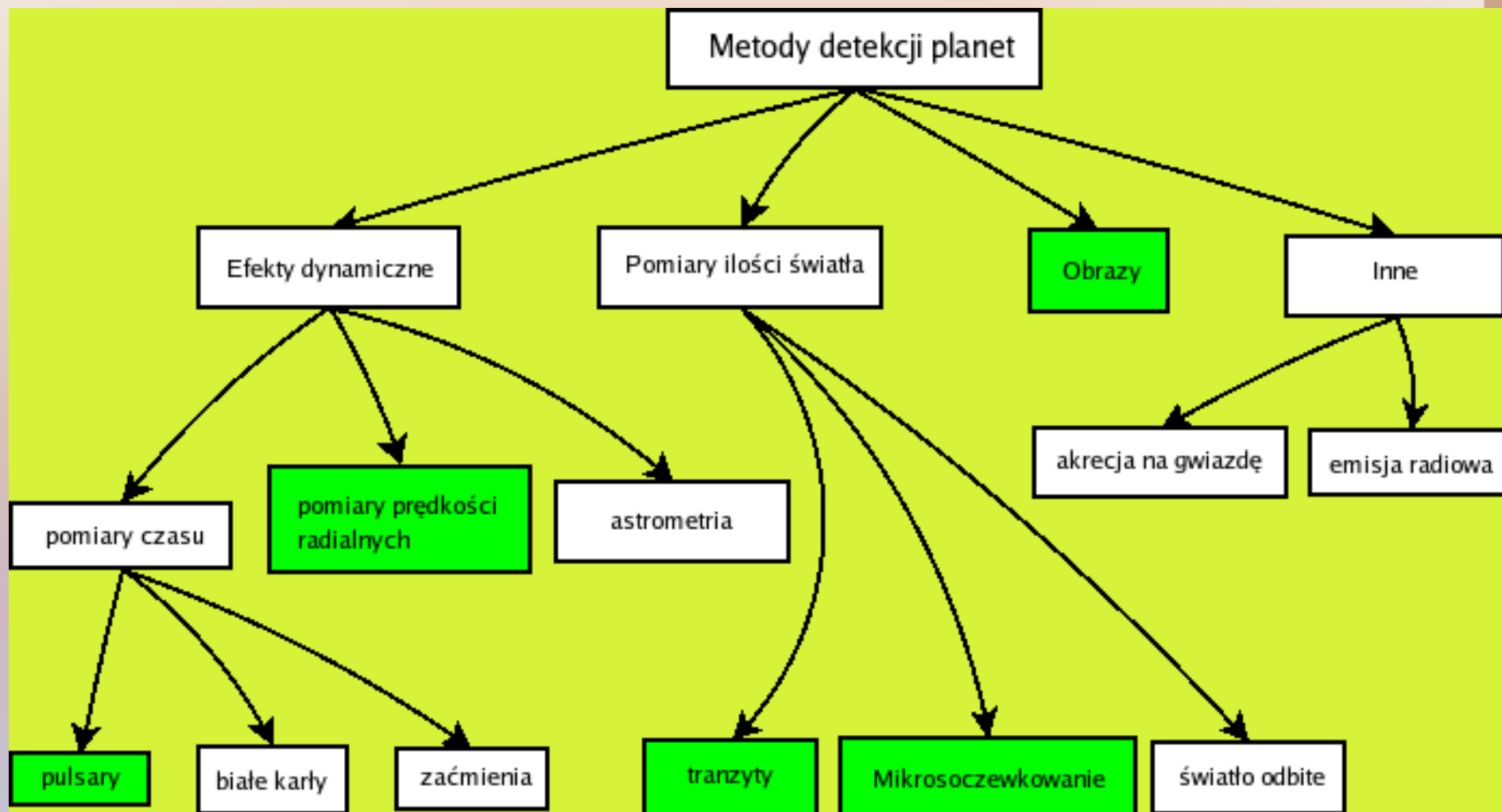
Sun

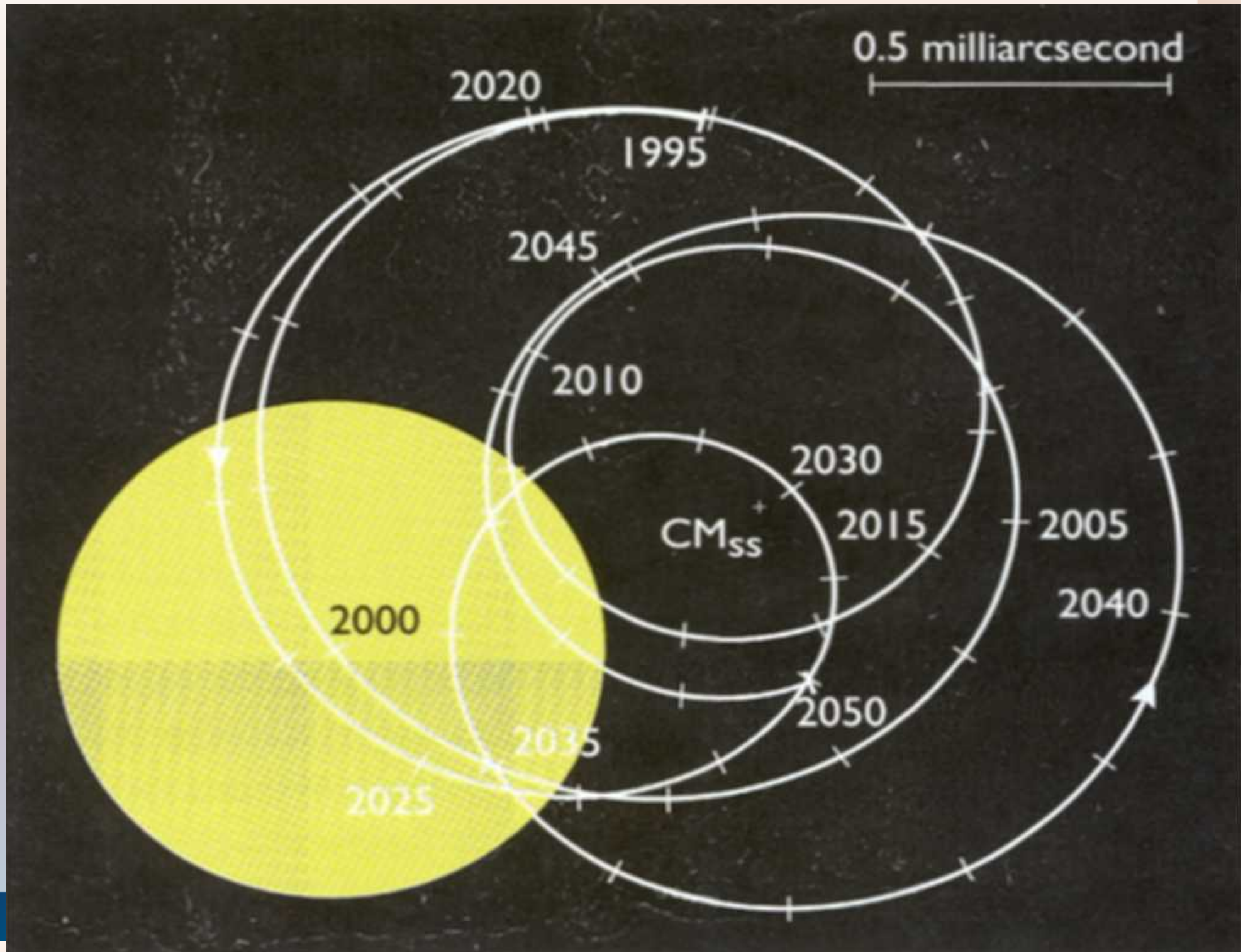
Mercury
0.387 AU
0.055 Earth

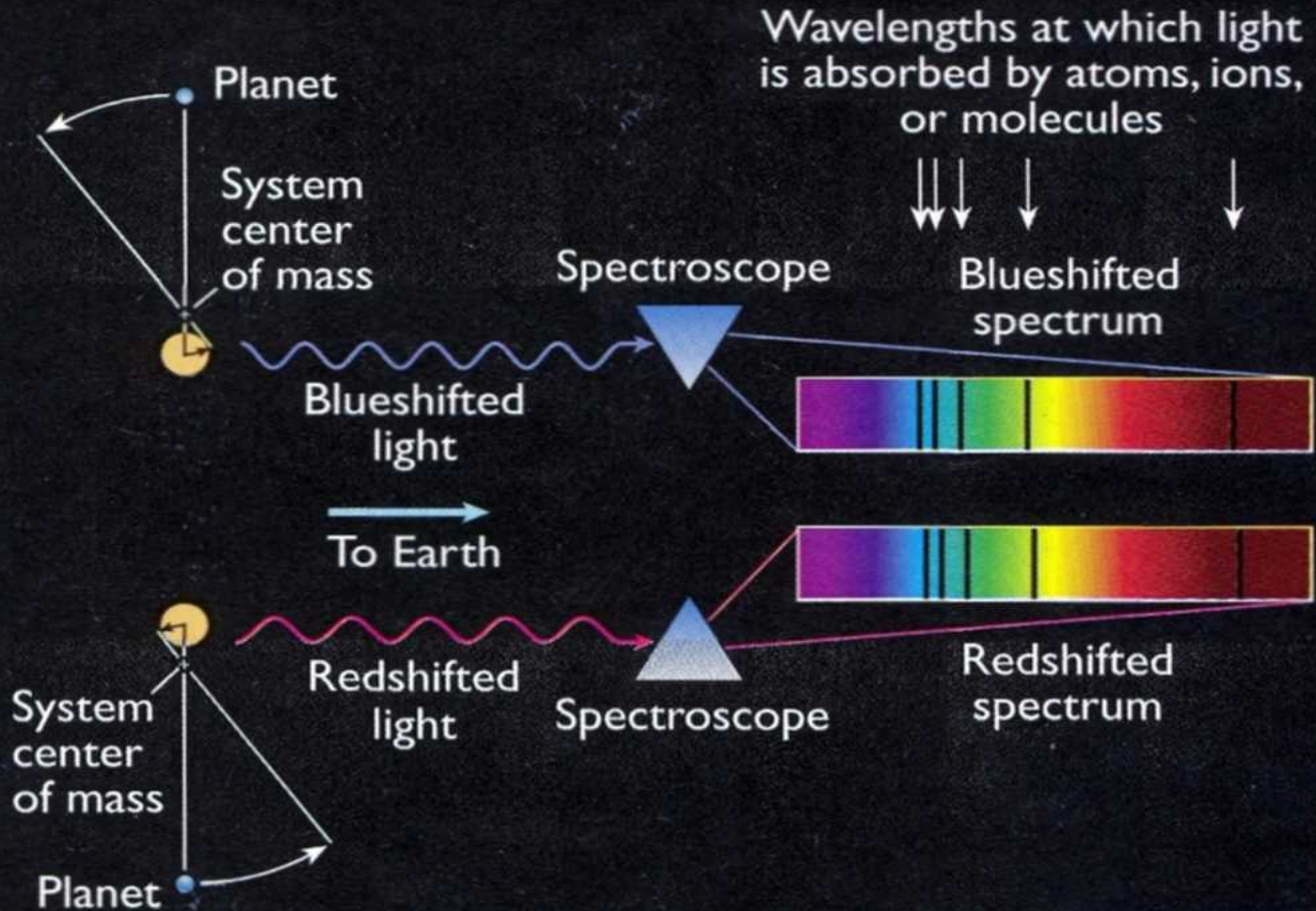
Venus
0.723 AU
0.815 Earth

W jaki sposób odkryć odległą planetę?



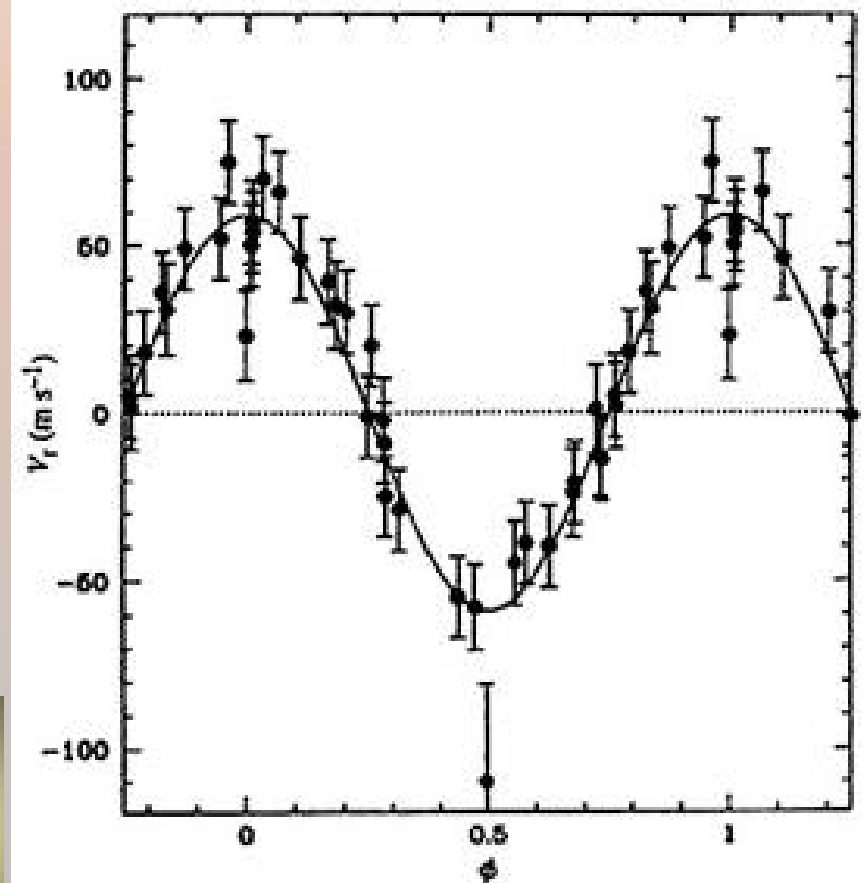
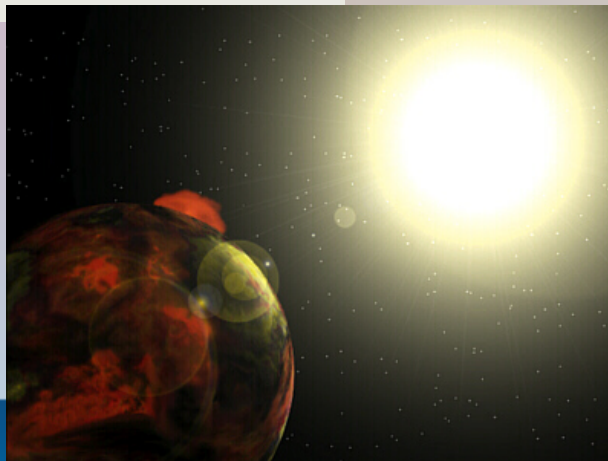




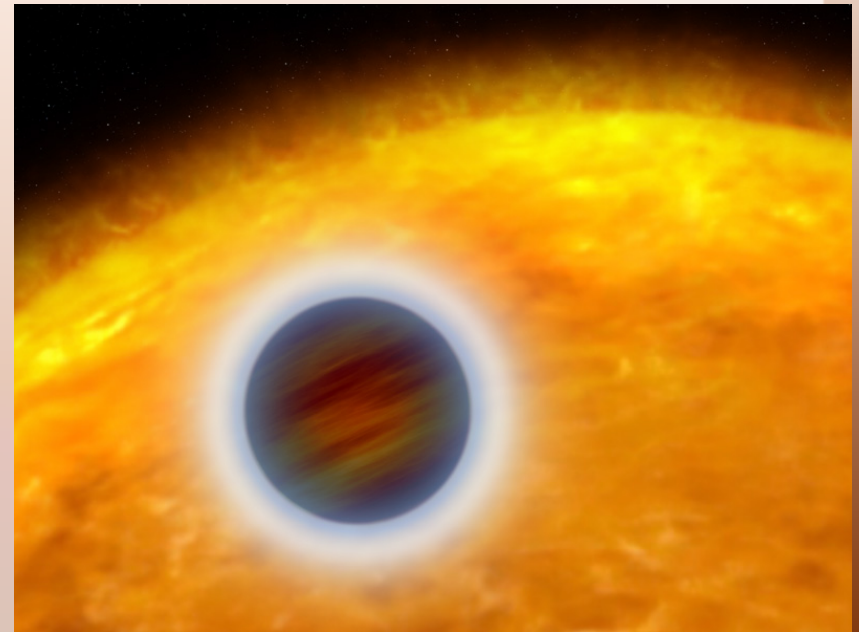
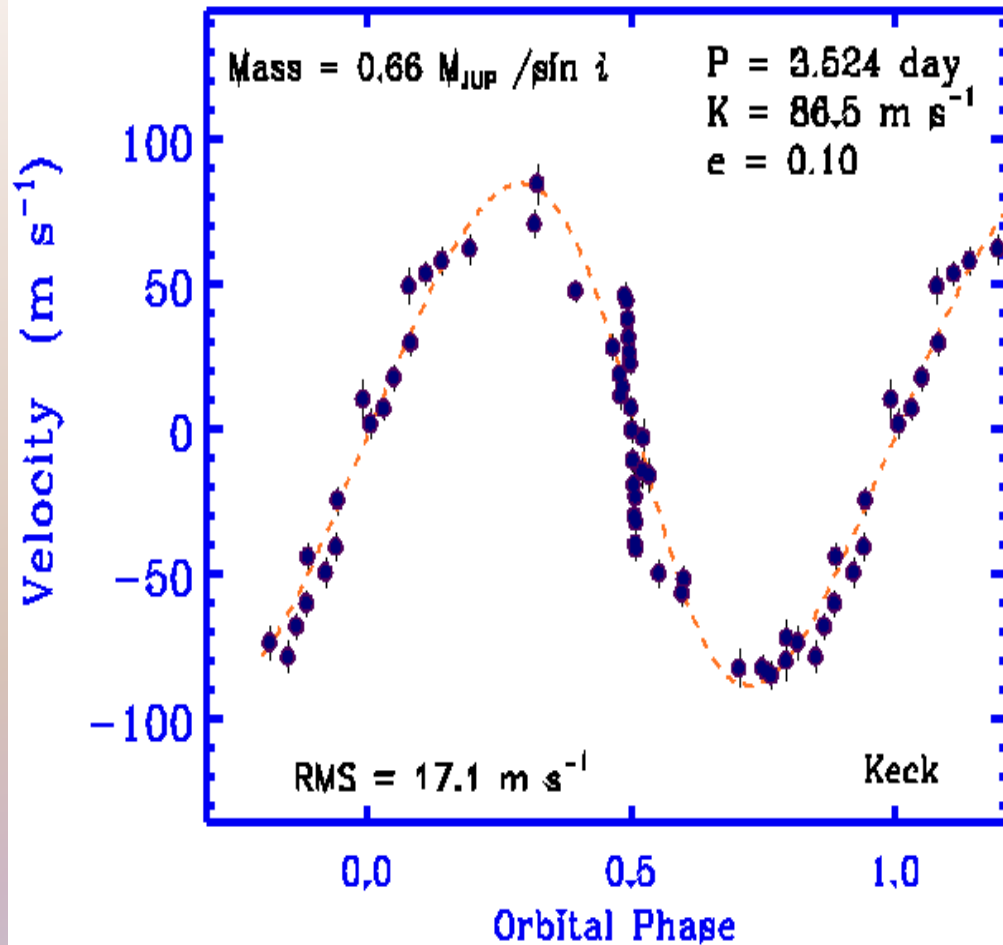


Pierwsza planeta wokół gwiazdy podobnej do Słońca

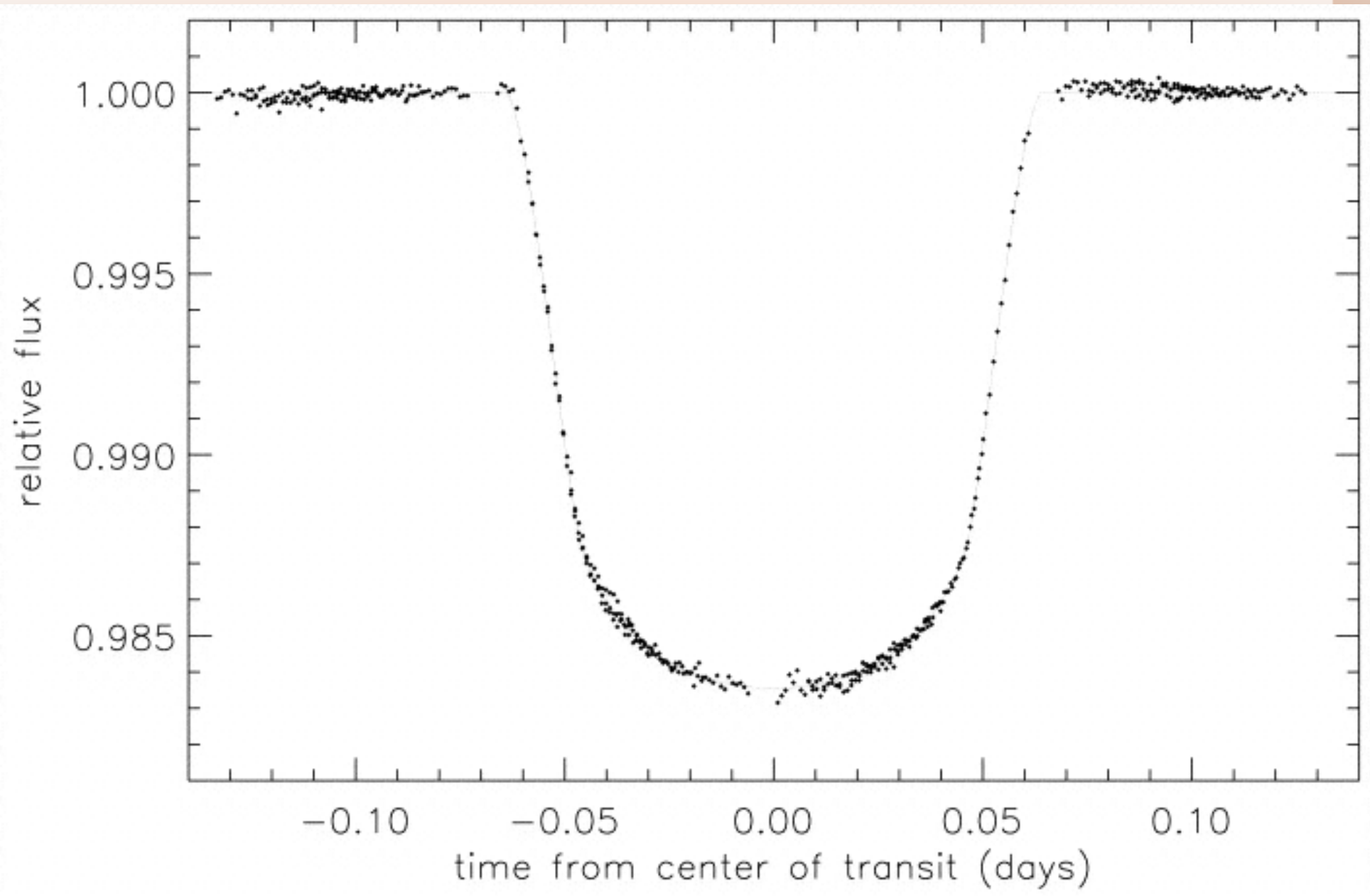
Name:	51 Peg b
M.sini:	0.46 M_J
Semi-major axis:	0.0512 AU
Orbital period:	4.23 d.
Eccentricity:	0.013
Omega (deg):	31
T_peri (JD-2450000):	68.89
Inclination:	-



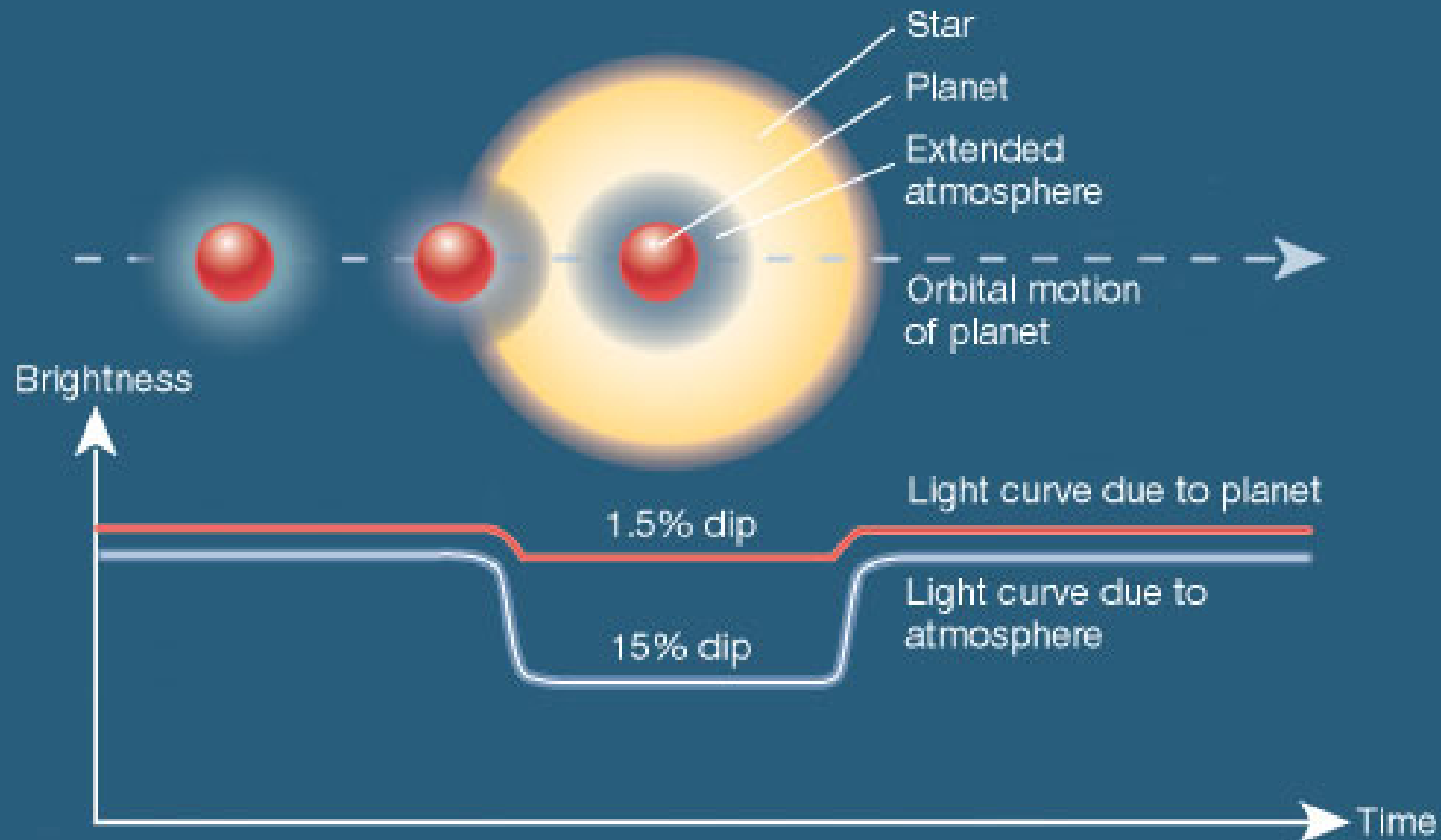
HD209458



Name:	HD 209458 b
M.sin<i>i</i>:	$0.69 \pm 0.05 M_{\text{J}}$
Radius	$1.43 \pm 0.04 R_{\text{Jup}}$
Semi-major axis:	0.045 AU
Orbital period:	$3.524738 \pm 0.000015 \text{ d.}$
Eccentricity:	0.0
Omega (deg):	83
T_{peri} (JD-2450000):	1585.85
Inclination:	86.1 ± 0.1

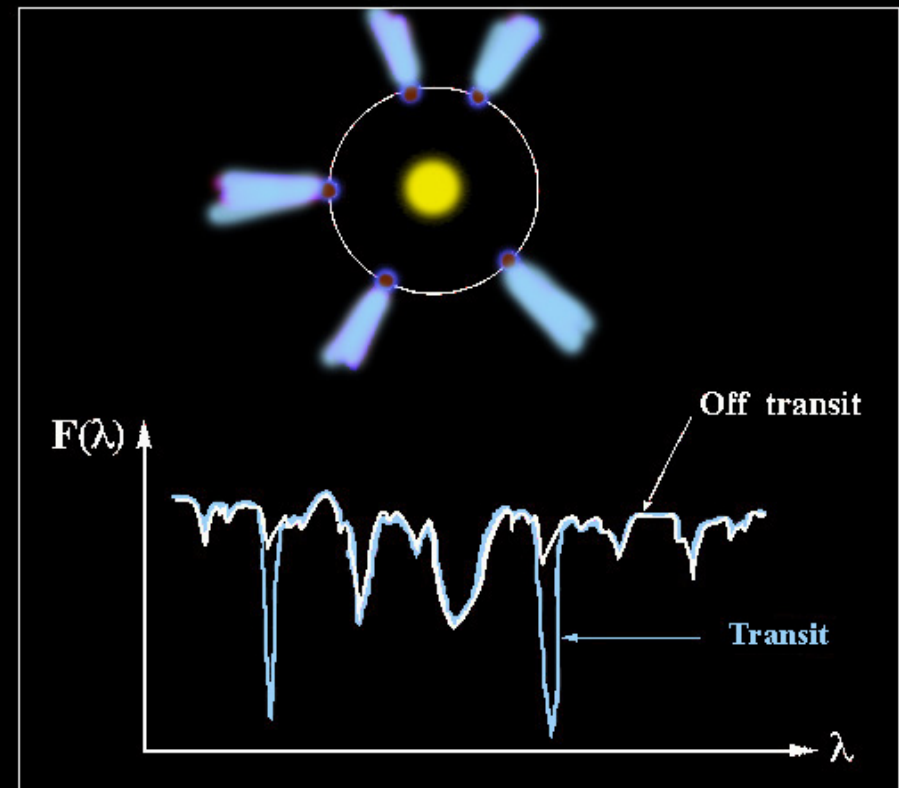
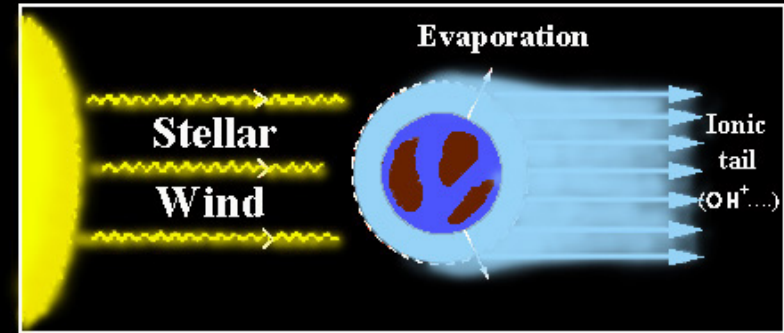


Schemat tranzytu



Wyznaczanie składu chemicznego atmosfery

Tail Close orbit planet (51 Peg)



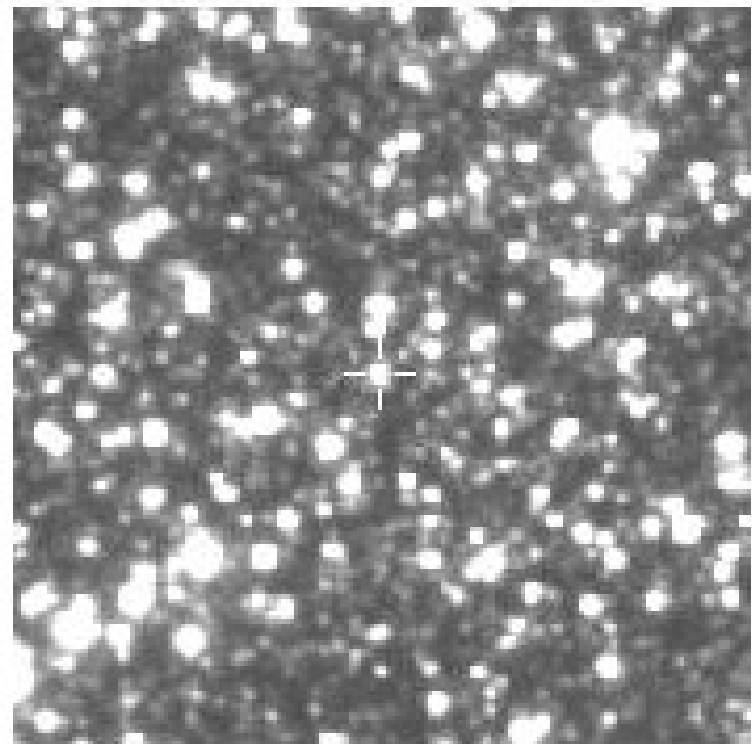
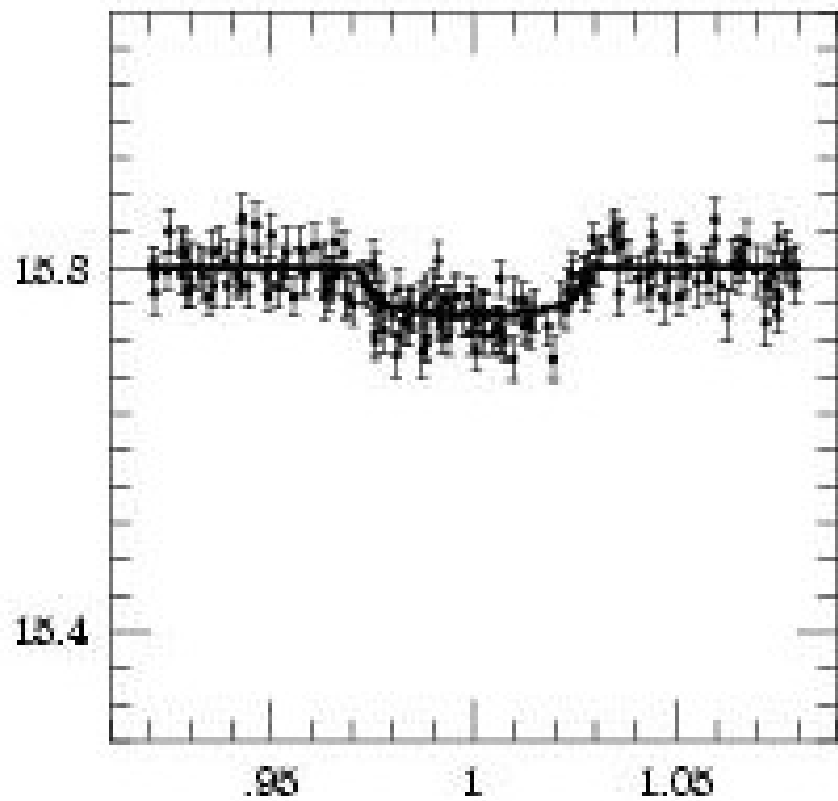
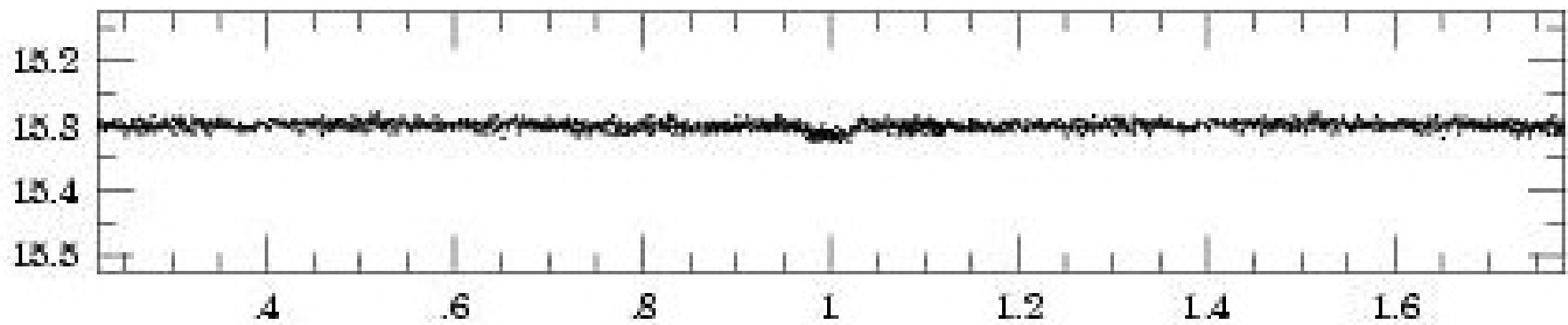


OGLE

ok. 220
obiektów z
tranzytami

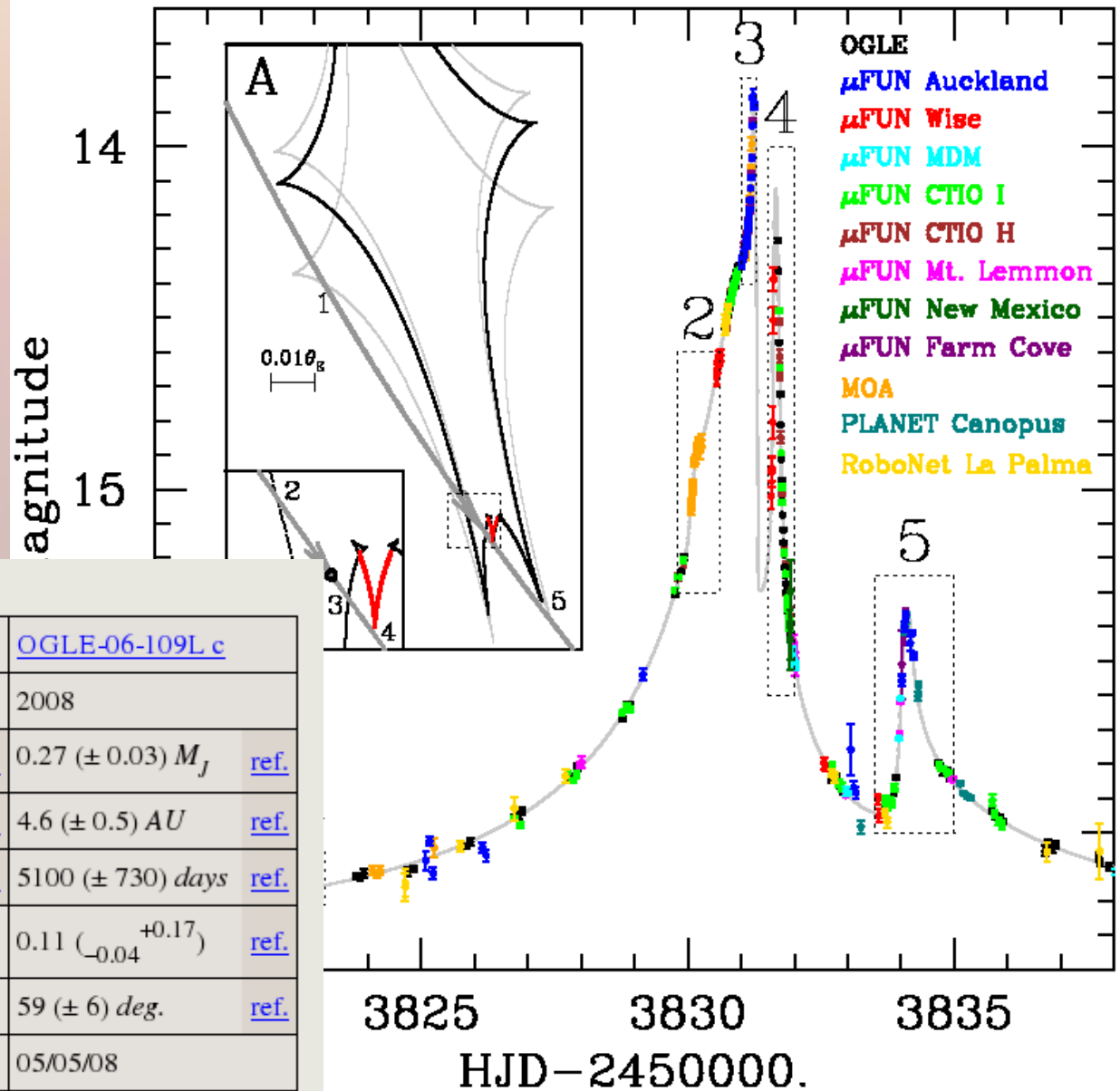
7 planet
potwierdzonych
spektroskopowo

OGLE-TR-56 P=1.21190 (days)



Mikrosoczewkowanie

9 planet
(8 układów)



- Basic data :

Name	OGLE-06-109L b	OGLE-06-109L c
Discovered in	2008	2008
Mass	0.71 (\pm 0.08) M_J ref.	0.27 (\pm 0.03) M_J ref.
*-Planet Dist. (proj.)	2.3 (\pm 0.2) AU ref.	4.6 (\pm 0.5) AU ref.
Orbital period	1825 (\pm 365) days ref.	5100 (\pm 730) days ref.
Eccentricity	-	0.11 ($_{-0.04}^{+0.17}$) ref.
Inclination	-	59 (\pm 6) deg. ref.
Update	14/02/08	05/05/08

Podsumowanie odkryć

15 listopada 2009 r

Znamy 405 planet poza Układem Słonecznym:

377 odkrytych metodą pomiarów prędkości radialnych

62 odkryte metodą obserwacji tranzytów

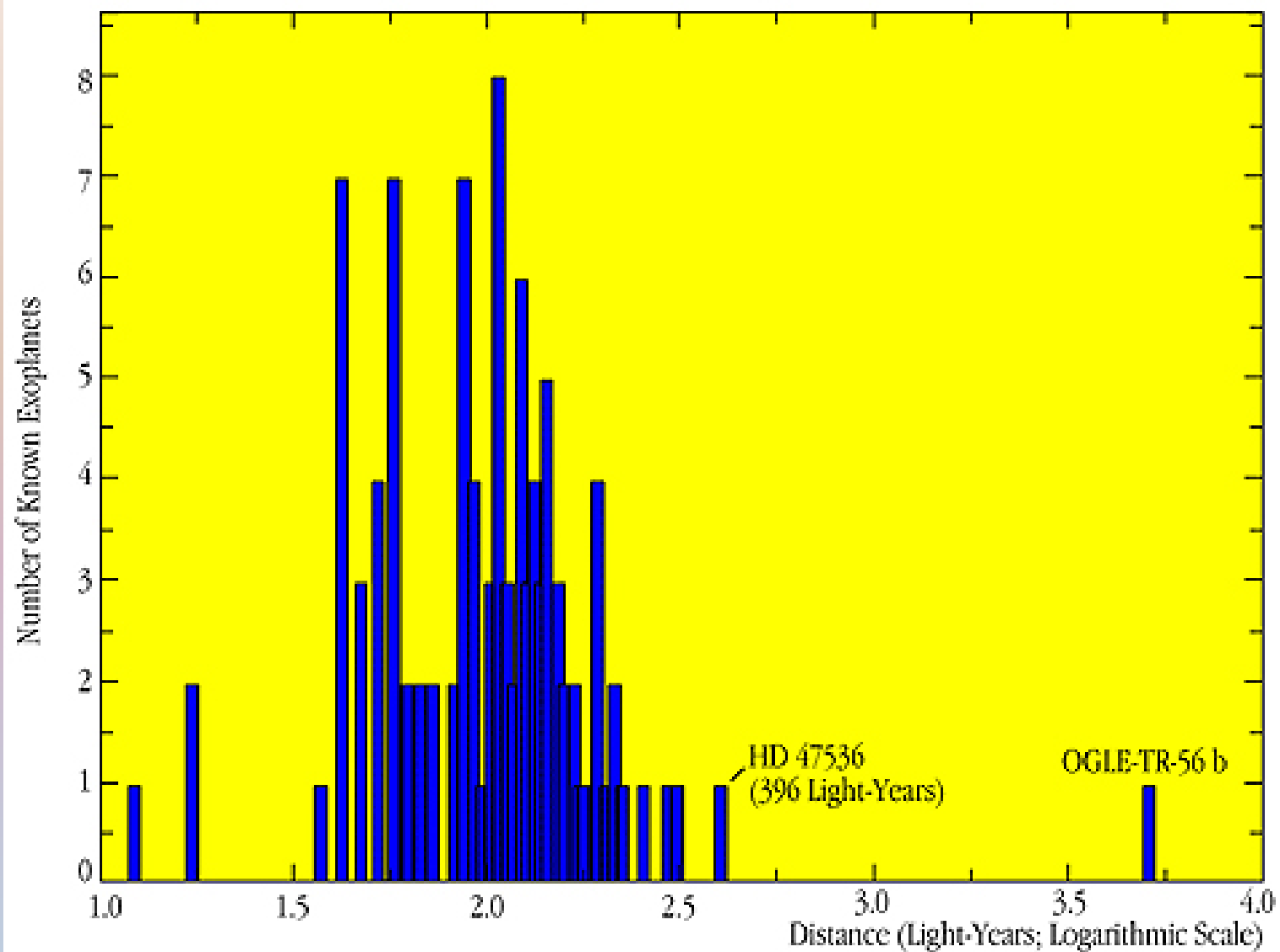
11 odkrytych za pomocą obrazowania

9 odkrytych metodą obserwacji mikrosoczewkowania

8 odkrytych metodą pomiarów czasu

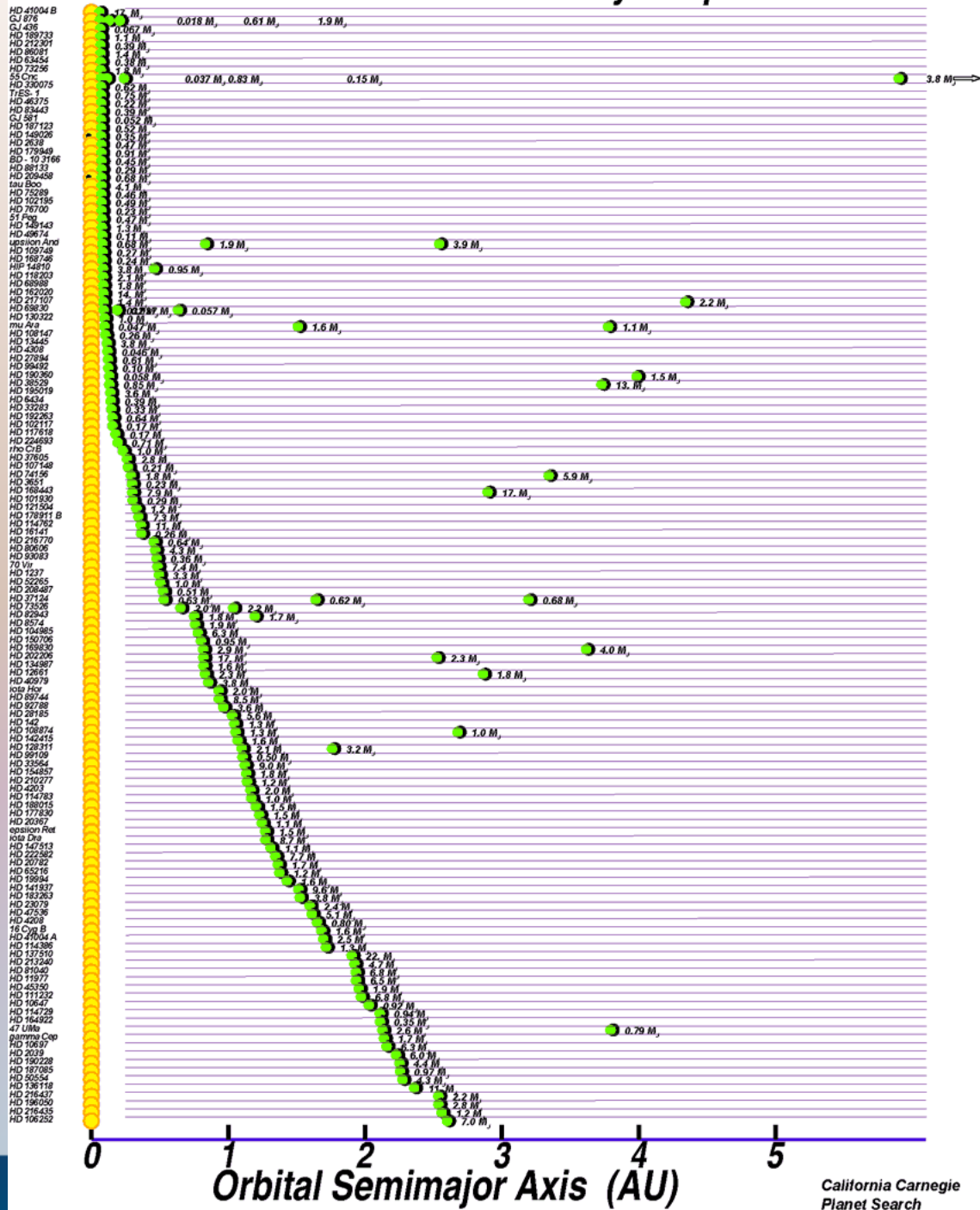
+ 64 odkrycia niepotwierdzone lub kontrowersyjne

Odległości od Słońca



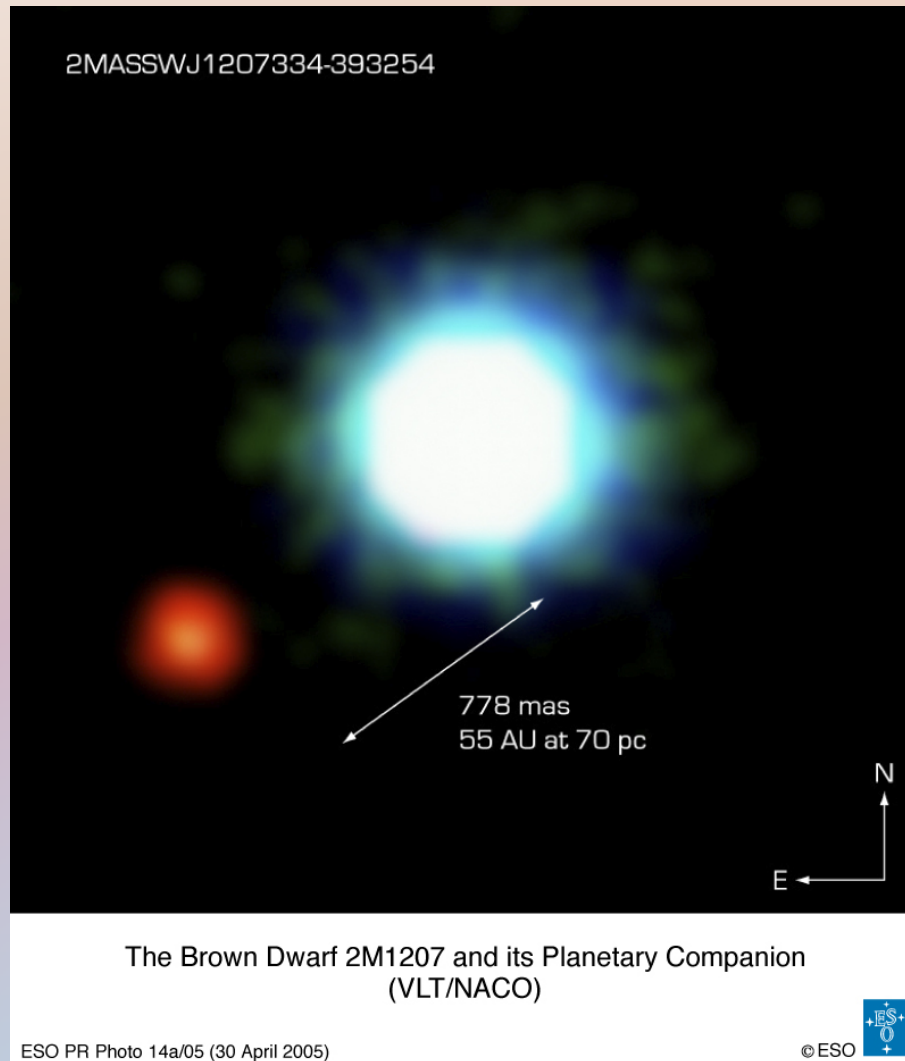
Distribution of Exoplanet Distances

The 178 Known Nearby Exoplanets



Rozmiary orbit

2M1207

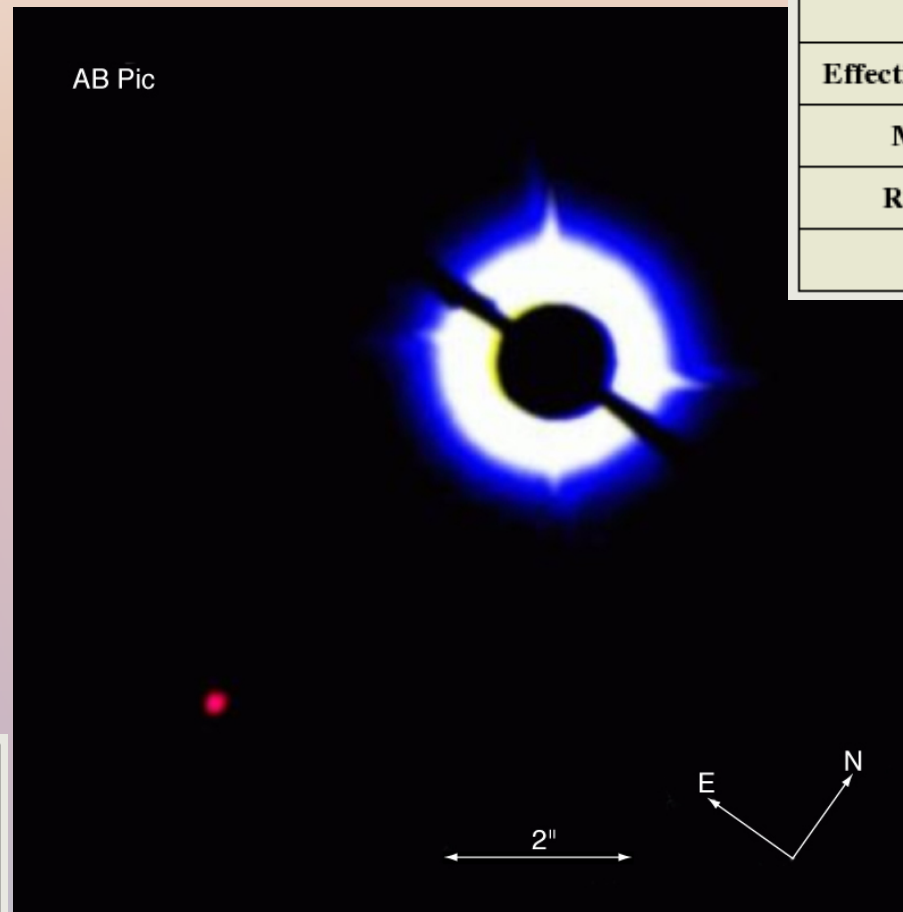


Name	2M1207
Distance	52.4 (\pm 1.1) pc ref.
Spectral Type	M8
Apparent Magnitude V	20.15
Apparent Magnitude I	15.95
Apparent Magnitude J	13
Mass	0.025 M_{sun}
Age	0.008 Gyr ref.
Right Asc. Coord.	12 07 33
Decl. Coord.	-39 32 54

Name	2M1207 b
Discovered in	2004
Mass	4 ($_{-1}^{+6}$) M_J ref.
*-Planet Dist. (proj.)	46 (\pm 5) AU ref.
Radius	1.5 R_J
Update	07/11/07

AB Pic

Name	AB Pic
Distance	45.6 (\pm 1.2) <i>pc</i>
Spectral Type	K2 V
Apparent Magnitude V	9.16
Age	0.03 <i>Gyr</i> ref.
Effective Temperature	4875 <i>K</i> ref.
Metallicity [Fe/H]	-0.64 ref.
Right Asc. Coord.	06 19 12
Decl. Coord.	-58 03 15



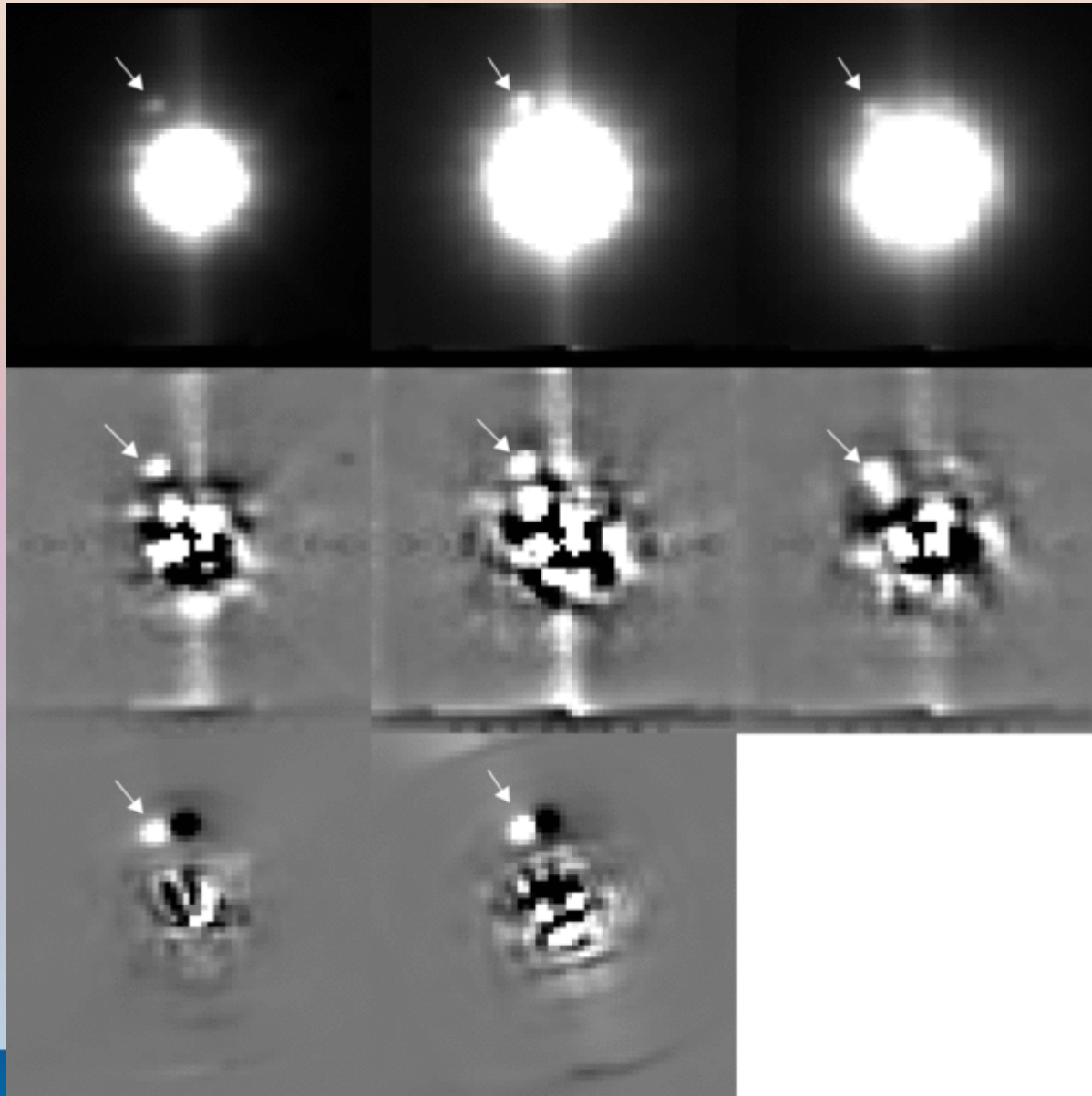
The Star AB Pictoris and its Companion
(VLT/NACO)

ESO PR Photo 14d/05 (30 April 2005)



Name	AB Pic b
Discovered in	2005
Mass	13.5 (\pm 0.5) M_J
*-Planet Dist. (proj.)	275 <i>AU</i>
Update	24/07/07

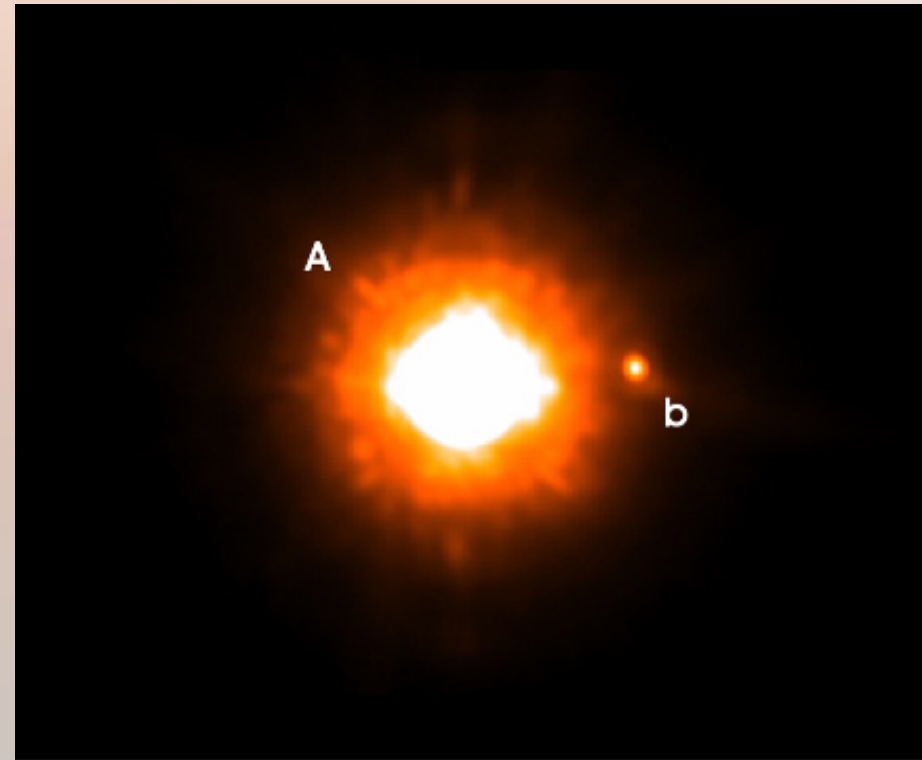
GQ Lup



GQ Lup

Name	GQ Lup
Distance	140 (\pm 50) <i>pc</i>
Spectral Type	K7eV
Apparent Magnitude V	11.4
Mass	0.7 M_{sun}
Age	0.001 (\pm 0.001) <i>Gyr</i> ref.
Right Asc. Coord.	15 49 12
Decl. Coord.	-35 39 03

Name	GQ Lup b
Discovered in	2005
Mass	21.5 (\pm 20.5) M_J
*-Planet Dist. (proj.)	103 (\pm 37) <i>AU</i>
Radius	1.8 R_J
Update	14/02/06



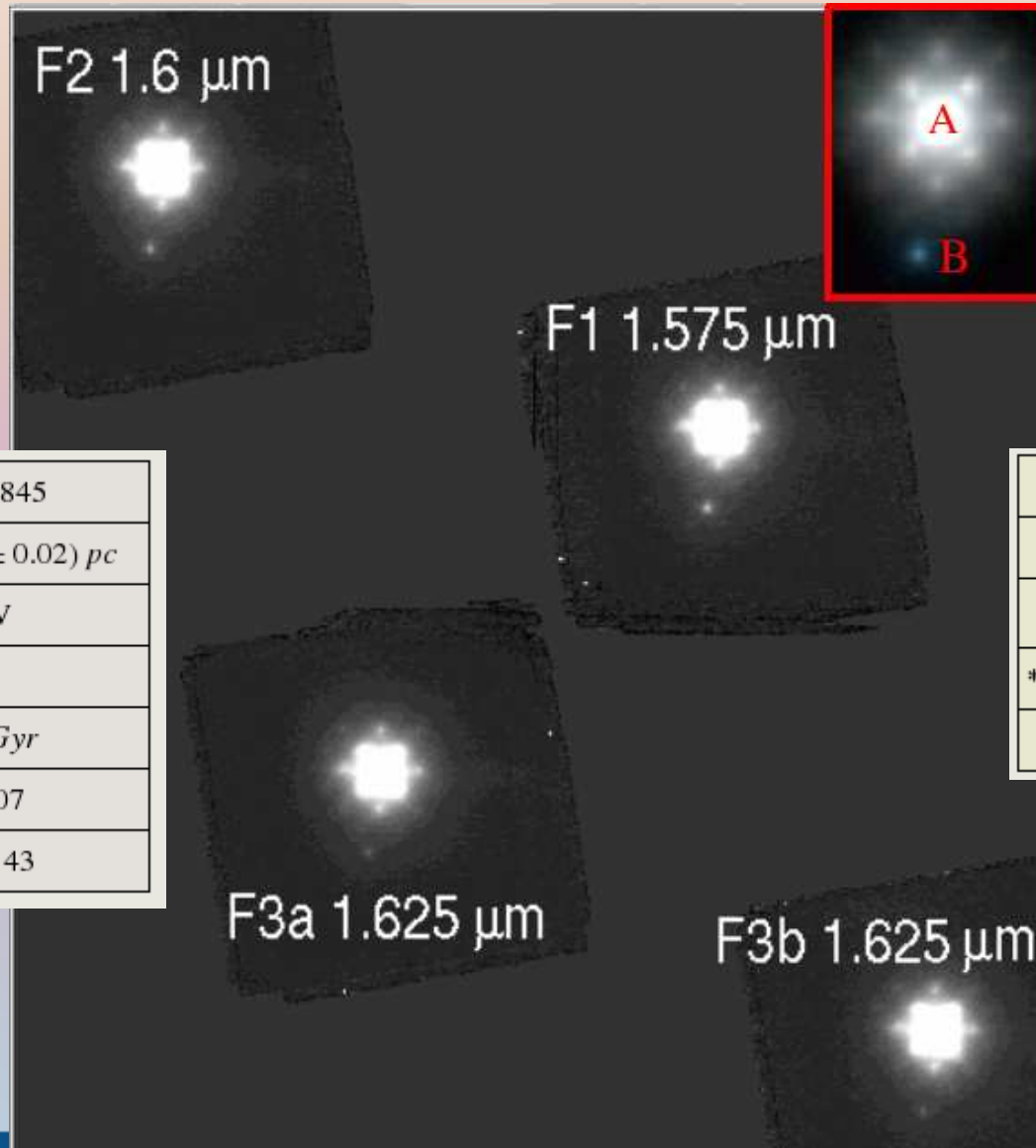
The Sub-Stellar Companion to GQ Lupi
(NACO/VLT)

ESO PR Photo 10a/05 (7 April 2005)

© European Southern Observatory



SCR 1845

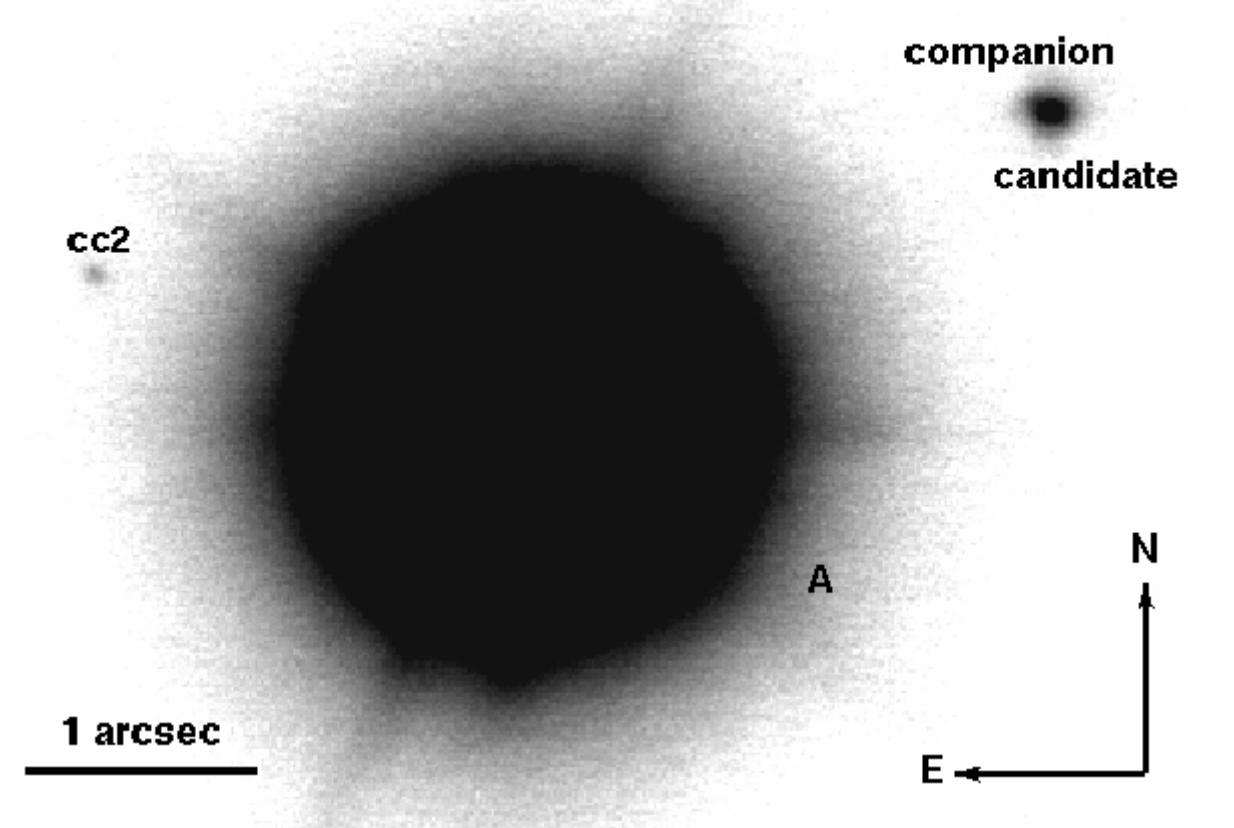


Name	SCR 1845
Distance	3.85 (\pm 0.02) pc
Spectral Type	M8.5 V
Apparent Magnitude V	17.4
Age	> 0.1 Gyr
Right Asc. Coord.	18 45 07
Decl. Coord.	-63 57 43

Name	SCR 1845 b
Discovered in	2006
Mass	> 8.5 M_J
*-Planet Dist. (proj.)	> 4.5 AU
Update	18/03/06

CT Cha

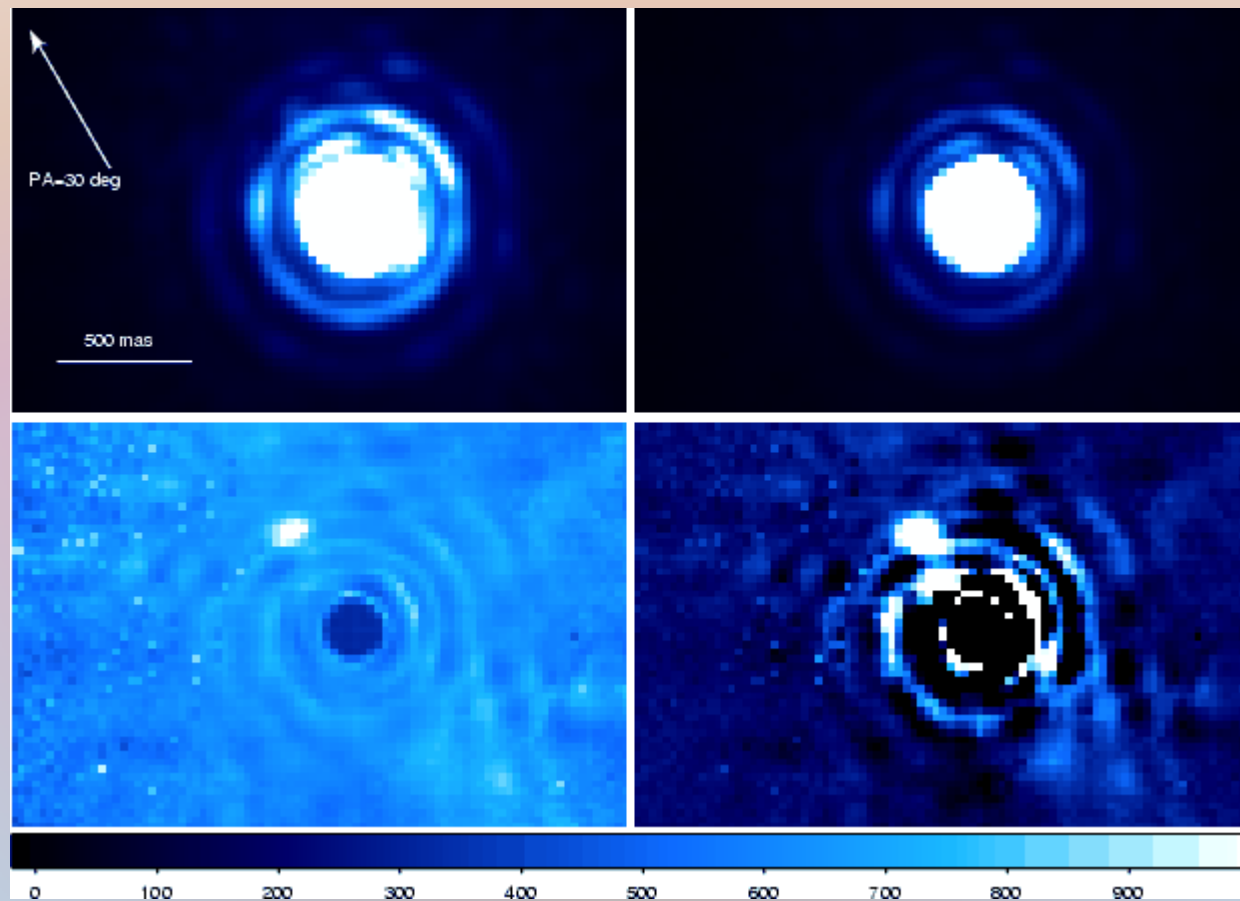
VLT-NACO Ks-band



Name	CT Cha
Distance	165 (\pm 30) <i>pc</i> ref.
Spectral Type	K7
Apparent Magnitude V	12.36
Right Asc. Coord.	11 04 09
Decl. Coord.	-76 27 19

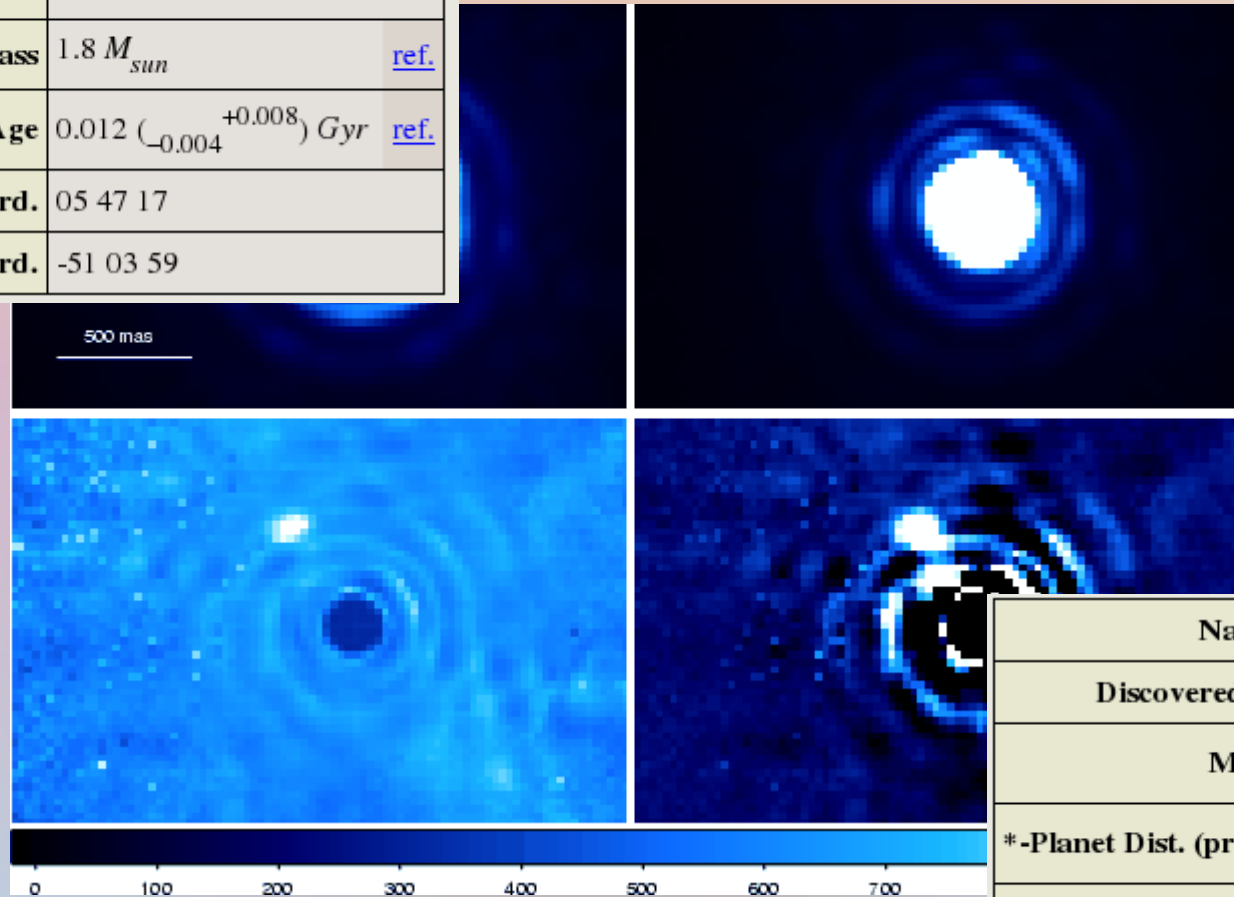
Name	CT Cha b
Discovered in	2008
Mass	17 (\pm 6) M_J ref.
*-Planet Dist. (proj.)	440 <i>AU</i> ref.
Radius	2.2 ($_{-0.6}^{+0.81}$) R_J ref.
Update	24/09/08

β Pic



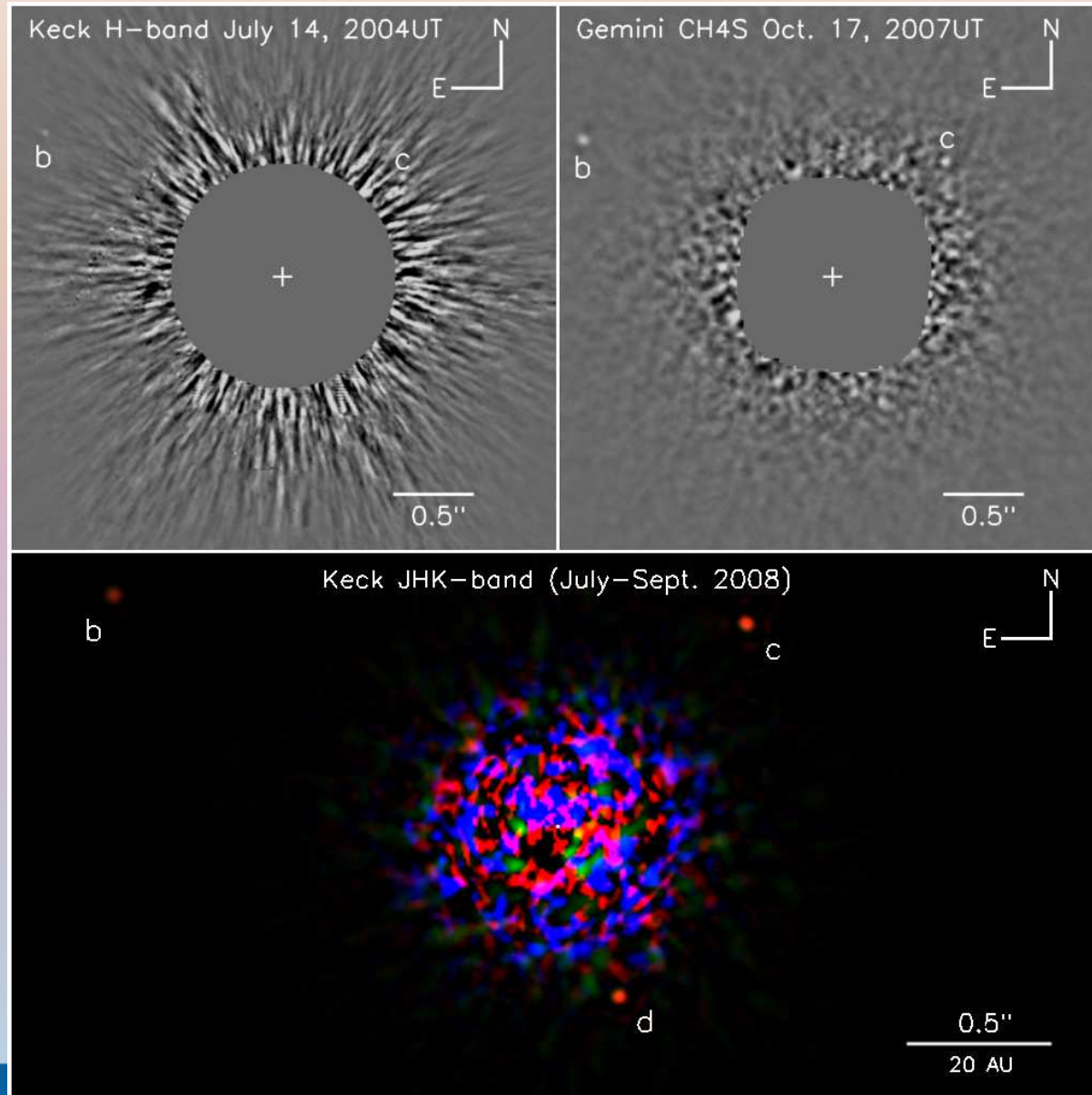
β Pic

Name	beta Pic
Distance	19.3 (± 0.2) pc ref.
Spectral Type	A6V
Apparent Magnitude V	3.86
Mass	1.8 M_{sun} ref.
Age	0.012 ($_{-0.004}^{+0.008}$) Gyr ref.
Right Asc. Coord.	05 47 17
Decl. Coord.	-51 03 59

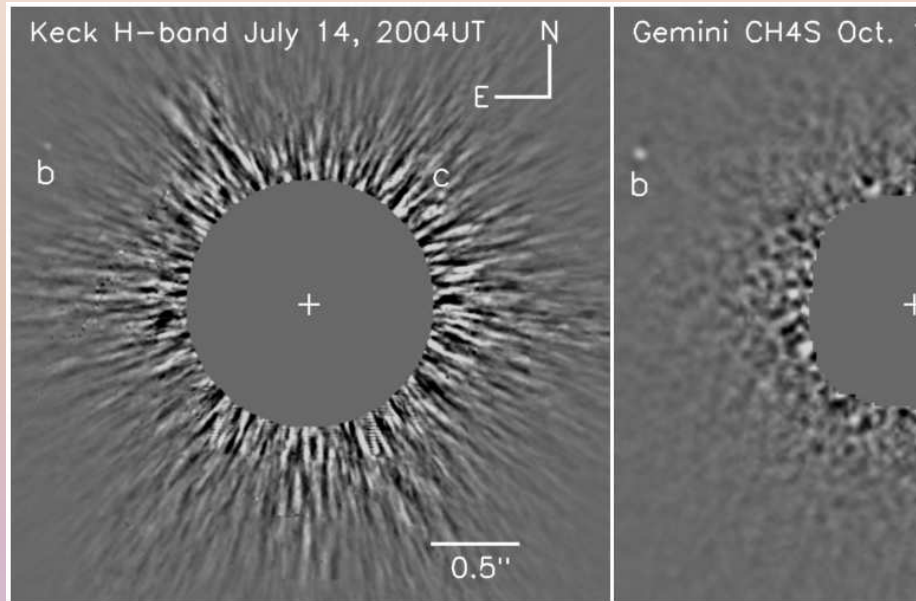


Name	beta Pic b
Discovered in	2008
Mass	8 ($_{-2}^{+5}$) M_J ref.
*-Planet Dist. (proj.)	8 ($_{-0.4}^{+1.7}$) AU ref.
Orbital period	6000 days ref.
Update	24/11/08

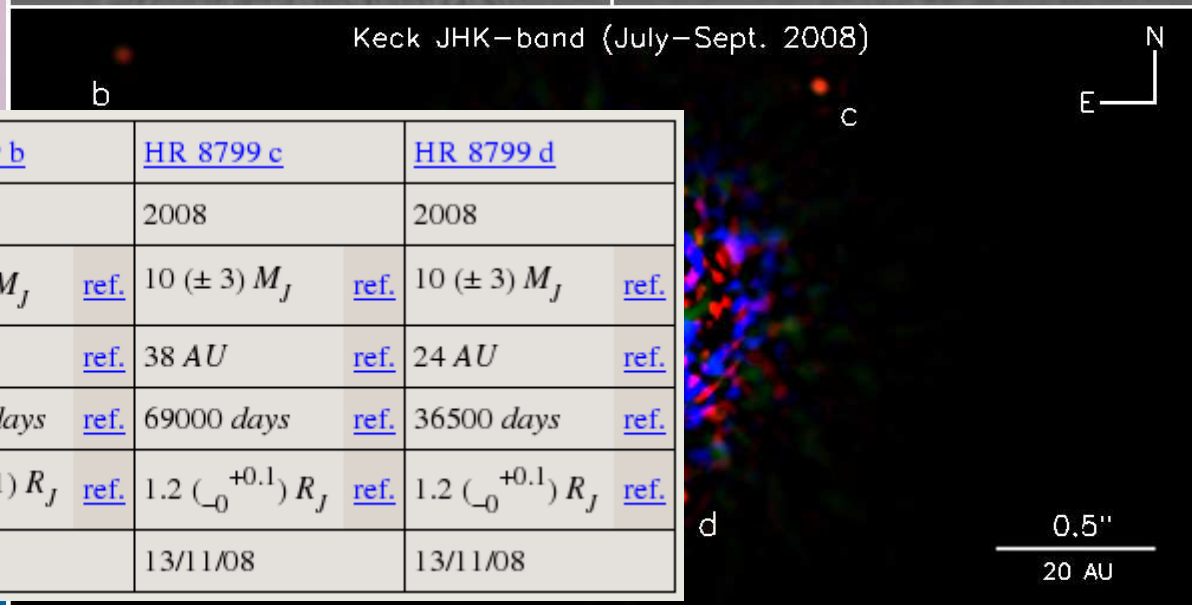
HR 8799 (V342 Peg)



HR 8799 (V342 Peg)

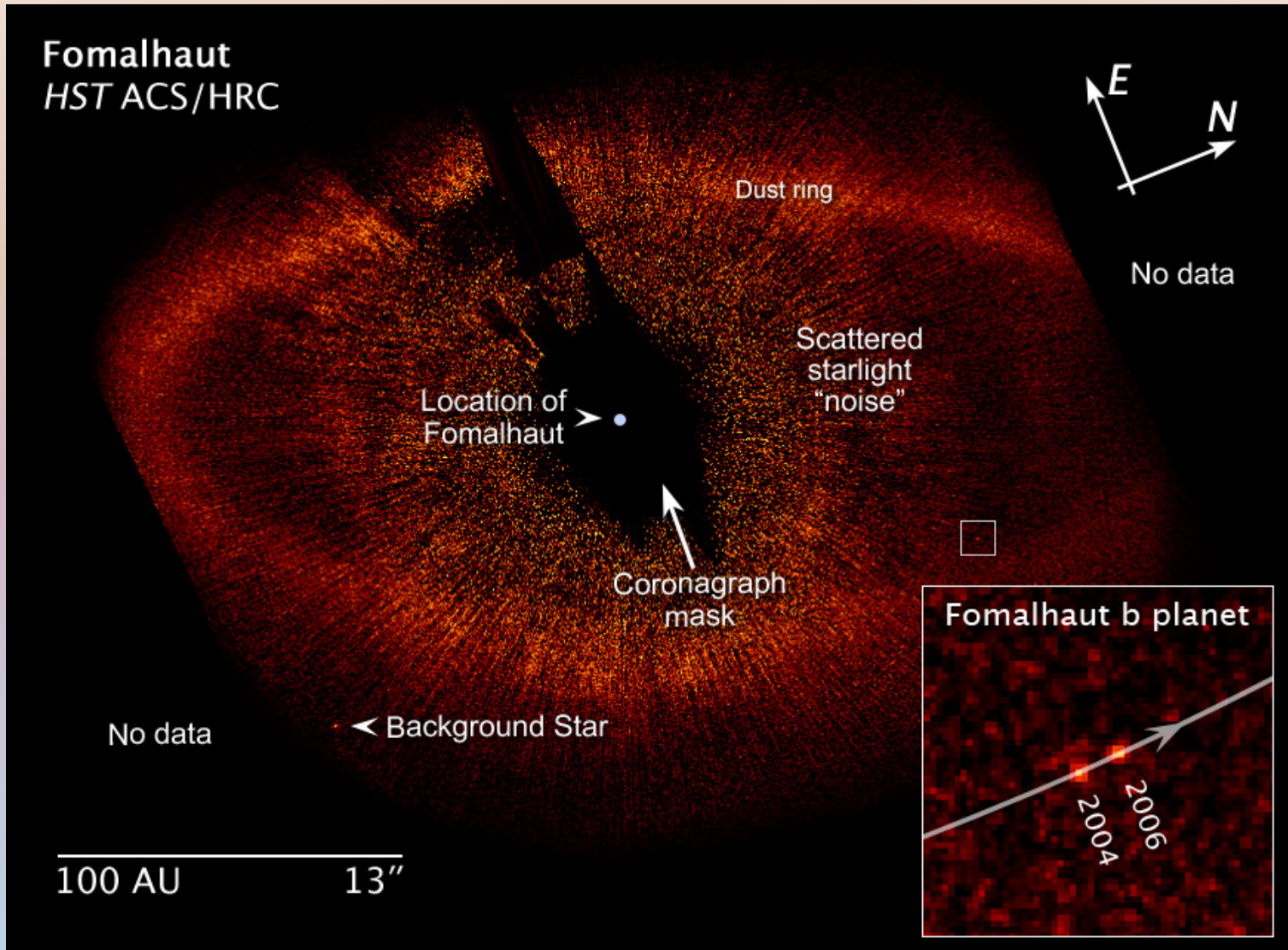


Name	HR 8799
Distance	39.4 (± 1) pc
Spectral Type	A5V
Apparent Magnitude V	5.96
Mass	1.5 (± 0.3) M_{sun}
Age	0.06 ($_{-0.03}^{+0.1}$) Gyr
Metallicity [Fe/H]	-0.47
Right Asc. Coord.	23 07 29
Decl. Coord.	+21 08 03



Name	HR 8799 b	HR 8799 c	HR 8799 d
Discovered in	2008	2008	2008
Mass	7 ($_{-2}^{+4}$) M_J ref.	10 (± 3) M_J ref.	10 (± 3) M_J ref.
*-Planet Dist. (proj.)	68 AU ref.	38 AU ref.	24 AU ref.
Orbital period	170000 days ref.	69000 days ref.	36500 days ref.
Radius	1.1 (± 0.1) R_J ref.	1.2 ($_{-0}^{+0.1}$) R_J ref.	1.2 ($_{-0}^{+0.1}$) R_J ref.
Update	13/11/08	13/11/08	13/11/08

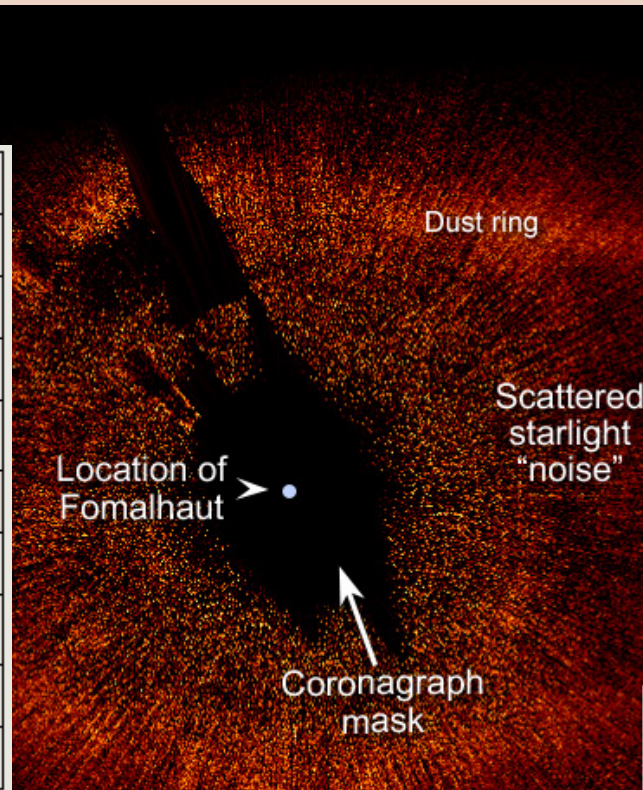
Formalhaut



Formalhaut

Fomalhaut HST ACS/HRC

Name	Fomalhaut
Distance	7.7 pc
Spectral Type	A3 V
Apparent Magnitude V	1.16
Mass	2.06 M_{sun}
Age	0.2 (\pm 0.1) Gyr ref.
Effective Temperature	8540 K
Radius	1.82 (\pm 0.06) R_{sun}
Right Asc. Coord.	22 57 39
Decl. Coord.	-29 37 20



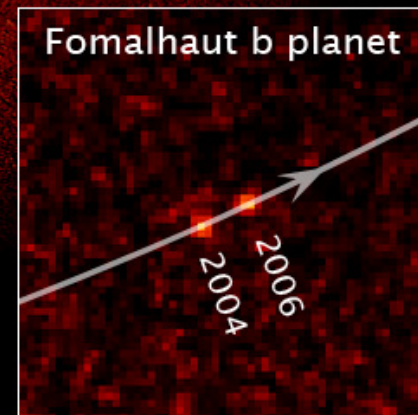
Name	Fomalhaut b
Discovered in	2008
Mass	$< 3 (-1.3^{+0.5}) M_J$ ref.
*-Planet Dist. (proj.)	115 AU ref.
Orbital period	320000 days ref.
Eccentricity	0.11 ($-0^{+0.02}$) ref.
Update	14/11/08

No data

← Background Star

100 AU

13"



<http://exoplanet.eu/>

