

Wadhurst Astronomical Society Newsletter December 2011 Issue

NOTICE

First, I must confess that in the November Newsletter, I got the date of the December meeting wrong! The December meeting will take place on the **14th of December** as stated in previous Newsletters. Sorry for any confusion caused!

EVENTS HAPPENING AT GREENWICH OBSERVATORY

Astro-photography

There is an exhibition of Astro Photographer winners work on display at the Greenwich Observatory, alongside the planetarium in Greenwich Park. Entry is free and the exhibition lasts until the 12th of February 2012.

It is open every day from 1000 to 1700 and there is also a café available.

An Evening With The Stars

There is also an event called "An Evening With The Stars" on certain days at least until March next year. It includes a show in the planetarium and time on the Prime Meridian with astronomers on hand and a hot drink. The visit also includes a chance to look through the Victorian 28-inch telescope in the "Onion" dome if weather permits. The cost for this event is £16 per person.

Further details of both these events and more can be found on the website at:

www.nmm.ac.uk/

MEETINGS

COMMITTEE MEETING

Members of the Committee are respectfully reminded that there is a meeting of the Committee at 1930 on Tuesday January 10th 2012. The meeting will be held at Phil Berry's house.

Any member of the Society is very welcome to come along, but please do let Phil know beforehand.

NOVEMBER MEETING

The meeting was opened by Phil Berry with an announcement from NASA inviting applications to become trainee astronauts on their new programme of commercial launch vehicles possibly into deep space. No takers from the Membership on this occasion... Also Phil mentioned the launch of the car-sized Mars rover successfully launched on November the 25th.

He then introduced our speaker for tonight.

400 Years of Telescopic Astronomy

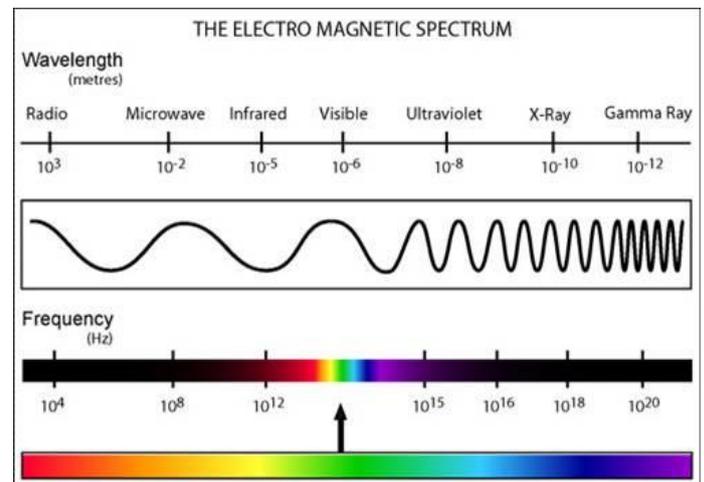
Dr. David Mannion

David has three degrees in astronomy and has been a teacher in the UK, Austria and Turkey over the past 25 years

and is the co-author of a book; "Galileo and 400 years of Telescopic Astronomy" but he surprised his audience by beginning with a slide of him as a very accomplished weightlifter.

Looking back to over 400 years, the Greeks had already estimated the size of the Earth to within 3% of what it is known to be today. David said that their problem was the religious beliefs at the time. It was declared that the Earth was the centre of everything and the planets, the Sun and the moon orbited us in perfectly circular crystalline spheres.

He then said that with the naked eye it is possible to see about 2,000 stars in the Milky Way. Galileo with his first telescope would have been able to make out over 10,000 stars yet we now know it to be made up of over 100 billion stars, although we were reminded that this is only using the visible part of the electromagnetic spectrum.



Despite the limiting field of view of Galileo's telescope he was able to confirm the orbit of Venus, but it didn't agree with the church's teachings at the time and caused a lot of trouble.

David then led us through the development of the optical telescope, mentioning the Short telescope of 1750, the 6 foot telescope at Birr Castle in Ireland, the 100-inch Hooker telescope and the 200-inch Palomar telescope built in 1948.

He talked about the need for observatories to be built at high altitudes to get as much as possible above the Earth's atmosphere which is where Earth-bound telescopes are being built today.

This led to talking about space telescopes such as the Hubble Space telescope and the shortly to be launched James Webb telescope. It was Edwin Hubble who predicted that there are very many galaxies and David said that there is something like 100 billion galaxies.

In 1931, the first radio telescope was built. It was 9 metres in diameter and for the first time wavelengths other than visible wavelengths were able to be observed.

We were told that there are many radio sources, often where there are very strong magnetic fields. These can be inside gas clouds and can only be detected using radio waves. One example is the gas cloud in Orion's Belt where new stars are being formed, creating much radiation.

The problem with radio telescopes is that the waves can be many metres long and this causes a problem with definition. Some time ago it was proposed that if radio telescopes some

distance apart had their outputs connected together, they could then produce a much better defined result.

The output of several telescopes around this country were combined together in a project called e-Merlin with a baseline of 217 Km to obtain very fine detail. Now, baselines across the world of 10,000 Km are being used to produce incredibly small detail.

New telescopes being built operate in infra-red wavelengths and have to be cooled with liquid helium to just above absolute zero to prevent the telescope from "seeing" itself.

Other parts of the spectrum take us to ultraviolet, x-rays and gamma radiation. We heard about the x-ray emission from the area around black holes and gamma ray bursts occurring 13 billion light years away at the edge of the universe and we only know about them because of these new telescopes.

The next part of telescopic astronomy David looked at was the detection of gravity waves. He described how the LIGO detector in the USA employs two 4 Km long vacuum tubes at 90° to each other and connected at the junction. Lasers are fired and reflected 50 times down each tube and the results compared. Great accuracy is necessary because the difference in path lengths when gravity waves are encountered is less than the width of a proton!

Finally David talked about Neutrino detection. These, he described as ghostly particles that have no electrical charge so are very difficult to detect. These are generated by the Sun but one important source is from Super Novae. At present there is a programme called Antares which uses a cubic kilometre of sea water in the Mediterranean Sea and another cubic kilometre in the Antarctic ice. They are looking for neutrinos that trigger the detectors. There are trillions of neutrinos passing through the Earth but only very few interact with the detectors.

A few years ago, astronomers were looking towards an object in the Large Magellanic Cloud in 1987 when it suddenly brightened into a Super Nova and two hours later a large number of neutrinos were detected on the Earth.

David feels that it is about time we had a Super Nova in our galaxy and that one is well overdue...

To end, David posed the question; "Is there extra-terrestrial Life in the Universe?"

There are more stars in the Universe than there are grains of sand in all the beaches of Earth, so what is the chance of life on a planet elsewhere? In about 1960 a great astronomer Frank Drake formed an equation that took into account the number of planets that could support life, the fraction of lifetime that civilisation survives, the fraction of intelligent life that could communicate and one thoughtful criterion; would they wish to communicate with us anyway!

There are a number of projects looking for signs of extra-terrestrial life. David thought that the chance of life is in the order of 100 billion to 1!

Has ET already landed?

Should we communicate with alien life? Professor Stephen Hawking says NO!

What do you think?

John Wayte's notes from the scientific world

John began by talking about particles discovered in 1932 by Pauli; particles that appear to go faster than light. There are three flavours; electron, Tau and Muon. Trillions pass through an out-held hand in one second without hitting any components of the atoms therein.

In fact, if they were to pass through a piece of lead, 1 light year thick then only half would interact with something!

Water has been detected around a quasar, 12 billion light years away. In fact there is an awful lot of it; about 140 trillion times that on Earth. The only thing is that it is extremely thinly dispersed at only 300 trillion times thinner than our own

atmosphere and extends to hundreds of light years around the quasar.

The Bino-viewer

Phil Berry brought along an interesting attachment for his telescope called a Bino-viewer. Phil's viewer was a William Optics Bino Viewer he had obtained through our own Ian King.

Essentially it is a binocular eyepiece which enables the observer to use both eyes when looking into the eyepiece of a telescope. He said that this was a particular pleasure when looking at the planets such as Jupiter. It almost gives the effect of seeing stereoscopic results and subjectively gives more light gathering properties.

It is rather expensive but it is Phil's intention of using it at one of our viewing sessions to let members see for themselves what a delight it is. In fact the evening following the November meeting, Phil and Brian Mills used the viewer successfully when giving interested non-members the chance to look at the night sky through a telescope at Uplands College across the road from our WAS venue.



An example of a Bino-viewer

Brian Mills Sky notes

This evening, Brian looked at the area around Pegasus and Andromeda and using star-hopping methods, showed how to find objects such as M15, a globular cluster, M31, the great Andromeda Galaxy, and another open cluster M34.

He also spent time on constellation recognition before looking at the Night Sky in the coming weeks. Much more will be found in his Sky Notes for December, later in the Newsletter.

DECEMBER MEETING

Wednesday 14th December 2011 – This is our Christmas meeting when Paul Treadaway will present a talk called "The Theory of Relativity". Paul is one of our own members and has spoken on a number of topics before.

There will also be mince pies to have with tea or coffee.

Meetings begin at 19:30 although members are invited to arrive anytime after 19:00 as this is a good time to exchange ideas and discuss problems and also relax before the meeting.

The venue as always is held in the Upper Room of the Methodist Church at the east end of Wadhurst Lower High Street, opposite the entrance to Uplands College. (For those with SatNav – the post code is TN5 6AT)

Anyone is welcome but on-members are asked if they wouldn't mind contributing £2.

FUTURE MEETINGS

Wednesday 18th January 2012 – January is the month when we hold the Society's Annual General Meeting. This is then followed by a talk by Dr. Bob Seaney called "The Multiverse" during which Bob introduces us to an exciting look at the Universe.

Wednesday 15th February 2012 – The main talk this evening will be by Robin Durant, whom we welcome back to give a presentation called "Telescopes; Which, Why and the Cost".

Wednesday 21st March 2012 – There will be a talk by Ben Ritchie called "The Life and Death of a Very High Mass Star".

Wednesday 18th April 2012 – Steve Richards talks about "Making Every Photon Count". He has written a book of the same name and is a beginners guide to Deep Space Astro – photography.

OTHER NOTES AND INFORMATION

SKY NOTES FOR DECEMBER

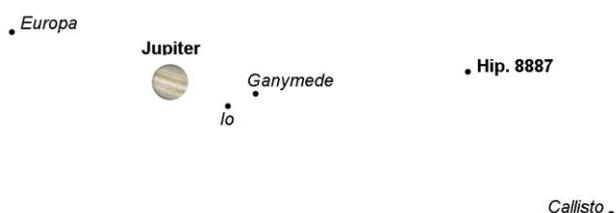
Planets

Mercury suffers an inferior conjunction on the 4th and then becomes a morning object reaching greatest western elongation on the 23rd. The planet may just be visible above the south eastern horizon immediately before sunrise. The Moon, one day away from new, is immediately below Mercury on the 23rd.

Venus is now visible in the early evening in the south west at magnitude -3.9. By mid December it sets two hours after the Sun, with this time increasing into next year until greatest eastern elongation occurs on March 27th. Its brightness also continues to increase during the first part of 2012 as its phase diminishes but its apparent size increases as it moves towards inferior conjunction.

Mars is in Leo at magnitude +0.3 and brightening. By the middle of the month it rises at 2300, and by the end of the month this has become 2215 with the planet increasing in apparent diameter all the time.

Jupiter is a brilliant object at magnitude -2.7, visible as soon as darkness falls. At 2000 it is almost due south at a height of 50° so is superbly placed for observation. The four Galilean moons are easily visible in binoculars if they can be held still or mounted on a tripod. An example of how they appear is shown in the diagram drawn for 2000 on December 16th. There is also a star (Hip. 8887) in close proximity which I have included and labelled to avoid confusion.



Saturn is still a morning object in Virgo at magnitude +0.7. In the middle of the month it rises at 0245 but by the month's end this has become 0155. By the end of January it rises almost exactly at midnight. The planet is gradually brightening and the angle of

the rings as seen from Earth has increased so that even a small telescope will provide excellent views.

Lunar Occultations

In the table below I've listed events for stars down to magnitude 6.5 that occur before midnight although there are others that are either of fainter stars or occur at more unsociable hours. DD = disappearance at the dark limb and RD = reappearance at the dark limb. **Times are in GMT.**

Dec.	Time	Star	Mag.	Ph	PA °
2 nd	2144	SAO 146415	6.4	DD	77
3 rd	1637	16 Piscium	5.7	DD	109
3 rd	2353	19 Piscium	4.9	DD	104
7 th	2125	40 Arietis	5.8	DD	102
14 th	2205	alpha Cancri	4.3	RD	279

Phases of the Moon for December

First ¼	Full	Last ¼	New
2 nd	10 th	18 th	24 th

ISS

Below are details of passes of the International Space Station (ISS) that occur before midnight and are brighter than magnitude -2. The details of all passes including those visible from other areas can be found at:

www.heavens-above.com

Please remember that the times and directions shown below are for when the ISS is at its **maximum** elevation, so you should go and look a few minutes before. **Times are in GMT.**

Dec.	Mag	Time	Alt°	Az.
20 th	-2.4	1747	35	SSE
21 st	-2.4	1825	46	SW
22 nd	-2.9	1729	51	SSE
23 rd	-2.1	1632	33	SSE
23 rd	-3.5	1808	88	WNW
24 th	-3.3	1711	71	SSE
25 th	-2.6	1614	49	SSE
25 th	-3.4	1750	80	N
26 th	-3.4	1653	89	SSE
26 th	-2.4	1828	46	WNW
27 th	-3.4	1732	78	N
28 th	-3.3	1635	81	N
28 th	-3.4	1811	79	SSW
29 th	-3.4	1737	84	N
30 th	-3.3	1616	78	N
30 th	-2.9	1752	59	SSW
31 st	-3.3	1655	82	SSW

Iridium Flares

The flares that I've listed are magnitude -4 or brighter although there are a lot more that are fainter, occur after midnight or at a lower altitude. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to:

www.heavens-above.com

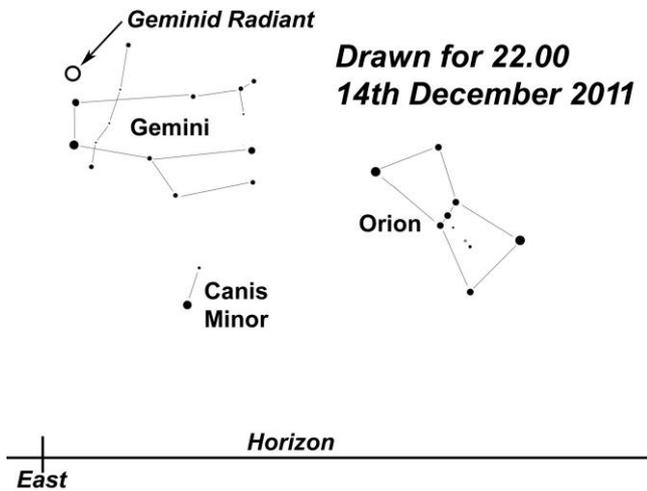
Remember that when one of these events is due it is sometimes possible to see the satellite in advance of the "flare", although of course it will be much fainter at that time. **Times are in GMT.**

Dec.	Time	Mag	Alt°	Az.
1 st	1709	-6	28	SSW
4 th	1700	-4	24	SSW
5 th	1814	-5	45	NNE
6 th	1808	-4	46	NNE

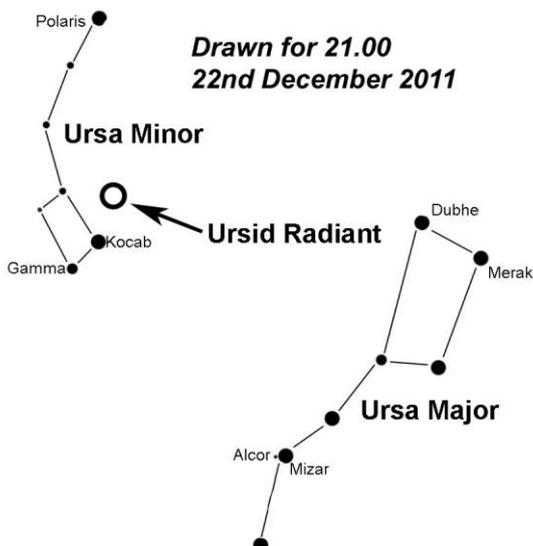
7 th	1652	-6	21	SSW
7 th	1802	-6	47	NE
9 th	1649	-6	18	SSW
11 th	1.53	-5	10	WNW
12 th	1649	-5	12	SW
12 th	1730	-4	15	WNW
13 th	1715	-4	18	WNW
14 th	1700	-5	21	WNW
16 th	1640	-5	21	WNW
16 th	1715	-5	61	NE
17 th	1628	-4	28	WNW
17 th	1709	-4	61	NE
18 th	1705	-4	64	NE
20 th	1602	-7	33	W
25 th	1825	-5	43	NNE

Meteors

The Geminids. This is one of the most prolific showers of the year and is active from the 7th to the 16th. Maximum occurs during the afternoon of the 14th, so watches on the nights of 13th/14th and 14th/15th could be worthwhile. Unfortunately a gibbous Moon is in attendance on both those nights so meteor numbers will be reduced. ZHR's can be as high as 100 meteors per hour.



The Ursids. This shower is active from December 17th to the 25th with maximum taking place on the night of the 22nd/23rd when the ZHR will be around 10 meteors per hour. The radiant is circumpolar, so it is always visible.



Lunar Eclipse

There will be a total eclipse of the Moon on December 10th. Sadly from the UK the Moon rises after totality is over. However, if you have a very good north eastern horizon you may be able to see the closing stages of the event. The diagram below shows the Moon immediately after it has risen with the shaded portion at top right that is still eclipsed. The eclipse ends at 16.18 hrs which is only about 27 minutes after moonrise.



The Night Sky in December

(Written for 2200 GMT mid month)

In the north Draco straddles the meridian and Ursa Minor points down towards the horizon. Ursa Major is standing on its tail whilst one of the members of the Summer Triangle (Vega) can be seen above the northern horizon just west of north. Looking east Leo is just rising whilst Canis Minor, Cancer and Gemini are all now on view.

Towards the south Orion and Taurus are approaching the meridian, whilst Capella is close to the zenith. In the west Aquarius is just setting and Pegasus is approaching the horizon. Deneb, one of the other members of the Summer Triangle, is still on view in the north west, although the third member (Altair) has already set.

Advanced Warning for 2012

February 2nd - Venus and Uranus are a third of a degree apart.
 March 3rd - Mars at opposition.
 April 15th - Saturn at opposition.
 June 6th - Transit of Venus partly visible.
 July 15th - Grazing occultation of Jupiter and its moons in the early hours of the morning.
 December 3rd - Jupiter at opposition.
 December 13th - Geminid meteor shower coincides with new Moon.

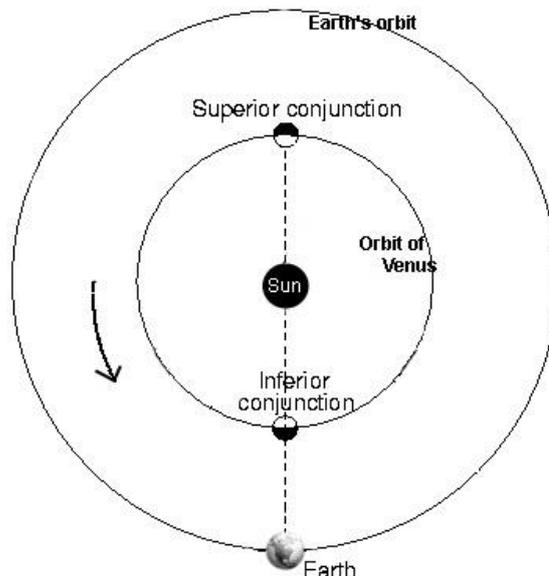
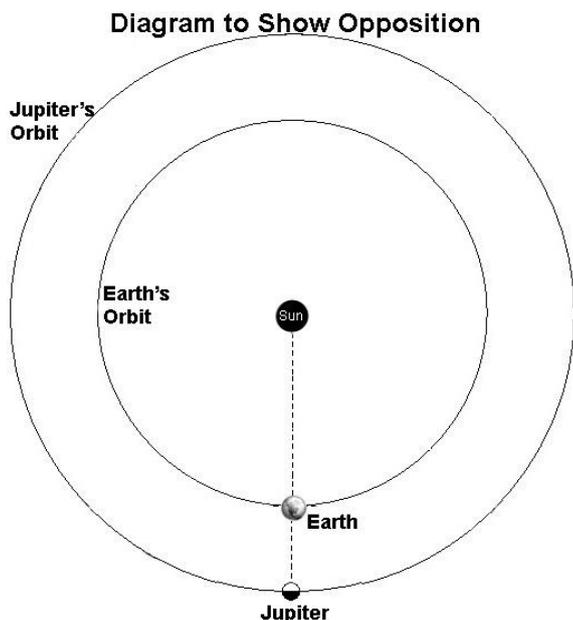
Brian Mills

DEFINITIONS OF TERMS USED IN ASTRONOMY

Opposition.

This is a term that we have discussed quite recently, but as it is used repeatedly in the "Advance Warning for 2012" section I thought it would stand a brief repetition. Opposition occurs when a planet is opposite the Sun in the sky. It follows that as the Sun sets, the planet in question rises with the reverse also being true. This means that as the time around opposition provides a night long view, it is an ideal time for observation. Due to the orbits of all planets being ellipses, some oppositions

are more favourable (the two planets are closer together) than others. Only planets whose orbits lie outside that of the Earth can come to opposition. The diagram uses Jupiter as an example but the same is true of the other outer planets.



You can see from the diagram that just before and just after inferior conjunction Venus has its illuminated side turned almost entirely away from Earth leaving just a thin but comparatively large crescent visible to us. Conversely when either side of superior conjunction its illuminated side is turned almost fully towards Earth and we see a nearly full but much smaller disc.

Brian Mills

Phases of Venus.

Venus exhibits phases in the same way as the Moon and for the same reason - both are illuminated by the Sun but are viewed from varying viewpoints. The result is that we can't always see all of the illuminated hemisphere. For Venus to go through one complete cycle from full, through new and back to full again takes 584 days. This is the time taken for Venus to orbit the Sun once and catch up and overtake the Earth on the inside track so to speak. Because Venus is one of our nearest planetary neighbours, the variation in distance between being at its closest and farthest is very marked.



At its closest to us (inferior conjunction) Venus has an angular diameter of 68 arc seconds whilst when at its most remote (superior conjunction) this has shrunk to just 10 arc seconds. The photographs above (taken around 90 days apart) show how the size of the planet can vary, although these are not quite at the two extremes.

NASA'S SPACE PLACE

Re-thinking an Alien World: The Strange Case of 55 Cancri e

Forty light years from Earth, a rocky world named "55 Cancri e" circles perilously close to a stellar inferno. Completing one orbit in only 18 hours, the alien planet is 26 times closer to its parent star than Mercury is to the Sun. If Earth were in the same position, the soil beneath our feet would heat up to about 3200 F. Researchers have long thought that 55 Cancri e must be a wasteland of parched rock.

Now they're thinking again. New observations by NASA's Spitzer Space Telescope suggest that 55 Cancri e may be wetter and weirder than anyone imagined.

Spitzer recently measured the extraordinarily small amount of light 55 Cancri e blocks when it crosses in front of its star. These transits occur every 18 hours, giving researchers repeated opportunities to gather the data they need to estimate the width, volume and density of the planet.

According to the new observations, 55 Cancri e has a mass 7.8 times and a radius just over twice that of Earth. Those properties place 55 Cancri e in the "super-Earth" class of exoplanets, a few dozen of which have been found. Only a handful of known super-Earths, however, cross the face of their stars as viewed from our vantage point in the cosmos, so 55 Cancri e is better understood than most.

When 55 Cancri e was discovered in 2004, initial estimates of its size and mass were consistent with a dense planet of solid rock. Spitzer data suggest otherwise: About a fifth of the planet's mass must be made of light elements and compounds—including water. Given the intense heat and high pressure these materials likely experience, researchers think the compounds likely exist in a "supercritical" fluid state.

A supercritical fluid is a high-pressure, high-temperature state of matter best described as a liquid-like gas, and a marvellous solvent. Water becomes supercritical in some steam turbines—and it tends to dissolve the tips of the turbine blades. Supercritical carbon dioxide is used to remove caffeine from coffee beans, and sometimes to dry-clean clothes. Liquid-fueled

rocket propellant is also supercritical when it emerges from the tail of a spaceship.

On 55 Cancri e, this stuff may be literally oozing—or is it steaming? —out of the rocks.

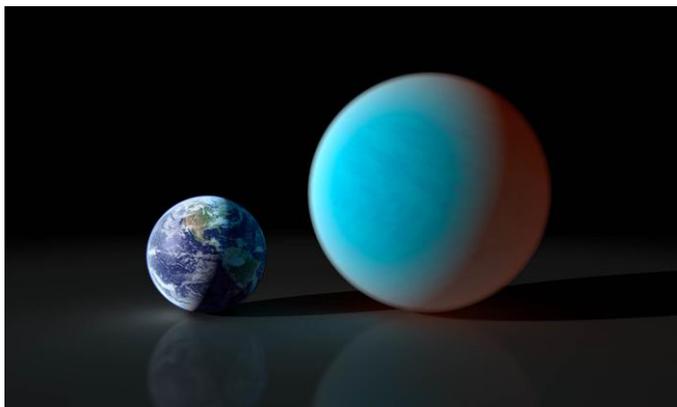
With supercritical solvents rising from the planet's surface, a star of terrifying proportions filling much of the daytime sky, and whole years rushing past in a matter of hours, 55 Cancri e teaches a valuable lesson: Just because a planet is similar in size to Earth does not mean the planet is like Earth.

It's something to *re*-think about.

Get a kid thinking about extrasolar planets by pointing him or her to "Lucy's Planet Hunt," a story in rhyme about a girl who wanted nothing more than to look for Earth-like planets when she grew up. Go to:

<http://spaceplace.nasa.gov/story-lucy>.

The original research reported in this story has been accepted for publication in *Astronomy and Astrophysics*. The lead author is Brice-Olivier Demory, a post-doctoral associate in Professor Sara Seager's group at MIT.



Caption:

Artist's rendering compares the size Earth with the rocky "super-Earth" 55 Cancri e. Its year is only about 18 hours long!

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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Any material for inclusion in the January 2012 Newsletter should be with the Editor by December 28th 2011