

Modern Cosmology

Martin Buoncristiani
University of the Third Age
Session 11

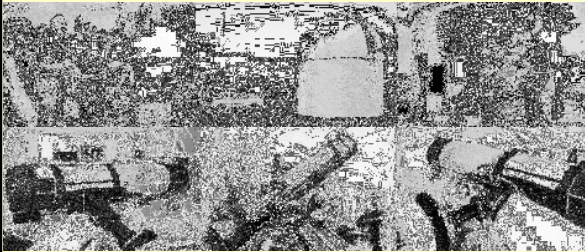
A Long Time Ago in Galaxies Far, Far Away...

Dr. Amanda Bauer
Super Science Fellow
Australian Astronomical Observatory



6pm, Thursday
When: 13 September, 2012
Where: To be confirmed

News from Mt. Burnett Observatory

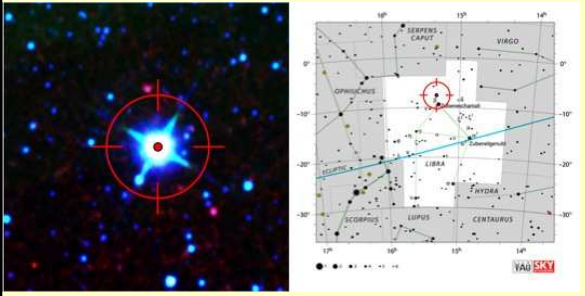


Gliese 581 Planetary System

Gliese 581 is a red dwarf star located 20.3 light years from Earth in the constellation Libra. It has a mass of one third of the Sun and at least six planets. The fourth planet from the star, Gliese 581g, is the first Earth-like planet detected around a star.



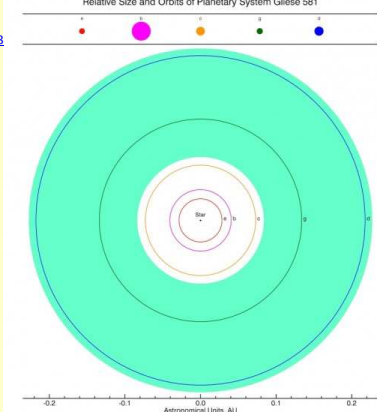
CREDIT: Abel Méndez, IAP Arles/Le 10m, 2008



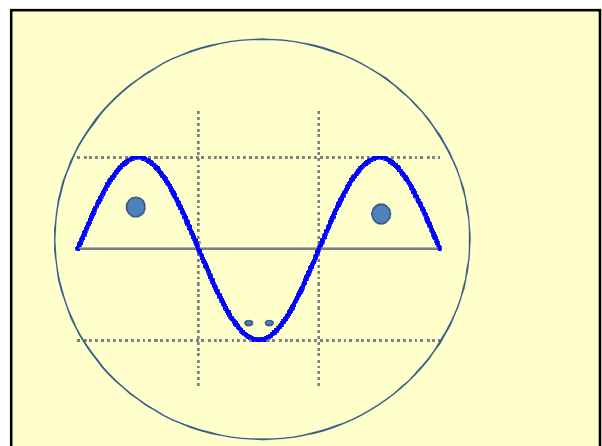
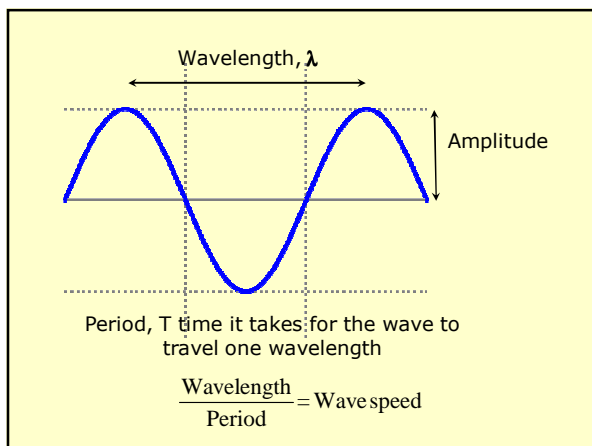
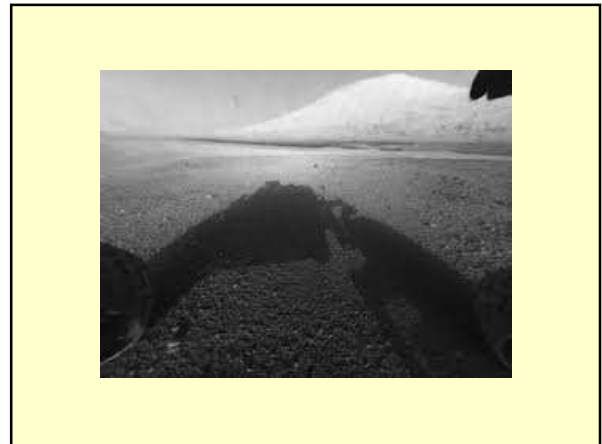
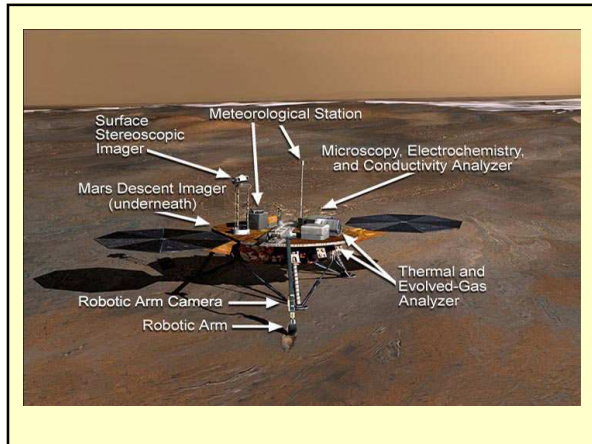
YAU SKY

Read more:
<http://www.universetoday.com/96374/exoplanet-gliese-581g-makes-the-top-5/#ixzz21ssyGLaX>

Relative Size and Orbits of Planetary System Gliese 581



Astronomical Units, AU



What waves in electromagnetic radiation?

Intensity $\left(\frac{\text{watts}}{\text{meter}^2} \right) = \frac{c \epsilon_0}{2} E_0^2 = 1.33 \times 10^{-3} E_0^2$

Wavelength = Wave speed / Frequency

Frequency = 1 / Period

$$\lambda f = c$$

Frequency (MHz)	Wavelength (m)	Photon Energy (eV)
1	300	4×10^{-9}
10	30	4×10^{-8}
100	3	4×10^{-7}
1000 (1GHz)	0.3 (30 cm)	4×10^{-6}
10,000 (10GHz)	0.03 (3 cm)	4×10^{-5}
100,000 (100 GHz)	0.003 (.3 cm)	4×10^{-4}
1,000,000 (1 THz)	0.0003 (.3 mm)	4×10^{-3}

Sources of radio waves from Space

Accelerating charges
for example synchrotron radiation

Synchrotron radiation from Crab Nebula

Figure 2.25: Six super-resolution images showing energy from the Crab Nebula. In these images, very light emission is first detected to be contained within discrete, elongated structures that follow the plane of the nebula's rotation. © The Crab Nebula in synchrotron light.

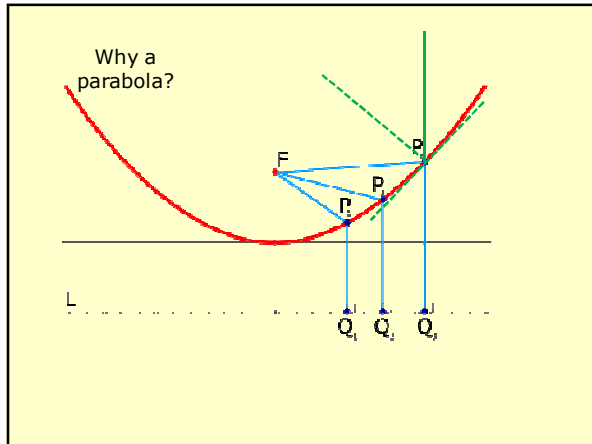
Detectors of radio waves from space

Directional antenna
Mirror plus receiver

Mirrors are:
Plane
Spherical
Parabolic

Receiver

Parkes Observatory (CSIRO) "The Dish"



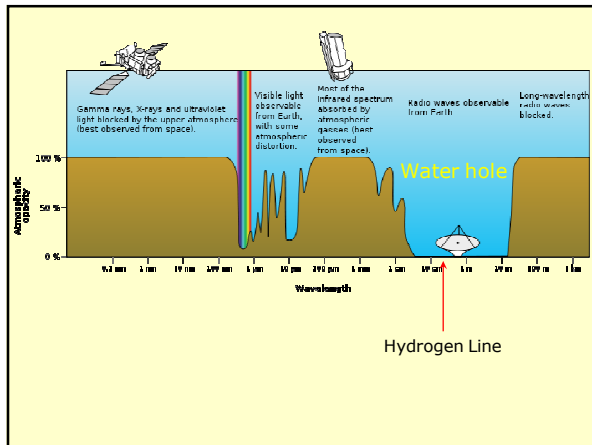
The Radio Telescope Spectrum

Channel 37 – 608 – 614 MHz
 Restricted use of a TV channel in US and Canada

Hydrogen Line 21 cm 1420 MHz
 (21.10617405413 cm \rightarrow 1420.40575177 MHz)

The Water Hole 1,420 – 1,666 MHz
 Search for Extra-Terrestrial Intelligence (SETI)

Wilkinson Microwave Anomaly Probe
 23, 33, 41, 61, 94 GHz



The world's biggest single aperture Radio telescope is at Arecibo, Puerto Rico

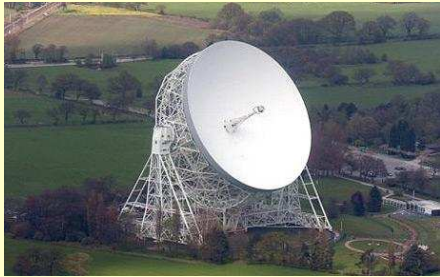
305 meter diameter

The largest steerable radio telescope in Europe is at Effelsberg, Germany

100 meter diameter

Green Bank 100 meter in the USA

Lovell Telescope at Jodrell Bank, UK



The Molonglo Observatory Synthesis Telescope (MOST) 843 MHz, operated by the University of Sydney.

modification of the East-West arm of the former *Molonglo Cross Telescope*, a larger version of the Mills Cross Telescope.

MOST is developing technology for the Australian Square Kilometer Array telescope. Since 2003 work has proceeded on the SKA Molonglo Prototype (SKAMP)



Radio Interferometer

