Wadhurst Astronomical Society Newsletter December 2012

MEETINGS

NOVEMBER MEETING

Phil Berry, our Secretary opened the November meeting by saying that we had been thanked by Hospice in the Weald for the Society's donation in memory of Michael Harte who had done so much for the Society over many years including looking after our page on the Wadhurst website.

Phil also added that we now have a new website at: www.wadhurstastro.co.uk

It has been partly updated but still has some work to be done. There will be a link to our new site from the town's website.

SAGAS, the Southern Area Group of Astronomical Societies have been invited by the BBC Star Gazing Live programme to take part on the 8th, 9th and 10th of January at the Amex Stadium just outside Brighton. About 500 people are expected to attend and will start each day at about 1630 in the afternoon and finish at around 2200. Phil said that any member wishing to go would be very welcome, but he did show a photograph he had taken recently on his way past and it was a blaze of lights. He was sure they wouldn't be on during the actual event.

On the subject of lighting, Phil had very recently attended a meeting at Uplands College across the road from where we hold our meetings and he said they had discussed the lighting used in the grounds and were very sympathetic to the light pollution they were causing and were prepared to consider changing them. Phil also talked to the Head of the college and was told that if ever we want to hold an event in the college grounds, they will make sure the lights are turned off. He provided our meeting with copies of the very detailed survey he had been working on for submission to the Parish Council.

He then introduced the evening's main speaker.

Early Pioneers of Astronomy
Jan Drozd

Jan has given us a number of well researched and enjoyable talks in the past and this was no exception.

He began by saying he wanted to cover astronomy from the very earliest records, from the concept of "Gods in the Sky" to time keeping, mathematics and science.

In the earliest days, skies would have been very clear and caused wonder at what was happening there. Probably one of the earliest star maps was found on the wall of a cave at Lascaux in France, dating from before 13,000 BC and appearing to show Orion's Belt, Aldebaran, and the Pleiades and other stars, more or less in their relative positions.

Other indications of early appreciation of the stars exist at places such as Stonehenge, the Towers at Chankillo in Peru and ancient structures built by the Mayans. Jan told us that Mayan Astronomy attributed movements in the skies to the whims of the Gods. Many movements could be predicted but their causes not understood.

These movements were used to forecast when to sow and harvest crops and were also used in navigation at sea.

Much early knowledge of Mayan Astronomy was lost when the Spanish destroyed almost all "documents and books" because they were viewed as being pagan.

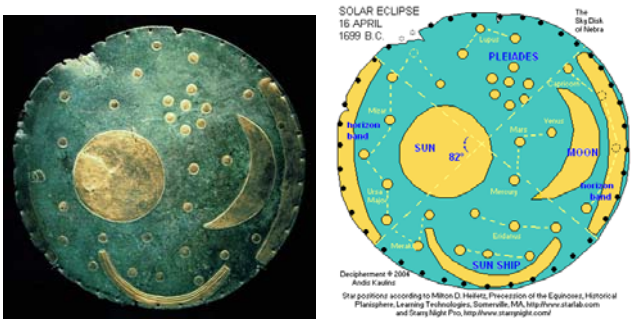
Jan looked at Chinese history and the detailed astronomical observations they recorded from as early as the 6th century BC.

Although based on a spherical Earth, these observations were used by astrologers to define their Dynasties. "Guest stars" such as comets and novae were important to them. One such observation recorded in 1054 BC has been identified today as M1, the Crab Nebula in the constellation of Taurus.

In 700 AD the Chinese produced the earliest complete paper star map, containing 1350 stars.

Towards 900 AD China was being influenced by Indian astronomical ideas and from 1280 AD Islamic astronomers were collaborating with their Chinese colleagues. During the Jesuit missions in the 16th century Chinese interest in astronomy was revitalised when new ideas and telescopes were introduced.

Then Jan related a fascinating story of two treasure hunters who in 2000 entered an archaeological site in East Germany and discovered a hoard of Bronze Age (1600 BC) items including a disc about 30 cm in diameter which they took away with them.



Nebra Sky Disk
Bronze Age (1600BC) former East Germany
An astronomical instrument as well as an item of religious significance?
It challenges the idea that "astronomy" only arose in the Mediterranean/Near East

A seller was later caught trying to sell the Nebra Disc on the black market, it having reached a value of about £300,000. It was finally recovered during a sting operation led by the police.

If genuine, it is the earliest concrete evidence of astronomical appreciation in northern Europe. It is a representation of the stars in the sky, showing the Sun, the moon, the solstices, a Sun ship and the Pleiades. As Jan says, it challenges the idea that astronomy only arose in the Mediterranean and near East.

Up until the discovery of the Nebra disc, ancient astronomy as we know it started in Babylonia. It was the Babylonians who used astronomy to establish an accurate calendar used for planting crops at the right time. These predictions were made by the priest-astronomers and these observations were also used by the Greeks.

It was the Babylonian's accurate astronomical observations and then mathematics which enabled the development of the sexagesimal system of numbers. Our circle of 360º, a degree of 60 minutes and a minute of 60 seconds in both time and angle measurement came from there.

Ancient Egyptian astronomy was also used for calendars, time keeping and religion. The flooding of the Nile always occurred at the summer solstice and also when Sirius rose before the Sun. The Nile brought down fertile silt to the valley.

Jan said that the first workable time measuring devices and our 24 hour day have an Egyptian origin.

We now moved on to the influence of Greek astronomers. As Jan told us, Greek science was one of the most intellectual tools to emerge from the ancient world. It was the Greeks who first used the Scientific Method and asked themselves how and why did things happened.

It was Aristotle who said that just thinking about questions of the world and skies about us was not enough; we should try and answer these questions by going and looking at things and measuring them.

The Greeks produced a 3 dimensional model to explain the apparent motion of the planets including a proposal that the Earth rotates around its own axis. Eratosthenes estimated the Earth's circumference with great accuracy. Later the first measurements of precession were made and also the first star catalogues compiled.

In 1903, sponge divers brought up a rusty iron device which remained in a museum in Athens until in 2006. The Antikythera Mechanism as it was named, was examined in x-rays which showed that it had at least 30 bronze gears and was in fact an astronomical calculator from at least 100 BC.

The Antikythera Mechanism

An analogue computer from 150–100 BC designed to calculate the positions of the Sun, Moon and possibly the planets!

It has 30 bronze gears but there may have been more!

In about 160 AD, Ptolemy, a Greek-Roman mathematician collected together selected astronomical observations and derived a geometric model although still with the Earth at the centre, reasoning that the apparent movement of the planets could be explained if they moved in cyclic orbits. He wrote an important astronomical treatise called the Almagest.

In 1496 a German printer, mathematician and astronomer updated Ptolemy's observations and printed the Regiomontanus. Because it was printed, it meant that those that used it all had the same information without errors that could have been introduced by previous copies each written out individually.

Indian astronomy dates from about 2,000 BC but originally was considered astrological, although was later influenced by Greek astronomy. In the 6th century Indian astronomers had already begun to consider the Sun may be at the centre of our solar system and that the planets orbited the Sun with elliptical orbits.

The decimal place-value with the number "zero" so important to us today was first recorded in India and then transmitted to the Islamic world and eventually to Europe.

The age between the 2nd and 6th century was considered the Golden Age of Islamic mathematics and science. They made very accurate observations and made a great contribution to the Scientific Method with many stars being given Arabic names such as Aldebaron, Altair and Betelgeuse.

Jan concluded by showing how science and astronomy had spread throughout the East starting in Babylonia, then to Greece and India; through Spain and into Europe. He also noted how astronomy had gone through various stages; religious, practical navigation, calendars and time-keeping used for agriculture, finally to the last stage; solely to gain knowledge.

The Sun
Brian Mills

This month, our Director of Observation, Brian Mills talked about the Sun as part of his series on Basic Astronomy.

Having demonstrated the difference between the solar Sun and the Newspaper of that name for certain members attending the meeting, Brian gave a number of facts and figures about the Sun.

- Diameter 1,392,684 Km
- 110 Earths would fit across the diameter of the Sun
- The sun was formed about 4.6 billion years ago

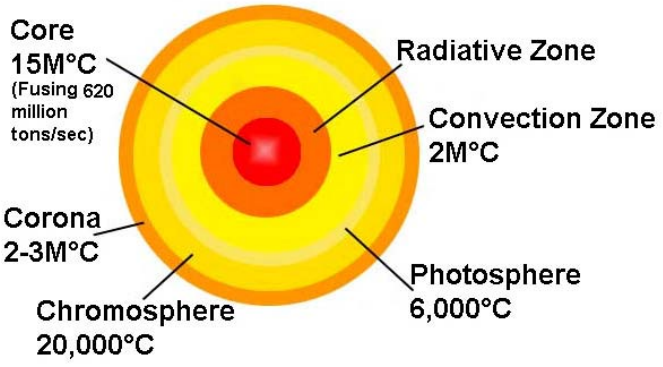
The current theories of the Sun's creation suggest that a molecular cloud collapsed either because it reached a critical size and formed thicker material through gravitational collapse, or through the outburst from a nearby supernova or maybe through a collision with another molecular cloud.

The result would break up to be stellar sized fragments, gravitationally collapsing to a more spherical collection of material where the temperature would begin to increase and when enough material was gathered together a protostar would be formed.

Accretion continues to about 0.5 solar masses, then the fusion of hydrogen begins. At this point our Sun would join the main sequence of stars on the Hertzsprung-Russell diagram. Hydrogen would fuse at about 620 million metric tons a second.

The mass of the Sun accounts for 99.86% of the material in the solar system. This material is made up of 75% hydrogen, 23.3% helium and the remaining 1.7% a mixture of oxygen, Iron, carbon and neon.

Brian described the interior of the Sun.



Composition of the Sun

The core is where hydrogen is fusing. This is surrounded by the Radiation zone where the matter is so dense that heat is transmitted by radiation. Around this is the Convection zone where material is not so dense and heat is transmitted by convection.

Next is the layer we see, called the Photosphere. Next, the Chromosphere is the line we see around the black moon during a total solar eclipse. Surrounding this layer is another layer, the Corona which is only seen during a total eclipse.

Next Brian described how Sun Spots migrate towards the equator during the 11-year solar cycle and demonstrated this with a graph of time against latitude; a graph that resembled the so called a butterfly diagram.

Sun spots tend to occur in pairs of opposite magnetic polarity. A photograph taken in Hydrogen-alpha light showed material leaving the surface of the Sun from a sunspot at the edge as imaged from Earth. Material could be seen being thrown out may hundreds of thousands of miles and returning back to the surface. But another mass ejection further round the rim showed material leaving so fast that it continued on out into space.

We were shown another image of the Sun taken from a solar observing satellite at one of the Earth's stable Lagrange points. The satellite monitors material being ejected towards the Earth. When this material reaches us, it is displayed as the aurora particularly at the poles.

Are all stars like the Sun?

We were shown a diagram comparing Betelgeuse, Rigel and the Earth, although the Earth had to be pointed out as a microscopic dot.

Betelgeuse is a red giant and unstable. There is a suggestion that it is about to become a supernova. At 640 light years away there is yet another suggestion that this might even have already occurred but the light hasn't reached us yet.

The Sun will continue to use up hydrogen for around another 6 billion years. When the hydrogen runs out, it will expand to become a red giant. Helium will start fusing into carbon, the outer layers will be shed, it will become a planetary nebula and will become a White Dwarf. Eventually it is thought the Sun will turn into something called a Black Dwarf, but Brian said no black dwarfs are thought to exist because so far the Universe is not old enough to have any.

Brian concluded with the Sky Notes which can be seen later in the Newsletter.

John Waytes produced more Scientific World snippets.

There are 2 new comets next year that will be worth looking out for.

The first one is Pan-STARRS, discovered in June 2011 by the Pan-STARRS telescope in Hawaii. This is scheduled to be at its maximum brightness between the 8th and 12th of March next year and could reach a magnitude of -0.5.

The second comet is ISON, or to give it its full name, C/2012 S1 (ISON).

This one is infinitely more interesting. The International Scientific Optical Network in Russia discovered comet ISON on the 21st of September 2012. This could actually reach a magnitude of -16 which could outshine the Moon. Look out for this during November next year.

Sadly some reported comets have produced a damp squid effect so don't hold your breath; only your telescope!

What make both of these comets especially interesting is that they are long period comets, fresh from the Oort Cloud and they are probably both virgin comets on their first visit to our Sun. They should be covered in fine pristine ice, which might give them both an advantage in the brightness stakes.

While on the subject of comets, you will have heard of the Richter Scale in relation to earthquakes. Do you know what the scale for asteroids and comets hitting the Earth is?

It's the Torino Scale.

This name was given after a conference in Torino, Italy in 1999 called to discuss these matters.

The scale goes from 1 to 10 depending on the hazard.

No hazard	**0**	Nothing likely to hit the Earth
Normal	**1**	Near pass possible but a hit extremely unlikely
Closely watched by astronomers	**2**	Closely monitored and may require attention but hit extremely unlikely
	3	1% or greater chance and may cause localised destruction
	4	1% remains but grade increased and probably causes no serious threat
Threatening	**5**	Close encounter that could cause local devastation
	6	Poses a serious but uncertain threat of Global catastrophe
	7	A close encounter that would require immediate planning
Certain collision	**8**	Collision with Earth a certainty where local destruction or Tsunami will result
	9	Unprecedented devastation or major Tsunami
	10	May wipe out civilisation

DECEMBER MEETING

Wednesday 12th of December 2012, the second Wednesday of this month – Society member Paul Treadaway continues his story of building his own telescope. His talk is called "The T200 Telescope First Light". Everyone is welcome and there will also be free mince pies as well!

Meetings begin at 1930 although members are invited to arrive anytime after 1900 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 non-members are asked if they wouldn't mind contributing £2 towards costs.

FUTURE MEETINGS

Wednesday 16th January 2013 The meeting begins with our Annual General Meeting. Then our Secretary, Phil Berry is talking about "Astronomical apps for Android Mobiles". With smart phones gaining in popularity Phil proposes to introduce some of these impressive applications available for use in astronomy and intended for Android mobiles.

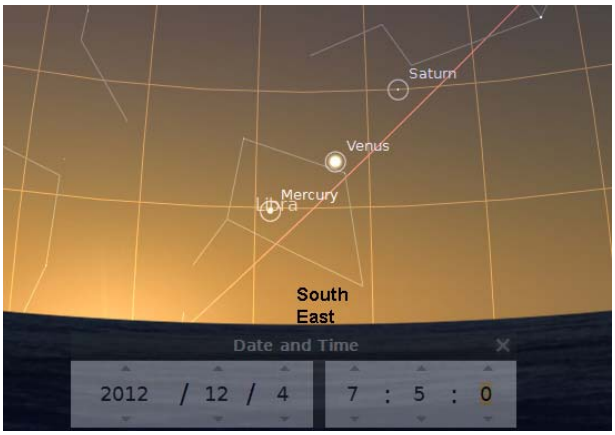
Wednesday 20th February 2012. Details to follow.

OTHER NOTES AND INFORMATION

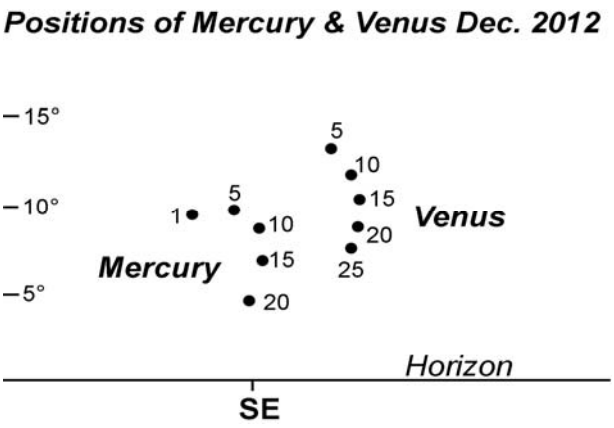
SKY NOTES FOR DECEMBER

Planets

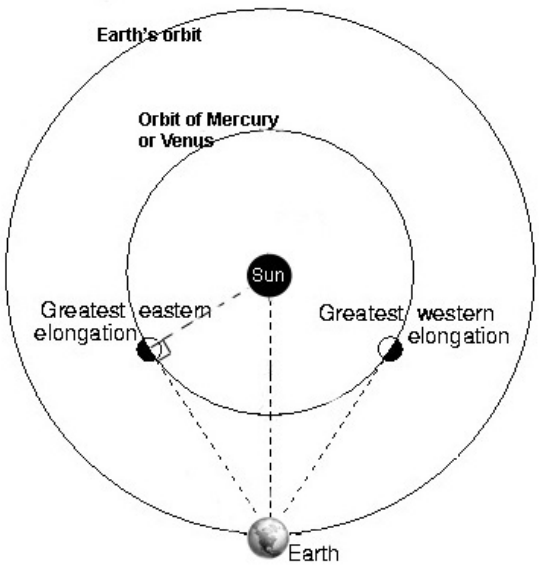
Mercury reaches its greatest western elongation on December 4th when it will be a morning object not far from its brighter rival Venus, whose position will assist in identification. The screenshot from Stellarium, below, shows the position of both planets just after 07.00 hrs on the 4th with the Sun 6° below the horizon. Mercury, at this time, is 10° high and Saturn 20°. As December progresses Mercury appears to draw closer to the Sun, heading for a superior conjunction on January 18th next year.



The diagram below illustrates the comparative positions of the two inner planets during December mornings.



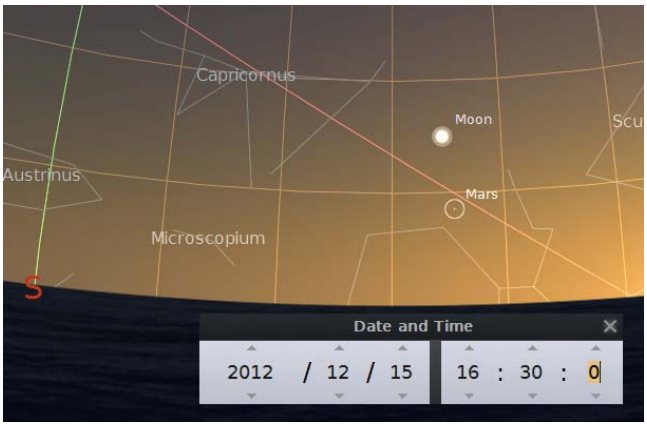
When we use the tern "greatest elongation" with respect to the inner planets, we are referring to the time when they appear to be as far from the Sun as possible. I say "appear to be" because this does not coincide with the time that they are truly east or west of our parent star.



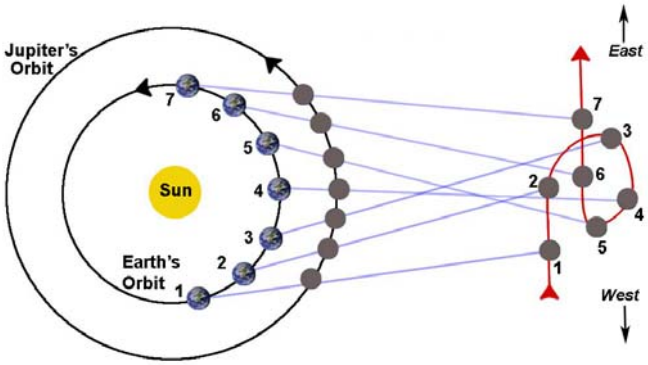
You can see from the diagram that elongation occurs when a line from the Earth to the orbit of Mercury or Venus strikes it at a tangent. At that time a line drawn from the planet to the Sun is perpendicular to the line to the Earth. Western elongation sees the planet to the west of the Sun and therefore rising ahead of it as a morning object. At eastern elongation the planet is east of the Sun rising and setting after it, as an evening object.

Venus at magnitude -4.0 is still visible as a brilliant morning object, rising just over two hours before the Sun in the middle of the month. Its position is shown in the "Mercury" section above. It is gradually drawing (apparently) closer to the Sun as it approaches superior conjunction on March 28th 2013.

Mars at magnitude +1.2 may just be glimpsed in the evening sky a little west of south. The Stellarium screenshot shows its position 9° above the horizon on the 15th at 16.30hrs. On that night a very slim crescent of the waxing Moon is almost directly above it.



Jupiter comes to opposition on the 3rd of the month when it reaches magnitude -2.8. It currently lies close to the Hyades cluster in Taurus, and will remain in this constellation until the end of June when it moves into neighbouring Gemini. At present it is moving retrograde (east to west) and will continue to do so until January 30th next year when it will assume direct motion again. This apparent looping movement is caused by the Earth catching up and overtaking Jupiter "on the inside" so to speak. The diagram illustrates this action.



Saturn is a morning object at magnitude +0.6 visible in the south east as shown in the "Mercury" section above. The apparent tilt of the rings is now 18° making it an excellent target for even modest telescopes.

Lunar Occultations

In the table below I've listed events for stars down to magnitude 7.0 that occur before midnight although there are others that are either of fainter stars or occur at more unsociable hours. DD = **d**isappearance at the **d**ark limb whilst RD = **r**eappearance at the **d**ark limb. There is now an extra column headed "mm" (millimetres) to show the minimum aperture telescope required for each event. **Times are in GMT.**

Please remember that the Society has telescopes that members can borrow, all of which are suitable for the following events.

Dec	Time	Star	Mag	Ph	Alt °	% illu	mm
3rd	22.37	50 Cancri	5.9	RD	16	76	60
18th	20.33	SAO 146239	6.4	DD	18	36	40
19th	16.17	SAO 128156	6.3	DD	37	44	50
19th	19.28	9 Piscium	6.3	DD	34	45	50

Occultation of M67

On December 4th at 00.20 hrs the open cluster M67 reappears from behind the dark lunar limb. There are no bright stars and a large aperture will be required to observe this event.

Phases of the Moon for December

Last ¼	New	First ¼	Full
6th	13th	20th	28th

ISS

Below are details of passes of the International Space Station (ISS) that occur before midnight and are magnitude -2.5 or brighter. 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 it's ***maximum*** elevation, so you should go out and look a few minutes beforehand. **Times are in GMT.**

Dec	Mag	Time	Alt°	Az.
16th	-3.0	18.05	52	S
17th	-2.5	17.14	39	SSE
18th	-3.5	18.00	65	WSW
19th	-3.2	17.09	65	SSE
20th	-3.4	17.55	62	WNW
21st	-3.4	17.04	89	N
22nd	-3.3	17.50	66	WNW
23rd	-3.4	16.59	78	N
24th	-3.4	17.45	85	SSW
25th	-3.4	16.54	83	N
26th	-2.8	17.39	58	SSW
27th	-3.2	16.48	77	SSW

Iridium Flares

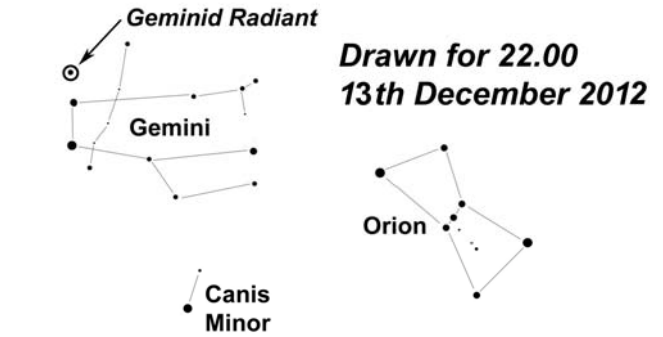
The flares that I've listed are magnitude -4 or brighter although there are a lot more that are fainter, occur after midnight or at a lower altitude. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to:
www.heavens-above.com

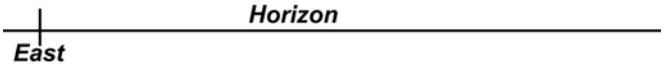
Remember that when one of these events is due it is sometimes possible to see the satellite in advance of the "flare", although of course it will be much fainter at that time. **Times are in GMT.**

Dec	Time	Mag	Alt°	Az.
6th	18.22	-7.8	40	NNE
8th	16.14	-8.4	71	E
9th	16.08	-6.2	72	E
15th	17.36	-4.5	56	NE
15th	18.29	-7.3	33	SSE
18th	17.23	-8.5	59	NE
19th	18.14	-7.4	32	SSE
27th	16.33	-4.6	69	ENE
29th	17.37	-4.7	30	S
31st	17.29	-7.0	29	S
31st	17.29	-6.8	28	S

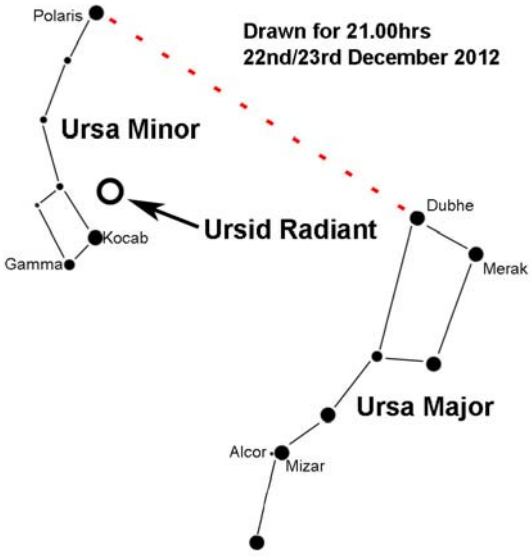
Meteor Showers

1. This month brings the best shower of the year in the shape of the Geminids. They are active from the 7th until the 16th with maximum occurring at 19.00 hrs on the 13th. This year there is no interference from the Moon as it is new on the night of maximum. The predicted ZHR is 100+ although this assumes that the radiant is at the zenith and conditions are ideal. Despite this it should be possible to see perhaps one meteor per minute when the shower is at its peak. The diagram below shows the position of the radiant, although it isn't necessary to look at this part of the sky because meteors can travel a long way. It is useful to know where the radiant point is so that you can confirm whether the event you just saw belongs to the shower or not. Simply trace the line of the meteor back to see if it came from the radiant area.





2. The second, and far less spectacular December shower is the Ursids. They are active from December 17th to the 25th with maximum on the night of 22nd/23rd. At this time the ZHR will be 10 at most, although there have been outbursts in comparatively recent years.



The Night Sky in December (Written for 22.00hrs GMT mid month)

In the east Regulus has just risen whilst Gemini and Cancer, with the open cluster M44 (also known as the Praesepe) are well above the horizon.

Towards the south Orion is approaching the meridian, whilst his retinue of dogs (Canis Major and Minor) are both now visible. The bright star Aldebaren in Taurus and the planet Jupiter are higher in the sky but are also close to the Meridian. On that line lies the long, faint and winding constellation of Eridanus (the river).

To the west, Pegasus and Aquarius are close to setting, although the Great Andromeda Spiral (M31) is still well positioned at an approximate elevation of 60°.

In the north the bright stars Vega in Lyra and Deneb in Cygnus are both approaching the horizon. The third member of the Summer Triangle, Altair in Aquila, has already set. Of the circumpolar constellations, Ursa Major lies to the east of the pole star whilst Cassiopeia and Cepheus lie to the west of it. Ursa Minor points toward the ground with its tail lying almost along the meridian.

Advance Warning for January

Jupiter continues to be superbly placed for observation.

Advance Warning for 2013

Mid to late February - best evening apparition of Mercury
April 28th - Saturn at opposition
September 8th - daylight occultation of Spica (alpha Virginis)
November 1st - Venus at greatest eastern elongation (evening object).

Brian Mills

NASA SPACE PLACE

It Takes More Than Warm Porridge to Make a Goldilocks Zone
By Diane K. Fisher

The "Goldilocks Zone" describes the region of a solar system that is just the right distance from the star to make a cozy, comfy home for a life-supporting planet. It is a region that keeps the planet warm enough to have a liquid ocean, but not so warm that the ocean boils off into space. Obviously, Earth orbits the Sun in our solar system's "Goldilocks Zone."

But there are other conditions besides temperature that make our part of the solar system comfortable for life. Using infrared data from the Spitzer Space Telescope, along with theoretical models and archival observations, Rebecca Martin, a NASA Sagan Fellow from the University of Colorado in Boulder, and astronomer Mario Livio of the Space Telescope Science Institute in Baltimore, Maryland, have published a new study suggesting that our solar system and our place in it is special in at least one other way.

This fortunate "just right" condition involves Jupiter and its effect on the asteroid belt.

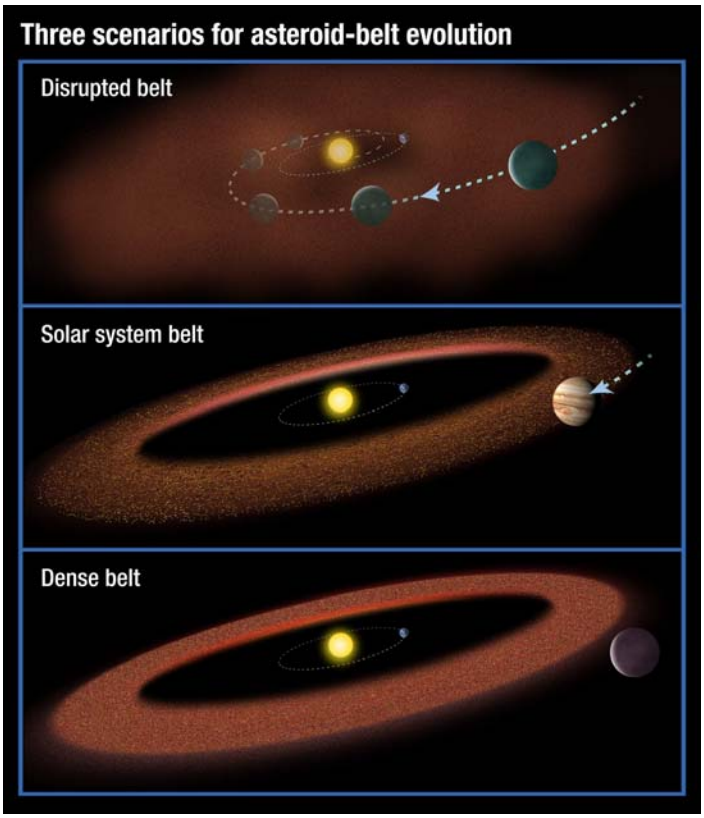
Many other solar systems discovered in the past decade have giant gas planets in very tight orbits around their stars. Only 19 out of 520 solar systems studied have Jupiter-like planets in orbits beyond what is known as the "snow line"—the distance from the star at which it is cool enough for water (and ammonia and methane) to condense into ice. Scientists believe our Jupiter formed a bit farther away from the Sun than it is now. Although the giant planet has moved a little closer to the Sun, it is still beyond the snow line.

So why do we care where Jupiter hangs out? Well, the gravity of Jupiter, with its mass of 318 Earths, has a profound effect on everything in its region, including the asteroid belt. The asteroid belt is a region between Mars and Jupiter where millions of mostly rocky objects (some water-bearing) orbit. They range in size from dwarf planet Ceres at more than 600 miles in diameter to grains of dust. In the early solar system, asteroids (along with comets) could have been partly responsible for delivering water to fill the ocean of a young Earth. They could have also brought organic molecules to Earth, from which life eventually evolved.

Jupiter's gravity keeps the asteroids pretty much in their place in the asteroid belt, and doesn't let them accrete to form another planet. If Jupiter had moved inward through the asteroid belt toward the Sun, it would have scattered the asteroids in all directions before Earth had time to form. And no asteroid belt means no impacts on Earth, no water delivery, and maybe no life-starting molecules either. Asteroids may have also delivered such useful metals as gold, platinum, and iron to Earth's crust.

But, if Jupiter had not migrated inward at all since it formed father away from the Sun, the asteroid belt would be totally undisturbed and would be a lot more dense with asteroids than it is now. In that case, Earth would have been blasted with a lot more asteroid impacts, and life may have never had a chance to take root.

The infrared data from the Spitzer Space Telescope contributes in unexpected ways in revealing and supporting new ideas and theories about our universe. Read more about this study and other Spitzer contributions at spitzer.caltech.edu. Kids can learn about infrared light and enjoy solving Spitzer image puzzles at:
spaceplace.nasa.gov/spitzer-slyder



Caption:
Our solar system is represented by the middle scenario, where the gas giant planet has migrated inward, but still remains beyond the asteroid belt.

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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SAGAS web-site www.sagasonline.org.uk

Any material for inclusion in the January 2013 Newsletter should be with the Editor by December 28th 2012