

Other Worlds



Over 200 planets have been discovered outside Solar System¹⁾:
most of them are gas giants like Jupiter.

How many planets are inhabited by intelligent beings?

One of them has following features:

- It rotates around a „recycled” star, i.e. a star of the second generation, created in a gravity collapse of the remains of the previous star, which ended its life with an explosion
- The star is located at the outskirts of the galaxy, where enough of heavy chemical elements is present, but where no strong gamma radiation sources exist and not too many black holes
- A satellite of a similar mass = 1/6, travels around the planet and stabilizes its orbit
- The atmosphere of the planet contains properly balanced amounts of the H₂O and CO₂, what causes a natural greenhouse effect (33K) and therefore water remains a liquid (not a gas or ice) – with an average temperature +15°C.
- Several global glaciations period happened in this planet's history, what accelerated and differentiated the biological evolution.



M.C. Escher, *Another world II*, 1947, woodcut



Messico 1991, foto Vittorio Napoli



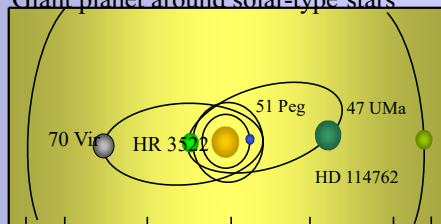
Do you know what that planet is?

If not, look out of the window!

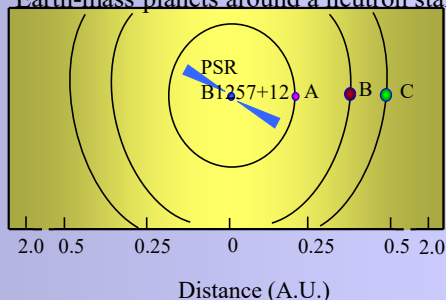
¹⁾ First of them was discovered by Alexander Wolszczan, see for example Wolszczan A., Confirmation of Earth-mass planets orbiting the millisecond pulsar PSR B1257+12 Science **264** (5158): 538-542 APR 22 1994

Planets around the neutron star PSR B1257+12 (A. Wolszczan, Penn State University)

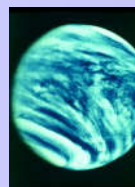
Giant planet around solar-type stars



Earth-mass planets around a neutron star



- PSR B1257+12 has three planets on 25, 66, 98-day, nearly coplanar orbits, with masses of 0.02, 3.9 and 4.2 M
- All three orbits almost fit within the orbit of Mercury
- Relative separations of the orbits are to scale with those of Mercury, Venus and Earth
- Planets B and C are in a near 3:2 mean motion resonance
- The system is dynamically stable over > 1 Gyr timescale



1.- Candidate planets around main sequence stars

Global statistics: 91 planetary systems

105 planets

12 multiple planets systems

| STAR click below for more | M[SIN] Jup. mass (note 1) | SEM-MAJ. AXIS (AU) | PERIOD days | ECC. | INCL. (deg) | Update |
|---------------------------------|---------------------------------|-----------------------|----------------|-------|----------------|----------|
| HD 49674 | 0.12 | 0.0568 | 4.948 | 0.0 | - | 13/06/02 |
| HD 76700 | 0.197 | 0.049 | 3.971 | 0.0 | - | 16/07/02 |
| HD 3651 | 0.2 | 0.284 | 62.23 | 0.63 | - | 16/01/03 |
| HD 16141 | 0.215 | 0.35 | 75.82 | 0.28 | - | 22/11/00 |
| HD 168746 | 0.23 | 0.065 | 6.403 | 0.081 | - | 26/02/02 |
| HD 46375 | 0.249 | 0.041 | 3.024 | 0. | - | 29/03/00 |
| HD 83443 | 0.35 | 0.038 | 2.9861 | 0.08 | - | 26/11/02 |
| HD 108147 | 0.41 | 0.104 | 10.901 | 0.498 | - | 26/02/02 |
| HD 75289 | 0.42 | 0.046 | 3.51 | 0.054 | - | 16/04/01 |
| 51 Peg | 0.46 | 0.05 | 4.2293 | 0.0 | - | 07/10/02 |
| BD -10 3166 | 0.48 | 0.046 | 3.487 | 0. | < 84.3° | 27/04/00 |
| HD 6434 | 0.48 | 0.15 | 22.09 | 0.30 | - | 22/11/00 |
| HD 187123 | 0.52 | 0.042 | 3.097 | 0.03 | - | 24/09/02 |
| HD 209458 | 0.69 | 0.045 | 3.524738 | 0.0 | 86.1 ° | 25/11/02 |
| Urs And | 0.69 | 0.059 | 4.6170 | 0.012 | - | 04/11/02 |
| | 1.89 | 0.829 | 241.5 | 0.28 | - | - |
| | 3.75 | 2.53 | 1284. | 0.27 | - | - |
| Epsilon Eridani | 0.86 | 3.3 | 2502.1 | 0.608 | 46 ° | 04/11/02 |
| | 0.1 ?? | 40?? | 280 yr?? | 0.3?? | ?? | - |
| HD 38529 | 0.78 | 0.129 | 14.309 | 0.29 | - | 22/10/02 |
| | 12.70 | 3.68 | 2174.3 | 0.36 | - | - |
| HD 4208 | 0.81 | 1.69 | 829.0 | 0.04 | - | 17/10/01 |
| HD 179949 | 0.84 | 0.045 | 3.093 | 0.05 | - | 20/04/01 |
| 55 Cnc | 0.84 | 0.11 | 14.65 | 0.02 | ~ 25°? | 13/01/03 |
| | 0.21? | 0.24? | 44.28? | 0.34? | ~ 25°? | - |
| | 4.05 | 5.9 | 5360 | 0.16 | ~ 25°? | - |
| HD 82943 | 0.88 | 0.73 | 221.6 | 0.54 | - | 12/09/02 |
| | 1.63 | 1.16 | 444.6 | 0.41 | - | - |
| HD 121504 | 0.89 | 0.32 | 64.6 | 0.13 | - | 21/08/00 |
| OGLE-TR-56 | 0.9 | 0.0225 | 1.2 | - | 86.2° | 30/01/03 |
| HD 114783 | 0.9 | 1.20 | 501.0 | 0.10 | - | 17/10/01 |
| HD 114729 | 0.9 | 2.08 | 1136. | 0.33 | - | 13/06/02 |
| HD 37124 | 0.75 | 0.54 | 152.4 | 0.10 | - | 25/11/02 |

[<http://cfa-www.harvard.edu/planets/cat1.html>]

Planet's foto : NASA