

CENTRIPETAL FORCE & GRAVITY Unit 14 & 8

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& NYTimes September 13, 2011 by Dennis Overbye ,Send Dr Cise an e-mail how you used this application, Thanks! Dr Cise

36 Light-Years From Here, New Hope for an Earth-Like Planet



An illustration of what the planet orbiting the Sun-like star HD 85512b might look like.

INTRODUCTION: Earth-Sun distance = 1.5×10^{11} m
 $M_{\text{sun}} = \sim 2 \times 10^{30}$ kg., 24 hrs/day, 3600 s/hr., Gravitational Constant $G = 6.67 \times 10^{-11}$ m³/kg s², Newton's 4th law =
 $F = G m_{\text{planet}} M_{\text{star}} / R_{\text{sp}}^2$, $F_{\text{centripetal}} = m_{\text{planet}} V^2 / R_{\text{sp}}$
From the two previous equations it can be show Kepler's 3rd law: $M_{\text{star}} = [4 \pi^2 / G] R_{\text{sp}}^3 / T^2$, where T = period of orbit.
 $V = R \times (\text{angular } v)$ and $(\text{angular } v) = 2 \pi / T$
QUESTIONS: (a) For this exoplanet find distance R_{sp} (in m) it is from It's star? (b) For this exoplanet find it's period(T) ...in s..of orbit about it's star? (c) Using Kepler's 3rd law find the mass of star HD85512 ? (d) Show HD85512 is as stated $\sim 2/3$ mass of the sun(M_{sun}) ?
ANSWERS: (a) $R_{\text{sp}} = \sim 3.75 \times 10^{10}$ m , (b) 5.01×10^6 s , (c) $\sim 1.24 \times 10^{30}$ kg , (d) _____.

European astronomers said Monday that they had found what might be the best candidate for a Goldilocks planet yet: a lump of something about 3.6 times as massive as the [Earth](#), circling its star at the right distance for liquid water to exist on its surface — and thus, perhaps, to host life, as we narrowly imagine it.

The planet, known as HD 85512b, is about 36 light-years from here, in the constellation Vela ()))))). It orbits its star at about a quarter of the distance that Earth circles the Sun, taking 58 days to make a year.))))) That distance would put it in the star's so-called habitable zone, if the planet is rocky and has some semblance of an atmosphere — “if everything goes right and you have clouds to shelter you,” as [Lisa Kaltenegger](#) of the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy in Heidelberg, Germany, summarized it. Astronomers cautioned, however, that it would take years and observations from telescopes not yet built before those assumptions could be tested and a search for signs of life could be undertaken.

Neither humans nor their robot helpers are likely to be dispatched toward Vela anytime soon. But the finding did vault HD 85512b to the top of a list of the handful of Goldilocks candidates.

The Vela planet was part of a haul of more than **50 new exoplanets** — as planets around other stars are called — discussed in a news conference on Monday hosted by the European Southern Observatory. They are the newest fruits of an eight-year observing program by astronomers based at the University of Geneva and led by Stephane Udry and Michel Mayor, working from a telescope at the European Southern Observatory in Chile. About 16 of them are so-called super-Earths, with masses less than 10 times the Earth, further encouraging astronomers that they are on the verge of finding planets like ours. A pair of papers — one with Dr. Mayor as lead author and the other with Francesco Pepe, also of Geneva, as lead author — have been submitted to *Astronomy and Astrophysics*, describing the planets.

The star that the Vela planet circles is known as HD 85512, or Gliese 370, after Wilhelm Gliese, a German astronomer. **The star is orange, about (((((two-thirds as massive and about an eighth as luminous as our Sun.))))))**