FAS Newsletter

Federation of Astronomical Societies http://www.fedastro.org.uk

FAS Convention rated the 'best ever'

Lord Rees giving his presentation.
More pics on Page 3

2011 FAS AGM & Convention - A Personal View

My impressions of the FAS Convention - that I attended with my daughter Karen.

Being a casual astronomer I was not sure what to expect as I had not been to anything like this before. I am glad I attended because it was a most enjoyable day made by the excellent presenters.

The day started well with a two hour drive to Cambridge only troubled by the low sun. On arrival I was introduced to other club members attending and was made most welcome.

The day was split into five presenters and at lunch time a tour of three telescopes. The talks were:

Dr. Carolyn Crawford -*The Energetic Universe.X-Ray Astronomy.*
Nic Szymanek.Photographing - *The Night Sky.*
Prof.Albert Zijlstra - *Planetary Nebulae.*
Dr.Nick Hewitt - *Active Galactive Nuclei & Their Observation by Amateurs.*
Lord Martin Rees - *From Planets to the Cosmic Dark Age.*

All of the talks were excellently presented with super illustrations and pictures and in a way that kept your interest for the hour that each talk took.

Of all the sessions I liked Dr. Crawfords in particular when she showed a picture of an object in the sky and then the X-Ray picture next to it. I was a little disappointed with Nic Szymanek as I was expecting from the heading a more 'how to' than his wonderful pictures. He did mention exposure and ISO settings for some of his DSLR pictures. Prof. Zijlstra was a most exuberant presenter hampered a little by his Dutch accent. Dr. Hewitt. Lord Martin Rees both gave interesting talks.

Lord Martins' response to questions from the audience at the end of his session showed what immense knowledge he has of astronomy.

Phil Stevenson
Redditch AS

President
Richard Sargent
4 Bache Drive, Upton,
Chester. CH2 2JB
president@fedastro.org.uk

Treasurer
Peter Cooke
Haven Cottage, Frithville,
Boston, Lincs, PE22 7DS
01205 750868
treasurer@fedastro.org.uk

Issue 98 Winter 2011

Secretary
Shaun O'Dell
147 Queen St, Swinton,
Mexborough, S Yorkshire.
S64 6NG
07714 093723
secretary@fedastro.org.uk

Newsletter Editor
Frank Johns
38 Chester Road, Newquay,
Cornwall. TR7 2RH
01637 878020
newsletter@fedastro.org.uk

Published by the Federation of Astronomical Societies ISSN 1361 - 4126

Presidents Spot

Hello fellow amateur astronomers!

I hope you are enjoying the long, dark winter nights and getting lots of observing done. By the time you read this it's possible that Stargazing Live 2012 is over so I could be a little late with some advice on carrying out a risk assessment before you hold a star party or public observing event in support of it. However it's still a good thing to do before any such event whatever time of year your society chooses to hold one.

A risk assessment before your event would help demonstrate (especially if a PLI claim were to arise) that your society has taken reasonable care to reduce hazards and the risk of an accident at its event. As we all know, moving around rough ground, telescope tripods and trailing cables etc. in the dark is not without its tripping and falling over hazards. There may be other hazards too. However there are things you can do beforehand to avoid/ minimise the risks and a risk assessment will help your society to do that.

If you visit the HSE website (http://www.hse.gov.uk/contact/faqs/riskassess.htm) you will find good, clear advice on carrying out a risk assessment. What does it entail? Basically the folk in your society who are planning the event go through a structured exercise to identify and write down what hazards might arise and how they plan to counter them. That is used to improve the safety of the event.

I mentioned PLI and I think it's worth reminding member societies who take out the optional group PLI cover what strategy we follow in its costing. The FAS has never aimed to make a profit on the PLI scheme, it only wants to charge societies what the Insurance company charges for the cover (a cost divided equally between those societies who take out the cover). Since we set the charge to societies and collect the money before we know what the new premium cost will be, this has sometimes produced a small surplus i.e. we overestimated what the insurer was going to charge and/or more societies than expected took out PLI cover. However this has been balanced by years when we have underestimated the new premium cost and it's been more than the PLI income from participating societies. The FAS has covered such shortfalls from reserves without applying a surcharge. So it's swings and roundabouts.

We want to continue to control this situation as well as we can so that if any small surplus occurs one year it is directly taken off the cost of the next year's premium to societies. You will also have seen from published accounts that we are maintaining a minimum reserve in the PLI fund equivalent to one year's PLI premium from the Insurers (which at the moment is roughly £4500). We are comfortably above that reserve at the moment and that is another reason why earlier this year we decided to significantly subsidise the cost of next year's PLI cover to societies. We will continue this policy whilst the reserve level allows us to. We also gave societies 6 months free PLI cover when a couple of years ago we changed (with societies approval) the insurance renewal date from January to the end of June.

Incidentally I heard that a society was upset that it took the FAS at least 8 months following their payment for PLI to provide them with a copy of the policy document. We need to explain to them that about 6 months of this wasn't actually a delay! Each January we ask societies for their renewal subs and at the same time we ask for PLI payment (if they want cover) for the next PLI cover renewal at the end of the following June. In other words if they took out PLI at the previous year's renewal they are still being covered (under the last policy document sent to them) until the following June. That still meant a delay of (say) 2 months in sending out the policy cover note which we regret. However much of the delay was down to negotiations with the Insurers on the cover position for any society that might be a Limited Company and also a society listing error on the first set of docs they provided to us. We don't issue the confirmation of cover to societies until our PLI Officer has checked the insurers schedule against our subscription list. So our aim is that the PLI cost to societies is no more than what the Insurers charge the FAS for the group cover (plus any PLI admin charges incurred by the FAS e.g. postage, telephone calls to Insurer).

That's more than enough from me for this newsletter!

Clear Skies!
Richard Sargent

FAS Online

Over the last year you will be aware that the FAS renewal process moved online and that we produced an improved societies events diary. We are constantly trying to improve our online services for our members and have recently amalgamated all of our tools into one convenient members area -

http://www.fedastro.org.uk/members.php .

Here you will find access to the Membership & Renewals System (MARS) where you can update:

- your society information
- the society events system
- and a bunch of useful FAS resources.

We have recently updated MARS as we noticed a bit of discrepancy in the counties given by members – there is now a drop down list for the postal counties and we ask that when you get time you login to the system and update your county.

If anyone has a particular service they would like to see on the FAS website then please get in touch.

Dr Samuel George
Webmaster

Hi Frank

Re The Jávea & District Astronomical Society

Just to confirm that we have changed our name to the Costa Blanca Astronomical Society, but I guess this will not be promulgated until the next issue of the FAS Handbook. We have actually left the U3A Denia Organisation and are still thriving and hope to attract some younger members as we now have no age limits to worry about.

Our FETTS Exhibition is proving to be very successful and the general public, expats, Spanish etc etc are very impressed with the NASA pictures of which we have about 20+ on display.

All the best for Xmas and the NY

Regards
Ed Morley
Costa Blanca Astronomical Society

More from the FAS Convention

Held on Saturday 15th October, at the Institute of Astronomy in Cambridge, the Annual FAS Convention proved to be a great success with 199 attendees spanning some 59 different astronomical societies from all over the UK.

Excellent talks were given by Carolin Crawford (IOA), Nick Hewitt (BAA), Nik Szymanek, Prof. Albert Zijlstra (Head of Astrophysics, Jodrell Bank) and Lord Martin Rees (IOA).

The Eric Zucker award was presented to Robin Scagell for his work in the astronomical community.

We would like to thank all of the speakers and the delegates for coming along and sharing a great day with us.

Robin Scagell receiving the Eric Zucker Award from FAS President Richard Sargent

As always the tour of the historic telescopes proved to be popular—especially with some sunspots on show

Delegates enjoying a welcome break in proceedings and having a chance to view the trade stands and generally chat with members of other societies.

Launch of Amateur Radio Satellite - ARISSat-1 .

ARISSat-1 was successfully deployed from the International Space Station on the 3rd of Aug2011 at 1443EDT. This was after a delay, because it should have been launched way back in April, but was removed from the EVA walk on that day. However, it was switched on from inside ISS using an antenna mounted on ISS for the Yuri Gagarin celebrations.

ARISSat-1, call-sign RS01S, is a new amateur radio satellite and part of its duties will be education. It was intended to transmit SSTV, beacons with announcements in may languages and will be a repeater with an uplink on 70cm and downlink on the amateur 2m band.

On launch there was a delay after some concerns about the 70cm aerial, but in the end it drifted away from ISS as normal. Battery voltage is discharging more than thought in the dark obits which forces a reset to low power more than expected..

Early days, but so far in Falmouth I have received good telemetry signals from the spacecraft, about it's well being and many slow scan TV pictures, two shown below.

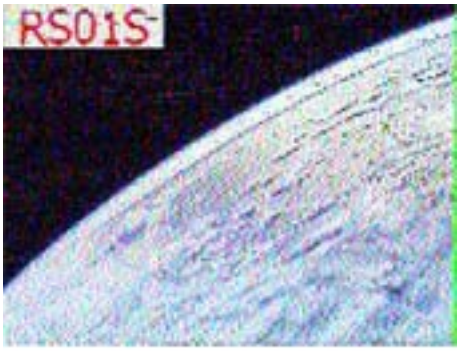
I received ARISSat-1 on my amateur radio receivers, but a good communications receiver covering our 2metre band will be useful, even handhelds will receive their transmissions. To decode the slowscan TV pictures I use a programme called MMSSTV operating in robot 36 - but on the ARISSat-1 webpage there is download programme for just this.

ARISSat-1 also uses 70cm for repeater operation.

More info can be found on the AMSAT webpage.

John Davies
Falmouth.

Picture Courtesy of Amsat.



Getting your society using the web effectively

Dr Samuel George

In this short article I will discuss a few ways of getting your society using the web in a productive way. The web is a great resource for drawing in new members and offering services to your existing members. We live in a web driven society were information is easily accessible so it is important that your website represents your society well.

This is as much the ramblings of a web user and a programmer and I'm not suggesting any of these things are necessary or even best practice – it's just some thoughts on how to use the web a bit better. If anyone has other suggestions then I'd love to hear them and maybe include these as comments on the web version of this text.

Your website

This is the main point of access to your society for the general public so it is very important to be clear and easy to use. One thing that I see missing on society websites quite often is a simple list of events, have a list of your events that are accessible and in an easy to use form. Members of the public are likely to want to contact you so make your contact list obvious, if you don't want to list your email address either create an address for the society so it can be forwarded or use a contact form. A stagnant site is almost as useful as a dead site, so make sure there are regular updates, sites that are obviously out of date do not encourage people to come along. Gone are the days of restrictive bandwidth, so use pictures! Pictures always help, especially of your events, but do reference these correctly. You could even use other web services to host these images and get even more exposure - I'll come back to that later. Take a look at what others do; there are some great astronomical society websites out there. Some have great design others have really useful information. The FAS website competition gives a good starting point – see http://goo.gl/fqvyp. If you find updating the system difficult it might be worth looking at a content management system, like Joomla. If you don't have a website, or want to save some cash, consider using free hosting. Google offer some great services and of course just a blog, e.g. blooger might be a good way to go. You can always get yourself a domain name that is specific for your society and forward it to another service. Have RSS feeds, these allows people to subscribe to your site (if you don't know what these are then these are effective ways of your web page being aggregated, take a read of www.whatisrss.com). Finally, use links, link to other local society events and to the FAS – we like to be linked to!

Emails:

These are always important, consider setting up a mail list that anyone can register with, something like Yahoo or Google groups make this really easy - you are even given code that you can just embed in your page and 'hey, presto' you have a nice join us form.

Flickr/Picasa

If you have images that you take at your society you should consider sharing them under a society account on a photo sharing site like these. This also helps to reduce bandwidth of your society and the server load is given to these services. Both sites have active communities of amateur astronomers so great to get some exposure.

Social Networking

Create a society account where you can post news items, interesting society details and updates. You can use Google+, Twitter, Tumblr, Facebook to name a few. All also give you the option to embed your feed in to your webpage, hence giving your website a "fresh look" whenever there is a new item. Oh and you can link to the FAS Twitter page, we have a hashtag #fedastro and a user account @fedastro. If you take videos of you society events consider posting them on youtube, it will also save you a ton of bandwidth and a great and easy way to embed inside your own pages.

Citizen science

Do your members participate in citizen science? If so why not include links to their results etc. If you don't participate then take a look at zoouniverse.org - a great way of participating in cutting edge science.

Write up your events

Create a blog or just put on your websites, these allow people to see how active you are and just what you are up to. Oh! and send these to us!

FAS website

Use our services! We have a bunch of online tools available for you to use. These include our FAS diary which will appear on our website and most likely our twitter feed. We have a new feature, FASWriteUp - submit your event write ups to us and we will post them on our website and provides a great way of getting content into our newsletter. If you feel we are missing something please let us know and we will try and accommodate this.

If any society has any question about any of the above and would like assistance just drop the FAS webmaster an email.

Attention: Society Treasurers

The FAS are currently exploring additional methods of payment of your subscription.

We are conducting a short survey to see what methods societies would like to use.

Currently we only accept payment via cheques, which works well but is slow for all parties. It will help our operational effectiveness and prepare for the future by moving to electronic payments.

The two other methods we are considering are: bank transfer (could be done online or in person at your bank) or an online debit/credit card processing site, e.g. paypal (you would not need an account with the service).

Could you please take a moment to fill in our few question survey.
See:

www.fedastro.org.uk/survey.php

KELLING HEATH

By Brendan Martin

Tuesday 20th September and it was that time of year off to Kelling Heath for the "Autumn equinox star party", the weather forecast for Tuesday was poor but forecast to improve during the rest of the week.

I arrived at Kelling at about 5am and tried to get my head down for a couple of hours before the site opened but the cockatiel kept in a cage opposite the car park had other ideas (it can be very noisy), I managed about 20 minutes but eventually 8.30am rolled on and the site office was opened, I duly booked in only to find my pitch had been cut in half (money making exercise I think). When I set my tent up I realised I would not be able to set up my gazebo which we use for storage, but never mind eh! Austin Fitch arrived just as I finished setting up (I think he was hiding in the car park waiting). It was later in the afternoon before Dave Owen, Geoff Regan and Ken Sharples arrived but we all managed to get set up before the forecasted rain arrived so no observing tonight instead we watched a film on the laptop.

Wednesday started nice and clear so out came the societies Coronado PST which gave some nice images of some nice prominences and Sun spots, during the day Dave Galvin and Camelia arrived they had booked a pitch and a log cabin the idea being to set up a tent on the pitch containing a laptop and telescope so Dave could do some imaging, there was a bit of patchy cloud as the Sun went down but this soon cleared to give beautiful clear skies and a serious observing session ensued with some excellent deep sky observing, the main target of the evening was to see if we could see the supernova in M101, it was quite easily spotted through even small telescopes and Dave Galvin managed to image it. Dave Robinson had also arrived during the day with his 14" Orion USA Intelliscope Dobsonian, this is a computerised push to like my 10" Orion Dob and Austin had his 12" skywatcher Dob my favourite object of the evening was ngc7332 which also has ngc7339 in the same field of view, about 11-0-lock some cloud moved in and we decided to call it a night as we were all pretty tired.

Thursday was pretty much the same as Wed. But in the evening we had a much longer observing session packing up at 3 in the morning, I used the binocular viewer on Jupiter that we had bought the previous year, they give

(Continued on page 7)

Saturday Trade stands

The largest scope at the event a 24" Dob's

Awaiting patent Austin's dew shield for Telrad's

(Continued from page 6)

amazing views of this planet and really bring out the detail, during the day four more LAS members arrived, Barry Nimmo, Peter Rea, Noel Rimmer and Laurence Ashworth, Barry got some nice images of M31 and M51 in which you can still see the dimming light of a supernova that exploded in May current estimated magnitude 14.5. Friday again was a beautiful day, Dave Galvin, Camelia and myself had booked a boat trip to go to Blakeney Point to see the resident seals in the afternoon, I must say this was well worth the effort and we were blessed with glorious Sunshine and 100's of seals, when we returned to the sight we got the chance to look through our PST and also a neighbours Solarmax scope the Sun was very active with plenty of prominences and developing Sunspots, early evening saw the arrival of Jim Lawler and his wife Angie, the nights obs. Session was not as good as the two previous nights due to patchy cloud but everyone was looking forward to Saturday and the trade stands.

Saturday proved a little disappointing as the bargains on the trade stands were few and far between, Austin managed to find a cheap 9x50 finder scope for a future project and some wide angle eyepieces from Skywatcher which were half price but that was about it, we did manage to buy a second hand telescope (a 4.5 inch reflector) to use on the Young Astronomer evenings. That evening did not produce very clear skies and we had limited observing. We always discuss our favourite object at the end of the week, trouble is there are so many but I would say Jupiter through my scope, M42 through Austin's and NGC891 through Daves Sunday was spent packing up and returning home, Dave Galvin was staying one more night but the weather forecast was not to clever. All in all it was another Equinox star party that delivered apart from rain on the first night we had good weather for the rest of the week and once again I came home sunburnt, I can't wait for next year.

Enjoying some Sun

Dave Galvins image of M101 with supernova

Looking through a Solarmax

Seals at Blakeney Point

There are more images from this event to be found in Pages 9 & 10 of the e-version of this Newsletter

Courtesy: LAS Newsletter

Observing at Ford - With Shropshire AS

September 2011.

The summer months of 2011 will go down as possibly the driest and clearest on record, at least so far as west Shropshire is concerned.

It was therefore with an awful feeling of déjà vu as Saturday 3rd September dawned grey and overcast, but still stubbornly dry. Hopes of a break in the grey blanket proved unfounded and not even the setting sun could be seen through the canopy. Nor did it rain more than a pitiful dampness on the parched ground.

The caravan park was fully occupied and a number of campers were using the playing field. The plan had been to give them a close and comfortable look at a first quarter yellow moon against a blue background, but sadly it was not to be.

And so an early return home was followed by the now customary – one might even say legendary – early cup of cocoa (of which I for one am becoming increasingly fed up).

October 2011.

At long last, a clear night!! And sadly I was late. At eight o'clock, when I should have been opening up, I was stuck on the A49 on my way home from visiting my daughter. Fortunately I had had the foresight to pre-load all the kit in my car and so, having collected my trusty neighbour Michael from the village, we were there by about 8.15. I was ready with an apology, but this was not needed as there was no-one waiting. A recently joined member arrived at about 8.30 with his tripod-mounted binoculars, so between three observers there were two sets of binoculars and one 8" Skywatcher.

By the time we were properly set up, the pre-First Quarter moon had already set.

The sky was completely cloudless and the full set of Autumn constellations were easily visible, as was the Milky Way as a clear hazy streak across the sky.

Our first target was Jupiter low in the south-east. For a time, it seemed that five moons could be seen instead of the usual four, but, as Jupiter moved against the background 'fixed' stars it became clear that the 'fifth moon' was in fact a faint line-of-sight background star.

Because of the unusually warm recent weather, the seeing did not have the sharp clarity of January or February but nevertheless there were so many stars visible in viewfinder and eyepiece that locating particular objects took more than the usual care. For example, Al-berio, the blue-gold double in Cygnus, proved elusive against the background star-fields.

The Andromeda galaxy, being further away from the galactic plane, proved a more easily located target. But by the time I got round to the Ring Nebula close to Lyra the seeing had become too hazy.

As the evening wore on, the days residual heat (still nearly 20°C at 22.00) made the seeing increasingly blurry and so we abandoned searching for single objects with the scope and concentrated on a slightly 'broader brush' approach with the binoculars.

My Ford neighbour Michael is always reluctant to acknowledge his skill and expertise, but he was able to guide us along the Milky Way from open cluster to star-field, like following a string of pearls.

We finally called it a day well after 22.00. It is such a shame that so few members were there to join the fun.

While the support in the east of the county and the attendance at the main Rodington meetings is of course encouraging, we are supposed to be the group for the whole county, and it is a big place. There are large areas where we have little or no presence and, as the price of fuel inexorably rises, people will think twice about making round-trips of 50+ miles to attend meetings.

Stan Courtney - Shropshire AS

Courtesy: HERMES

FAS Council Members—from the left: Callum Potter, Shaun O'dell, Steve Williams, Richard Sargent, Gary Gawthrope, Richard Last, John Axtell, Peter Cooke, John Evans and Samuel George.

Other Council members who were not at the Convention are: Keith Brackenborough, Dave Evetts, Paul Harper and Frank Johns

more - LAS at Kelling Heath

Dave Galvin setting up

Noel Rimmers 16" Dobs

and yet more - LAS at Kelling Heath

Peter's solar scope

M31 by Barry Nimmo from Kelling Heath

James Webb Mirrors Pass Deep-Freeze Exams

by JASON MAJOR - *Universe Today*

The last of the 21 mirrors for the James Webb Space Telescope have come out of deep freeze – literally! – and are now approved for space operations, a major milestone in the development of the next generation telescope that's being hailed as the "successor to Hubble."

"The mirror completion means we can build a large, deployable telescope for space," said Scott Willoughby, vice president and Webb program manager at Northrop Grumman Aerospace Systems. "We have proven real hardware will perform to the requirements of the mission."

The all-important mirrors for the Webb telescope had to be cryogenically tested to make sure they could withstand the rigors and extreme low temperatures necessary for operating in space. To achieve this, they were cooled to temperatures of -387F (-233C) at the X-ray and Cryogenic Test Facility at Marshall Space Flight Center.

When in actual use, the mirrors will be kept at such low temperatures so as not to interfere with deep-space infrared observations with their own heat signatures.

JWST engineers anticipate that, with such drastic cooling, the mirrors will change shape. The testing proved that the mirrors would achieve the shapes needed to still perform exactly as expected.

The James Webb Space Telescope mirrors at Marshall Space Flight Center. Credit: Emmett Given, NASA Marshall

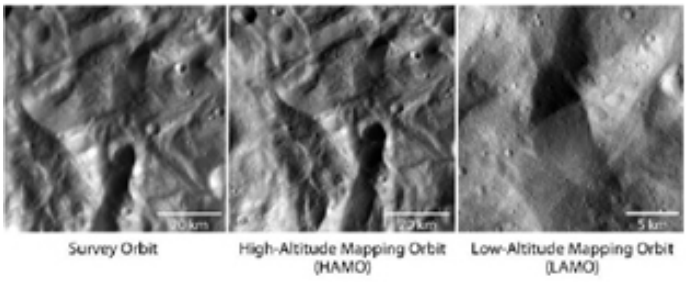
"This testing ensures the mirrors will focus crisply in space, which will allow us to see new wonders in our universe," said Helen Cole, project manager for Webb Telescope mirror activities.

Planned for launch in 2018, the JWST will be the premier observatory of the next decade, serving thousands of astronomers worldwide. It will study every phase in the history of the Universe, ranging from the first luminous glows after the Big Bang to the formation of solar systems capable of supporting life on Earthlike planets.

NASA's Dawn Spacecraft Obtains First Low Altitude Images of Vesta

ScienceDaily (Dec. 21, 2011)

NASA's Dawn spacecraft has sent back the first images of the giant asteroid Vesta from its low-altitude mapping orbit. The images, obtained by the framing camera, show the stippled and lumpy surface in detail never seen before, piquing the curiosity of scientists who are studying Vesta for clues about the solar system's early history.



NASA's Dawn spacecraft has spiraled closer and closer to the surface of the giant asteroid Vesta. (Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA)

At this detailed resolution, the surface shows abundant small craters, and textures such as small grooves and lineaments that are reminiscent of the structures seen in low-resolution data from the higher-altitude oarbits. Also, this fine scale highlights small outcrops of bright and dark material.

A gallery of images can be found online at: http://www.nasa.gov/mission_pages/dawn/multimedia/gallery-index.html .

The images were returned to Earth on Dec. 13. Dawn scientists plan to acquire data in the low-altitude mapping orbit for at least 10 weeks. The primary science objectives in this orbit are to learn about the elemental composition of Vesta's surface with the gamma ray and neutron detector and to probe the interior structure of the asteroid by measuring the gravity field.

The Dawn mission to the asteroids Vesta and Ceres is managed by NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, for NASA's Science Mission Directorate, Washington. Dawn is a project of the directorate's Discovery Program, managed by NASA's Marshall Space Flight Center in Huntsville, Ala. UCLA is responsible for overall Dawn mission science. The Dawn Framing Cameras have been developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by DLR German Aerospace Center, Institute of Planetary Research, Berlin, and in coordination with the Institute of Computer and Communication Network Engineering, Braunschweig. The framing camera project is funded by the Max Planck Society, DLR, and NASA/JPL.

More information about the Dawn mission is online at:http://www.nasa.gov/dawn and http://dawn.jpl.nasa.gov .

2012: Shadow of the Dark Rift

By Francis Reddy

One of the most bizarre theories about 2012 has built up with very little attention to facts. This idea holds that a cosmic alignment of the sun, Earth, the centre of our galaxy -- or perhaps the galaxy's thick dust clouds -- on the winter solstice could for some unknown reason lead to destruction. Such alignments can occur but these are a regular occurrence and can cause no harm (and, indeed, will not even be at its closest alignment during the 2012 solstice.)

Thick dust clouds block our night-time view of the Milky Way, creating what is sometimes called the Dark Rift. The fact that -- from the viewpoint of Earth -- the sun aligns with these clouds, or the galactic center, near the winter solstice is no cause for concern. Credit: A. Fujii

The details are as follows: Viewed far from city lights, a glowing path called the Milky Way can be seen arching across the starry sky. This path is formed from the light of millions of stars we cannot see individually. It coincides with the mid plane of our galaxy, which is why our galaxy is also named the Milky Way.

Thick dust clouds also populate the galaxy. And while infrared telescopes can see them clearly, our eyes detect these dark clouds only as irregular patches where they dim or block the Milky Way's faint glow. The most prominent dark lane stretches from the constellations Cygnus to Sagittarius and is often called the Great Rift, sometimes the Dark Rift.

Another impressive feature of our galaxy lies unseen in Sagittarius: the galactic center, about 28,000 light-years away, which hosts a black hole weighing some four million times the sun's mass.

The claim for 2012 links these two pieces of astronomical fact with a third – the position of the sun near the galactic center on Dec. 21, the winter solstice for the Northern Hemisphere – to produce something that makes no astronomical sense at all.

As Earth makes its way around the sun, the sun appears to move against the background stars, which is why the visible constellations slowly change with the seasons. On Dec. 21, 2012, the sun will pass about 6.6 degrees north of the galactic center – that's a distance that looks to the eye to be about 13 times the full moon's apparent size – and it's actually closer a couple of days earlier. There are different claims about why this bodes us ill, but they boil down to the coincidence of the solstice with the sun entering the Dark Rift somehow portending disaster or the mistaken notion that the sun and Earth becoming aligned with the black hole in the galactic center allows some kind of massive gravitational pull on Earth.

The first strike against this theory is that the solstice itself does not correlate to any movements of the stars or anything in the universe beyond Earth. It just happens to be the day that Earth's North Pole is tipped farthest from the sun.

Second, Earth is not within range of strong gravitational effects from the black hole at the center of the galaxy since gravitational effects decrease exponentially the farther away one gets. Earth is 93 million miles from the sun and 165 quadrillion miles from the Milky Way's black hole. The sun and the moon (a smaller mass, but much closer) are by far the most dominant gravitational forces on Earth. Throughout the course of the year, our distance from the Milky Way's black hole changes by about one part in 900 million – not nearly enough to cause a real change in gravity's pull. Moreover, we're actually nearest to the galactic center in the summer, not at the winter solstice.

Third, the sun appears to enter the part of the sky occupied by the Dark Rift every year at the same time, and its arrival there in Dec. 2012 portends precisely nothing.

Enjoy the solstice, by all means, and don't let the Dark Rift, alignments, solar flares, magnetic field reversals, potential impacts or alleged Maya end-of-the-world predictions get in the way.

Provided by JPL/NASA (**news** : **web**)

Courtesy: PhysOrg.com December 22, 2011

Giant planet ejected from the solar system

Simulations indicate that Jupiter might have pushed a smaller gas giant planet out of the solar system early in its history.

By Southwest Research Institute, San Antonio, Texas — Published: November 11, 2011

Artist's impression of a planet ejected from the early solar system. Image courtesy of Southwest Research Institute

Just as an expert chess player sacrifices a piece to protect the queen, the solar system may have given up a giant planet and spared Earth.

"We have all sorts of clues about the early evolution of the solar system," said David Nesvorny from the Southwest Research Institute in San Antonio, Texas. "They come from the analysis of the trans-Neptunian population of small bodies known as the Kuiper Belt and from the lunar cratering record."

These clues suggest that the orbits of giant planets were affected by a dynamical instability when the solar system was only about 600 million years old. As a result, the giant planets and smaller bodies scattered away from each other.

Some small bodies moved into the Kuiper Belt and others traveled inward, producing impacts on the terrestrial planets and the Moon. The giant planets moved as well. Jupiter, for example, scattered most small bodies outward and moved inward.

This scenario presents a problem, however. Slow changes in Jupiter's orbit, such as the ones expected from interaction with small bodies, would have conveyed too much momentum to the orbits of the terrestrial planets, stirring up or disrupting the inner solar system and possibly causing Earth to collide with Mars or Venus.

"Colleagues suggested a clever way around this problem," said Nesvorny. "They proposed that Jupiter's orbit quickly changed when Jupiter scattered off of Uranus or Neptune during the dynamical instability in the outer solar system." The "jumping-Jupiter" theory is less harmful to the inner solar system because the orbital coupling between the terrestrial planets and Jupiter is weak if Jupiter jumps. Nesvorny conducted thousands of computer simulations of the early solar system to test the jumping-Jupiter theory. He found that, as hoped for, Jupiter did in fact jump by scattering from Uranus or Neptune. When it jumped, however, Uranus or Neptune was knocked out of the solar system. "Something was clearly wrong," he said.

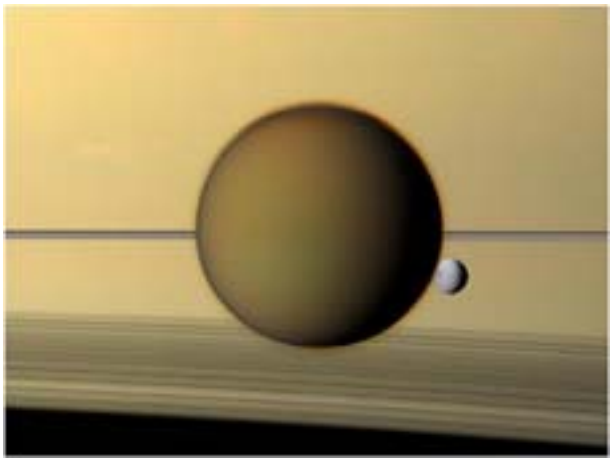
Motivated by these results, Nesvorny wondered whether the early solar system could have had five giant planets instead of four. By running the simulations with an additional giant planet with mass similar to that of Uranus or Neptune, things suddenly fell in place. One planet was ejected from the solar system by Jupiter, leaving four giant planets behind, and Jupiter jumped, leaving the terrestrial planets undisturbed.

"The possibility that the solar system had more than four giant planets initially, and ejected some, appears to be conceivable in view of the recent discovery of a large number of free-floating planets in interstellar space, indicating the planet ejection process could be a common occurrence," said Nesvorny.

Science Daily (Nov 10, 2011)

NASA's Cassini Delivers Holiday Treats from Saturn *ScienceDaily (Dec. 23, 2011)*

No team of reindeer, but radio signals flying clear across the solar system from NASA's Cassini spacecraft have delivered a holiday package of glorious images. The pictures, from Cassini's imaging team, show Saturn's largest, most colorful ornament, Titan, and other icy baubles in orbit around this splendid planet.



Titan and Dione: Saturn's third-largest moon Dione can be seen through the haze of its largest moon, Titan, in this view of the two posing before the planet and its rings from NASA's Cassini spacecraft. (Credit: NASA/JPL-Caltech/SSI)

The release includes images of satellite conjunctions in which one moon passes in front of or behind another. Cassini scientists regularly make these observations to study the ever-changing orbits of the planet's moons. But even in these routine images, the Saturnian system shines. A few of Saturn's stark, airless, icy moons appear to dangle next to the orange orb of Titan, the only moon in the solar system with a substantial atmosphere. Titan's atmosphere is of great interest because of its similarities to the atmosphere believed to exist long ago on the early Earth.

The images are online at:http://www.nasa.gov/cassini , http://saturn.jpl.nasa.gov andhttp://ciclops.org .

While it may be wintry in Earth's northern hemisphere, it is currently northern spring in the Saturnian system and it will remain so for several Earth years. Current plans to extend the Cassini mission through 2017 will supply a continued bounty of scientifically rewarding and majestic views of Saturn and its moons and rings, as spectators are treated to the passage of northern spring and the arrival of summer in May 2017.

"As another year traveling this magnificent sector of our solar system draws to a close, all of us on Cassini wish all of you a very happy and peaceful holiday season, " said Carolyn Porco, Cassini imaging team lead at the Space Science Institute, Boulder, Colo.

More information about Cassini mission is online athttp://www.nasa.gov/cassini and http://saturn.jpl.nasa.gov .

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute in Boulder, Colo.

What if the Earth had Two Moons?

by AMY SHIRA TEITEL *on DECEMBER 27, 2011*

The idea of an Earth with two moons has been a science fiction staple for decades. More recently, real possibilities of an Earth with two moons have popped up. The properties of the Moon's far side has many scientists thinking that another moon used to orbit the Earth before smashing into the Moon and becoming part of its mass. Since 2006, astronomers have been tracking smaller secondary moons that our own Earth-Moon system captures; these metre-wide moons stay for a few months then leave.

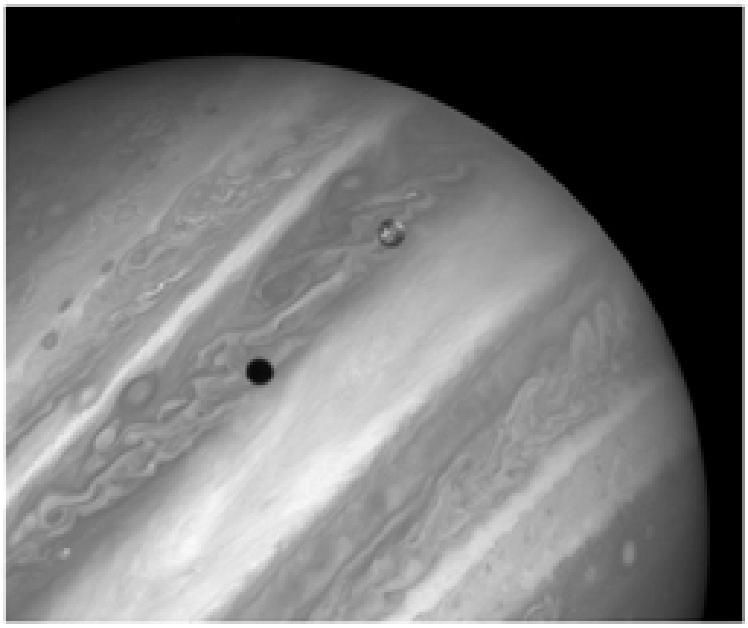
But what if the Earth actually had a second permanent moon today? How different would life be? Astronomer and physicist Neil F. Comins delves into this thought experiment, and suggests some very interesting consequences.

The Earth and Moon as seen from Mariner 10 en route to Venus. This could be a similar view of two moons as seen from Earth. Image credit: NASA/courtesy of nasaimages.org

Our Earth-Moon system is unique in the solar system. The Moon is 1/81 the mass of Earth while most moons are only about 3/10,000 the mass of their planet. The size of the Moon is a major contributing factor to complex life on Earth. It is responsible for the high tides that stirred up the primordial soup of the early Earth, it's the reason our day is 24 hours long, it gives light for the variety of life forms that live and hunt during the night, and it keeps our planet's axis tilted at the same angle to give us a constant cycle of seasons.

A second moon would change that.

For his two-mooned Earth thought experiment, Comins proposes that our Earth-Moon system formed as it did – he needs the same early conditions that allowed life to form – before capturing a third body. This moon, which I will call Luna, sits halfway between the Earth and the Moon.



This shot of Io orbiting Jupiter shows the scale between other moons and their planet. Image credit:NASA/courtesy of nasaimages.org

Luna's arrival would wreak havoc on Earth. Its gravity would tug on the planet causing absolutely massive tsunamis, earthquakes, and increased volcanic activity. The ash and chemicals raining down would cause a mass extinction on Earth.

But after a few weeks, things would start to settle.

Luna would adjust to its new position between the Earth and the Moon. The pull from both bodies would cause land tides and volcanic activity on the new moon; it would develop activity akin to Jupiter's volcanic moon Io. The constant volcanic activity would make Luna smooth and uniform, as well as a beautiful fixture in the night sky.

The Earth would also adjust to its two moons, giving life a chance to arise. But life on a two-mooned Earth would be different.

The combined light from the Moon and Luna would make for much brighter nights, and their different orbital periods will mean the Earth would have fewer fully dark nights. This will lead to different kinds of nocturnal beings; nighttime hunters would have an easier time seeing their prey, but the prey would develop better camouflage mechanisms. The need to survive could lead to more cunning and intelligent breeds of nocturnal animals.

Humans would have to adapt to the challenges of this two-mooned Earth. The higher tides created by Luna would make shoreline living almost impossible – the difference between high and low tides would be measured in thousands of feet. Proximity to the water is a necessity for sewage draining and transport of goods, but with higher tides and stronger erosion, humans would have to develop different ways of using the oceans for transfer and travel. The habitable area of Earth, then, would be much smaller.

The measurement of time would also be different. Our months would be irrelevant. Instead, a system of full and partials months would be necessary to account for the movement of two

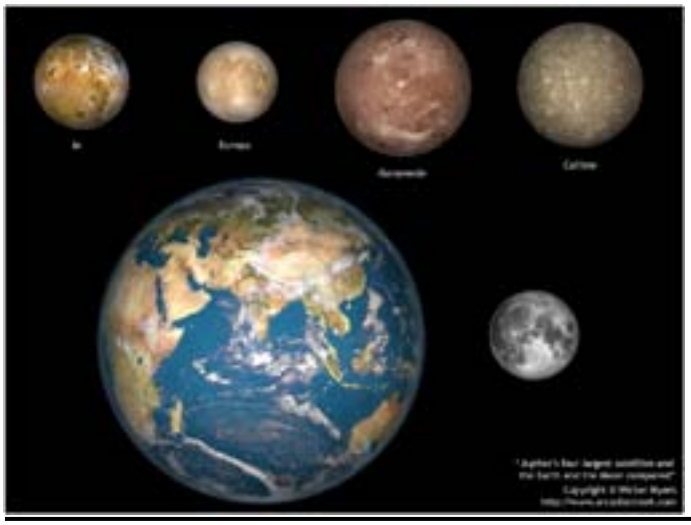
(Continued on page 15)

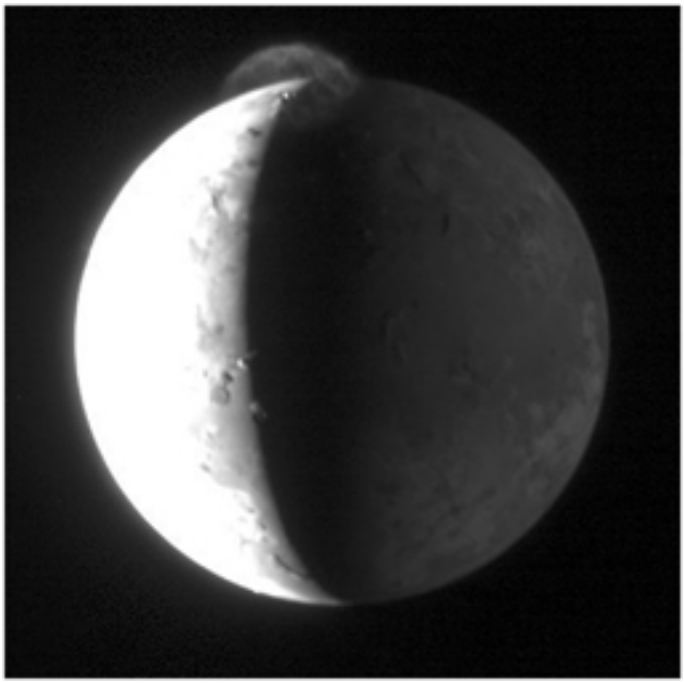
(Continued from page 14)
moons.

Eventually, the Moon and Luna would collide; like the Moon is now, both moons would be receding from Earth. Their eventual collision would send debris raining through Earth's atmosphere and lead to another mass extinction. The end result would be one moon orbiting the Earth, and life another era of life would be primed to start.

Source: Neil Comins' *What if the Earth had Two Moons? And Nine Other Thought Provoking Speculations on the Solar System*.

Universe Today





New Horizons captured this image of volcanic activity on Io. The same sight could be seen of Luna from Earth. Image credit: NASA/courtesy of nasaimages.org

Two More Earth-Sized Planets Discovered by Kepler, Orbiting Former Red Giant Star

by PAUL SCOTT ANDERSON *on DECEMBER 26, 2011*

Amid all of the news last week regarding the discovery by Kepler of two Earth-sized planets orbiting another star, there was another similar find which hadn't received as much attention. There were *two more Earth-sized planets* also just discovered by Kepler orbiting a different star. In this case, however, the star is an old and dying one, and has passed its red giant phase where it expands enormously, destroying (or at least barbecuing) any nearby planets in the process before becoming just an exposed core of its former self. The paper was just published in the journal *Nature*.

The two planets, KOI 55.01 and KOI 55.02, orbit the star KOI 55, a subdwarf B star, which is the leftover core of a red giant star. Both planets have very tight orbits close to the star, so they were probably engulfed during the red giant phase but managed to survive (albeit "deep-fried"). They are estimated to have radii of 0.76 and 0.87 that of Earth, the smallest known exoplanets found so far orbiting an active star.

Artist's conception of the KOI 55 system. Credit: S. Charpinet / Univ. of Toulouse

According to lead author Stephane Charpinet, "Having migrated so close, they probably plunged deep into the star's envelope during the red giant phase, but survived."

"As the star puffs up and engulfs the planet, the planet has to plow through the star's hot atmosphere and that causes friction, sending it spiraling toward the star," added Elizabeth 'Betsy' Green, an associate astronomer at the University of Arizona's Steward Observatory. "As it's doing that, it helps strip atmosphere off the star. At the same time, the friction with the star's envelope also strips the gaseous and liquid layers off the planet, leaving behind only some part of the solid core, scorched but still there."

The discovery was also unexpected; the star had already been the subject of study using the telescopes at Kitt Peak National Observatory, part of a project to examine pulsating stars. For more accurate measurements however, the team used data from the orbiting Kepler space telescope which is free of interfering atmospheric effects. According to Green, "I had already obtained excellent high-signal to noise spectra of the hot subdwarf B star KOI 55 with our telescopes on Kitt Peak, before Kepler was even launched. Once Kepler was in orbit and began finding all these pulsational modes, my co-authors at the University of Toulouse and the University of Montreal were able to analyze this star immediately using their state-of-the art computer models."

Two tiny modulations in the pulsations of the star were found, which further analysis indicated could only come from planets passing in front of the star (from our viewpoint) every 5.76 and 8.23 hours.

Our own Sun awaits a similar fate billions of years from now and is expected to swallow Mercury, Venus, Earth and Mars during its expansion phase. "When our sun swells up to become a red giant, it will engulf the Earth," said Green. "If a tiny planet like the Earth spends 1 billion years in an environment like that, it will just evaporate. Only planets with masses very much larger than the Earth, like Jupiter or Saturn, could possibly survive." The discovery should help scientists to better understand the destiny of planetary systems including our own.

This finding is important in that it not only confirms that Earth-size planets are out there, and are probably common, but that they and other planets (of a wide variety so far) are being found orbiting different types of stars, from newly born ones, to middle-age ones and even dying stars (or dead in the case of pulsars). They are a natural product of star formation which of course has implications in the search for life elsewhere.

Universe Today

Astronomers Discover Rare Galaxy at Dawn of Time

ScienceDaily (Dec. 21, 2011)

Astronomers, including the University of California, Riverside's Bahram Mobasher and his graduate student Hooshang Nayyeri, have discovered that one of the most distant galaxies known is churning out stars at a shockingly high rate. The researchers made the discovery using NASA's Spitzer and Hubble space telescopes. The blob-shaped galaxy, called GN-108036, is the brightest galaxy found to date at such great distances.

The galaxy, which was discovered and confirmed using ground-based telescopes, is 12.9 billion light-years away. Data from Spitzer and Hubble were used to measure the galaxy's high star production rate, equivalent to about 100 suns per year. For reference, our Milky Way galaxy is about five times larger and 100 times more massive than GN-108036, but makes roughly 30 times fewer stars per year.

The discovery is surprising because previous surveys had not found galaxies this bright so early in the history of the universe. According to the researchers, GN-108036 may be a special, rare object that they happened to catch during an extreme burst of star formation.

The international team of astronomers, led by Masami Ouchi of the University of Tokyo, Japan, first identified the remote galaxy after scanning a large patch of sky with the Subaru Telescope atop Mauna Kea in Hawaii. Its great distance was then carefully confirmed with the W.M. Keck Observatory, also on Mauna Kea.

GN-108036 lies near the very beginning of time itself, a mere 750 million years after our universe was created 13.7 billion years ago in an explosive "Big Bang." Its light has taken 12.9 billion years to reach us, so we are seeing it as it existed in the very distant past.

Astronomers refer to the object's distance by a number called its "redshift," which relates to how much its light has stretched to longer, redder wavelengths due to the expansion of the universe. Objects with larger redshifts are farther away and are seen further back in time. GN-108036 has a redshift of 7.2. Only a handful of galaxies have confirmed redshifts greater than 7, and only two of these have been reported to be more distant than GN-108036.

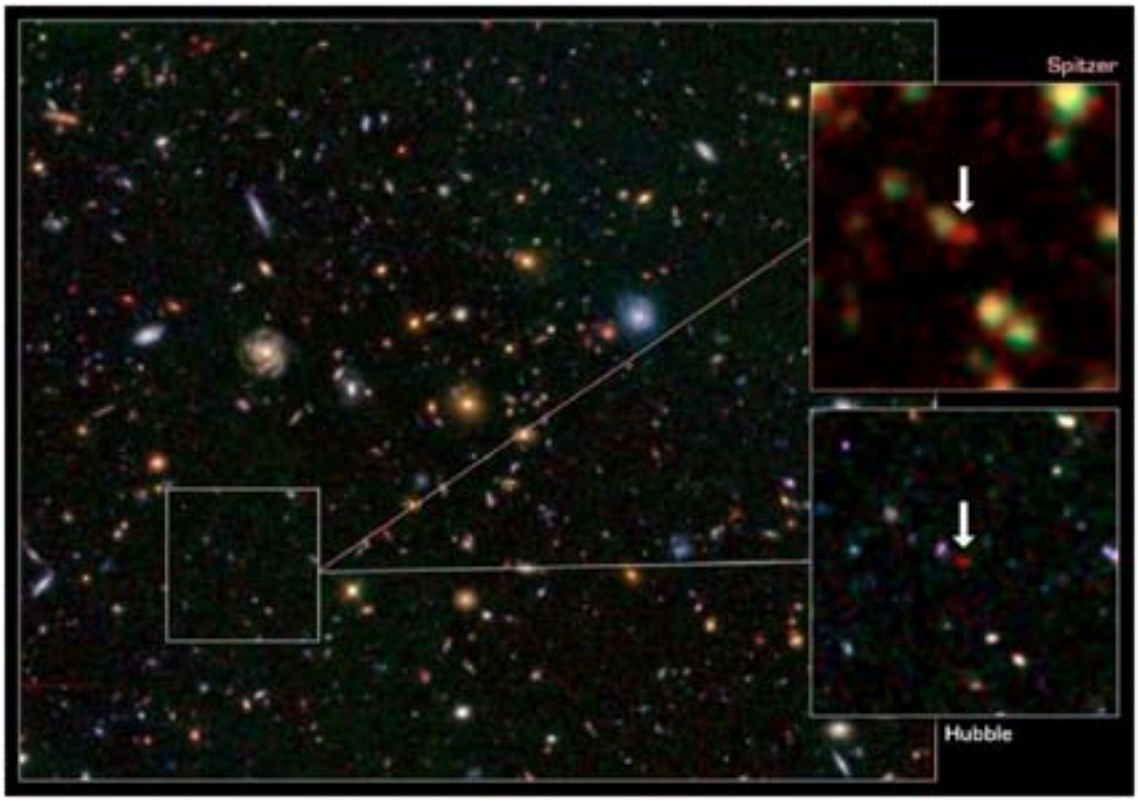
Infrared observations from Spitzer and Hubble were crucial for measuring the galaxy's star-formation activity. Astronomers were surprised to see such a large burst of star formation because the galaxy is so small and from such an early cosmic era. Back when galaxies were first forming, in the first few hundreds of millions of years after the Big Bang, they were much smaller than they are today, having yet to bulk up in mass.

During this epoch, as the universe expanded and cooled after its explosive start, hydrogen atoms permeating the cosmos formed a thick fog that was opaque to ultraviolet light. This period, before the first stars and galaxies had formed and illuminated the universe, is referred to as the "dark ages." The era came to an end when light from the earliest galaxies burned through, or "ionized," the opaque gas, causing it to become transparent. Galaxies similar to GN-108036 may have played an important role in this event.

"The high rate of star formation found for GN-108036 implies that it was rapidly building up its mass some 750 million years after the Big Bang, when the universe was only about five percent of its present age," said Mobasher, a professor of physics and astronomy. "This was therefore a likely ancestor of massive and evolved galaxies seen today."

The researchers report their findings in the *Astrophysical Journal*.

Other authors include: Kyle Penner and Benjamin J. Weiner of the University of Arizona, Tucson; Yoshiaki Ono, Kazuhiro Shimasaku and Kimihiko Nakajima of the University of Tokyo; Mark Dickinson and Jeyhan S. Kartaltepe of the National Optical Astronomy Observatory, Ariz.; Daniel Stern of NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif.; Nobunari Kashikawa of the National Astronomical Observatory of Japan; and Hyron Spinrad of UC Berkeley.



This image shows one of the most distant galaxies known, called GN-108036, dating back to 750 million years after the Big Bang that created our universe. The galaxy's light took 12.9 billion years to reach us.
(Credit: NASA/JPL-Caltech/STScI/University of Tokyo)

New calculations suggest Jupiter's core may be liquefying

December 21, 2011 by Bob Yirka

Jupiter, the largest planet in our solar system, may be causing its own core to liquefy, at least according to Hugh Wilson and colleague Burkhard Militzer of UC, Berkeley. They've come to this conclusion after making quantum mechanical calculations on the conditions that exist within the big planet. In a paper published on the preprint server *arXiv*, and submitted to *Physical Review Letters*, the two explain that because the gas giant has a relatively small core made of mostly iron, rock (partly magnesium oxide) and ice, and sits embedded in fluid hydrogen and helium all under great pressure from the planet's gravity (which has created very high temperatures (16,000 K)), there is a likelihood that the core is liquefying due to the heat and pressure exerted on the magnesium oxide.

Calculating the possibility of the magnesium oxide liquefying had to be done to predict the outcome because recreating the environment that exists inside of Jupiter for experimentation purposes isn't feasible. They have in essence shown that magnesium oxide, when exposed to such high temperatures and pressure, has high solubility, which of course means a high probability of dissolving into a liquid. In a previous study, the team also made calculations showing that the core ice would likely be dissolving as well.

The findings suggest that Jupiter's core might not be as big as it once was, though it currently weights about as much as ten Earth's (the whole planet weighs as much as 318 Earth's). This implies that the core could eventually be reduced down to nothing at all. And if that's the case, than those who study exoplanets, particularly the giant gas variety, will have to do some rethinking, because those others might not have a core at all, contrary to conventional wisdom.

Unfortunately, the calculations the two performed can't give a rate of erosion, thus a timeline for how long it's taken for the core to come to its current size can't be made, nor can predictions be made on how long it might take for the core to disappear altogether; both of which would be useful in helping to predict the ages of other gas giants out beyond our solar system. Luckily, NASA has a space probe on the way to measure Jupiter's gravitational field more accurately, though it won't get there till 2016; that should give scientists plenty of time to consider the impact these new findings might have on their current models regarding giant gas planets.

More information: Rocky core solubility in Jupiter and giant exoplanets, arXiv:1111.6309v1 [astro-ph.EP] **http://arxiv.org/abs/1111.6309**

Courtesy: PhysOrg.com

New Evidence for Complex Molecules On Pluto's Surface

ScienceDaily (Dec. 20, 2011)

The new and highly sensitive Cosmic Origins Spectrograph aboard the Hubble Space Telescope has discovered a strong ultraviolet-wavelength absorber on Pluto's surface, providing new evidence that points to the possibility of complex hydrocarbon and/or nitrile molecules lying on the surface, according to a paper recently published in the Astronomical Journal by researchers from Southwest Research Institute and Nebraska Wesleyan University.

The Cosmic Origins Spectrograph aboard NASA's Hubble Space Telescope recently discovered a strong ultraviolet-

Such chemical species can be produced by the interaction of sunlight or cosmic rays with Pluto's known surface ices, including methane, carbon monoxide and nitrogen.

The project, led by SwRI's Dr. Alan Stern, also included SwRI researchers Dr. John Spencer and Adam Shinn, and Nebraska Wesleyan University researchers Dr. Nathaniel Cunningham and student Mitch Hain.

"This is an exciting finding because complex Plutonian hydrocarbons and other molecules that could be responsible for the ultraviolet spectral features we found with Hubble may, among other things, be responsible for giving Pluto its ruddy color," said Stern.

The team also discovered evidence of changes in Pluto's ultraviolet spectrum compared to Hubble measurements from the 1990s. The changes may be related to differing terrains seen now versus in the 1990s, or to other effects, such as changes in the surface related to a steep increase in the pressure of Pluto's atmosphere during that same time span.

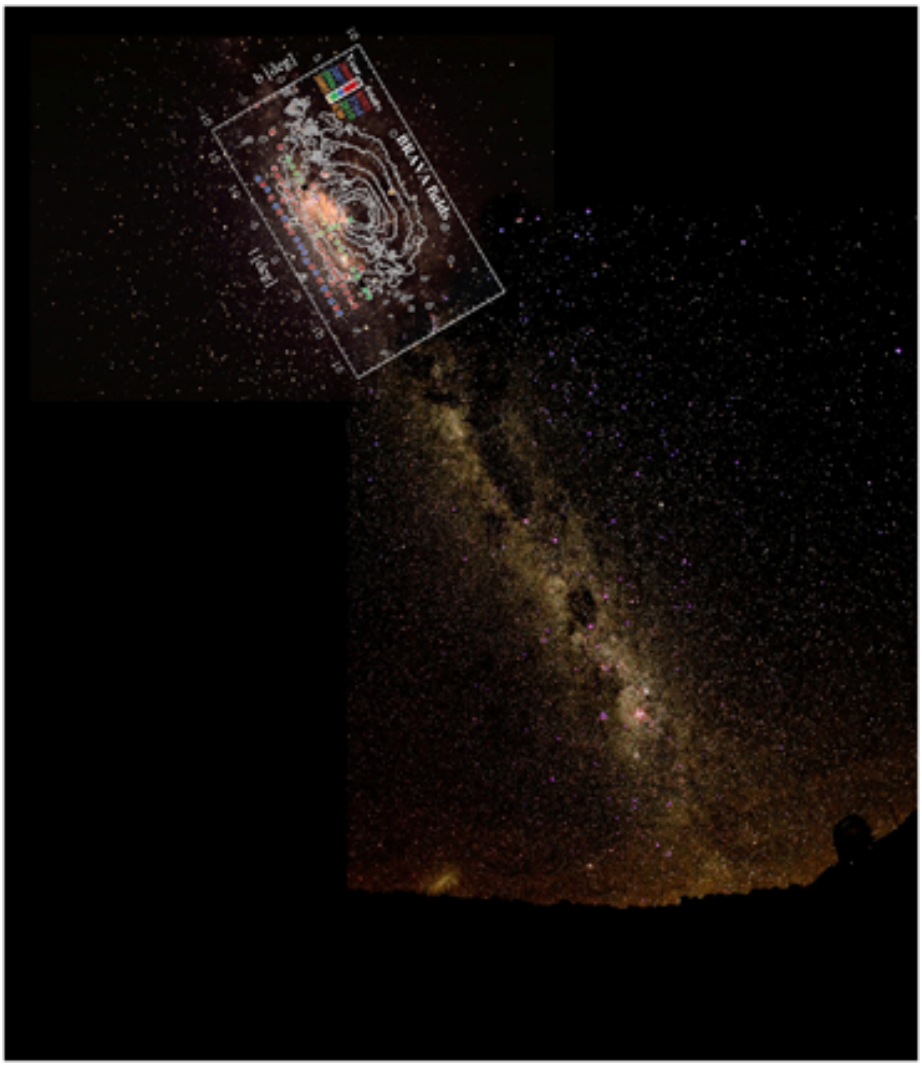
"The discovery we made with Hubble reminds us that even more exciting discoveries about Pluto's composition and surface evolution are likely to be in store when NASA's New Horizons spacecraft arrives at Pluto in 2015," Stern added.

This research was supported by a grant from the Space Telescope Science Institute.

New insight into the bar in the centre of the Milky Way

PhysOrg.com December 19, 2011

It sounds like the start of a bad joke: do you know about the bar in the center of the Milky Way Galaxy? Astronomers first recognized almost 80 years ago that the Milky Way Galaxy, around which the sun and its planets orbit, is a huge spiral galaxy. This isn't obvious when you look at the band of starlight across the sky, because we are inside the galaxy: it's as if the sun and solar system is a bug on the spoke of a bicycle wheel. But in recent decades astronomers have suspected that the center of our galaxy has an elongated stellar structure, or bar, that is hidden by dust and gas from easy view. Many spiral galaxies in the universe are known to exhibit such a bar through the center bulge, while other spiral galaxies are simple spirals. And astronomers ask, why? In a recent paper Dr. Andrea Kunder, of Cerro Tololo Inter-American Observatory (CTIO) in northern Chile, and a team of colleagues have presented data that demonstrates how this bar is rotating.



The BRAVA fields are shown in this image montage. For reference, the center of the Milky Way is at coordinates L= 0, B=0. The regions observed are marked with colored circles. This montage includes the southern Milky Way all the way to the horizon, as seen from CTIO. The telescope in silhouette is the CTIO Blanco 4-m. (Just peaking over the horizon on the left is the Large Magellanic Cloud, the nearest external galaxy to our own.) Image Credit: D. Talent, K. Don, P. Marenfeld & NOAO/AURA/NSF and the BRAVA Project

As part of a larger study dubbed BRAVA, for Bulge Radial Velocity Assay, a team assembled by Dr. R. Michael Rich at UCLA, measured the velocity of a large sample of old, red stars towards the galactic center. (See image) They did this by observing the spectra of these stars, called M giants, which allows the velocity of the star along our line of sight to be determined. Over a period of 4 years almost 10,000 spectra were acquired with the CTIO Blanco 4-meter telescope, located in the Chilean Atacama desert, resulting in the largest homogeneous sample of radial velocities with which to study the core of the Milky Way. Analyzing the stellar motions confirms that the bulge in the center of our galaxy appears to consist of a massive bar, with one end pointed almost in the direction of the sun, which is rotating like a solid object. Although our galaxy rotates much like a pinwheel, with the stars in the arms of the galaxy orbiting the center, the BRAVA study found that the rotation of the inner bar is cylindrical, like a toilet roll holder. This result is a large step forward in explaining the formation of the complicated central region of the Milky Way.

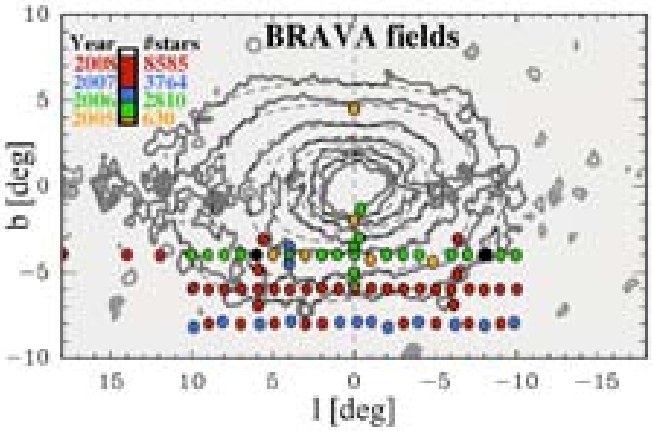
The full set of 10,000 spectra were compared with a computer simulation of how the bar formed from a pre-existing disk of stars. Dr. Juntai Shen of the Shanghai Observatory developed the model. The data fits the model extremely well, and suggests that before our bar existed, there was a massive disk of stars. This is in contrast to the standard picture in which our galaxy's central region formed from the chaotic merger of gas clouds, very early in the history of the Universe. The implication is that gas played a role, but appears to have largely organized into a massive rotating disk, that then turned into a bar due to the gravitational interactions of the stars.

(Continued on page 19)

(Continued from page 18)

The stellar spectra also allow the team to analyze the chemical composition of the stars. While all stars are composed primarily of hydrogen, with some helium, it is the trace of all the other elements in the periodic table, called "metals" by astronomers, that allow us to say something about the conditions under which the star formed. The BRAVA team found that stars closest to the plane of the Galaxy have a lower ratio of metals than stars further from the plane. While this trend confirms standard views, the BRAVA data cover a significant area of the bulge that can be chemically fingerprinted. By mapping how the metal content of stars varies throughout the Milky Way, star formation and evolution is deciphered, just as mapping carbon dioxide concentrations in different layers of Antarctic ice reveal ancient weather patterns.

The international team of astronomy on this project has made all of their data available to other astronomers so that additional analysis will be possible. They note that in the future it will be possible to measure more precise motions of these stars so that they can



determine the true motion in space, not just the motion along our line of sight.

More information: A preprint version of the research paper accepted for publication is available on the Web at http://arxiv.org/abs/1112.1955

Provided by National Optical Astronomy Observatory

(PhysOrg.com)

Why Do We Live in Three Dimensions?

by AMY SHIRA TEITEL *on* DECEMBER 26, 2011

Day to day life has made us all comfortable with 3 dimensions; we constantly interact with objects that have height, width, and depth. But why our universe has three spatial dimensions has been a problem for physicists, especially since the 3-dimensional universe isn't easily explained within superstring theory or Big Bang cosmology. Recently, three researchers have come up with an explanation.

The puzzling universe. Image credit: NASA/courtesy of nasaimages.org

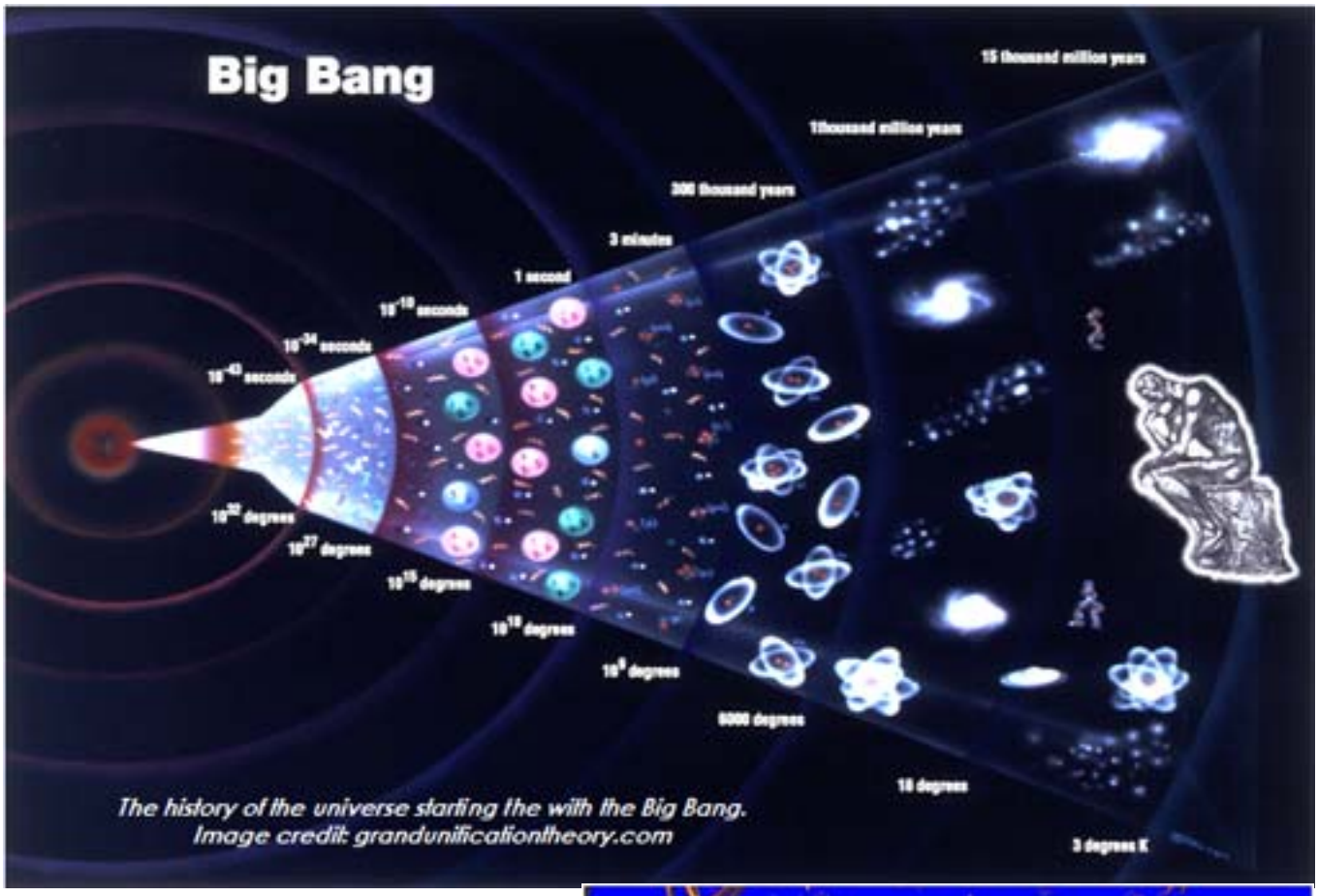
Most astronomers subscribe to Big Bang cosmology, the model that proposes that the universe was born from the explosion of an infinitely tiny point. The theory is supported by observations of the cosmic microwave background and the abundance of certain naturally occurring elements. But Big Bang cosmology is at odds with Einstein's theory of general relativity – general relativity doesn't allow for any situation in which the whole universe is one tiny point, which means this theory alone can't explain the origin of the universe.

The incompatibility between general relativity and Big Bang cosmology has stumped cosmologists. But almost 40 years ago, superstring theory arose as a possible unifying theory of everything.

Superstring theory suggests that the four fundamental interactions among elementary particles – electromagnetic force, weak interaction, strong interaction, and gravity – are represented as various oscillation modes of very tiny strings. Because gravity is one of the fundamental forces, superstring theory includes an explanation of general relativity. The problem is, superstring theory predicts that there are 10 dimensions – 9 spatial and one temporal. How does this work with our 3 dimensional universe?

Superstring theory has remained little more than a theory for years. Investigations have been restricted to discussing models and scenarios since performing the actual calculations have been incredibly difficult.

(Continued on page 20)



The history of the universe starting the with the Big Bang.
Image credit: grandunificationtheory.com

(Continued from page 19)

As such, superstring theory's validity and usefulness have remained unclear.

But a group of three researchers, associate professor at KEK Jun Nishimura, associate professor at Shizuoka University Asato Tsuchiya, and project researcher at Osaka University Sang-Woo Kim, has succeeded in generating a model of the universe's birth based on superstring theory.

Using a supercomputer, they found that at the moment of the Big Bang, the universe had 10 dimensions – 9 spatial and 1 temporal – but only 3 of these spatial dimensions expanded.

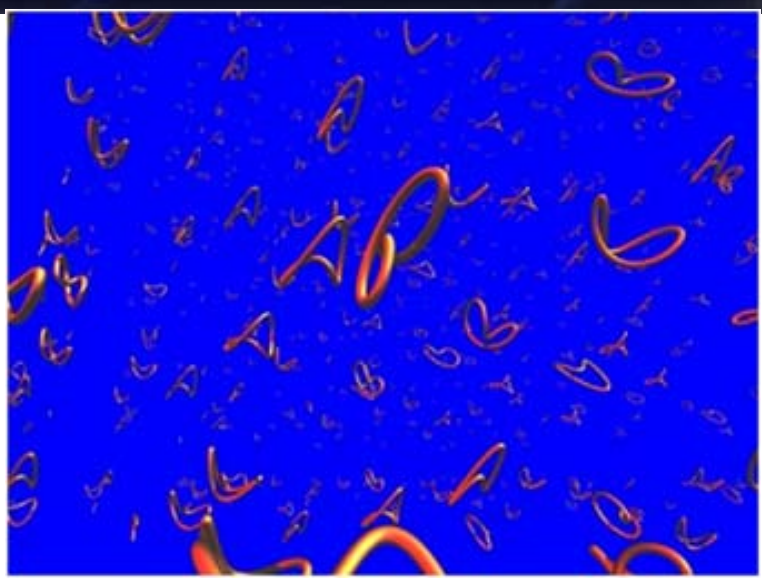
The team developed a method for calculating matrices that represent the interactions of strings. They used these matrices to calculate how 9 dimensional space changes over time. As they moved further back in time, they found that space is extended in 9 directions, but at one point only 3 directions start to expand rapidly.

In short, the 3 dimensional space that we live in can result from the 9 original spatial dimensions string theory predicts.

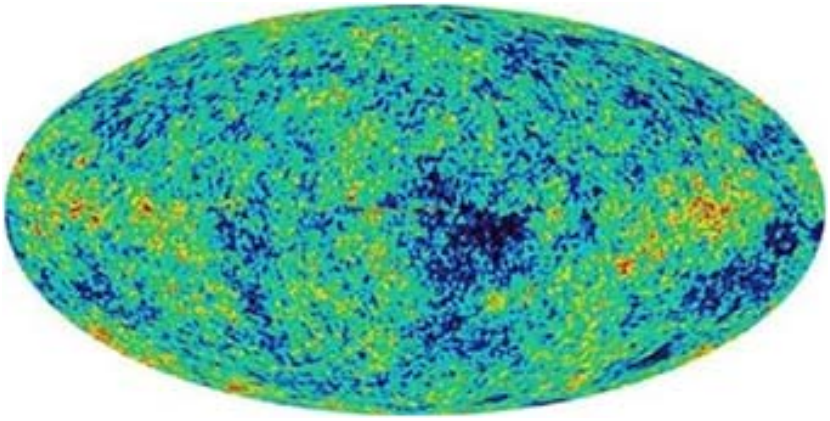
This result is only part of the solution to the space-time dimensionality puzzle, but it strongly supports the validity of superstring theory. It's possible, though, that this new method of analyzing superstring theory with supercomputers will lead to its application towards solving other cosmological questions.

Source: The mechanism that explains why our universe was born with 3 dimensions.

Courtesy: UniverseToday.com



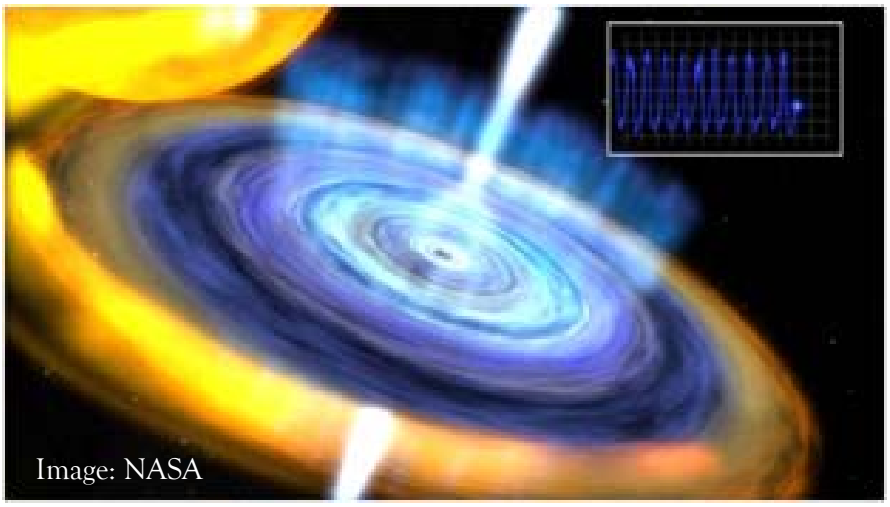
A visualization of strings. Image credit: R. Dijkgraaf.



This "baby picture" of the universe shows tiny variations in the microwave background radiation temperature. Hot spots show as red,

NASA's RXTE detect 'heartbeat' of smallest black hole candidate (w/ video)

An international team of astronomers has identified a candidate for the smallest-known black hole using data from NASA's Rossi X-ray Timing Explorer (RXTE). The evidence comes from a specific type of X-ray pattern, nicknamed a "heartbeat" because of its resemblance to an electrocardiogram. The pattern until now has been recorded in only one other black hole system.



Named IGR J17091-3624 after the astronomical coordinates of its sky position, the binary system combines a normal star with a black hole that may weigh less than three times the sun's mass. That is near the theoretical mass boundary where black holes become possible.

Gas from the normal star streams toward the black hole and forms a disk around it. Friction within the disk heats the gas to millions of degrees, which is hot enough to emit X-rays. Cyclical variations in the intensity of the X-raysobserved reflect processes taking place within the gas disk. Scientists think that the most rapid changes occur near the black hole's event horizon, the point beyond which nothing, not even light, can escape.

Astronomers first became aware of the binary system during an outburst in 2003. Archival data from various space missions show it becomes active every few years. Its most recent outburst started in February and is ongoing. The system is located in the direction of the constellation Scorpius, but its distance is not well established. It could be as close as 16,000 light-years or more than 65,000 light-years away.

The record-holder for wide-ranging X-ray variability is another black holebinary system named GRS 1915+105. This system is unique in displaying more than a dozen highly structured patterns, typically lasting between seconds and hours.

"We think that most of these patterns represent cycles of accumulation and ejection in an unstable disk, and we now see seven of them in IGR J17091," said Tomaso Belloni at Brera Observatory in Merate, Italy. "Identifying these signatures in a second black hole system is very exciting."

In GRS 1915, strong magnetic fields near the black hole's event horizon eject some of the gas into dual, oppositely directed jets that blast outward at about 98 percent the speed of light. The peak of its heartbeat emission corresponds to the emergence of the jet.

Changes in the X-ray spectrum observed by RXTE during each beat reveal that the innermost region of the disk emits enough radiation to push back the gas, creating a strong outward wind that stops the inward flow, briefly starving the black hole and shutting down the jet. This corresponds to the faintest emission. Eventually, the inner disk gets so bright and hot it essentially disintegrates and plunges toward the black hole, re-establishing the jet and beginning the cycle anew. This entire process happens in as little as 40 seconds.

While there is no direct evidence IGR J17091 possesses a particle jet, its heartbeat signature suggests that similar processes are at work. Researchers say that this system's heartbeat emission can be 20 times fainter than GRS 1915 and can cycle some eight times faster, in as little as five seconds.

Astronomers estimate that GRS 1915 is about 14 times the sun's mass, placing it among the most-massive-known black holes that have formed because of the collapse of a single star. The research team analyzed six months of RXTE observations to compare the two systems, concluding that IGR J17091 must possess a minuscule black hole.

"Just as the heart rate of a mouse is faster than an elephant's, the heartbeat signals from these black holes scale according to their masses," said Diego Altamirano, an astrophysicist at the University of Amsterdam in The Netherlands and lead author of a paper describing the findings in the Nov. 4 issue of *The Astrophysical Journal Letters*.

The researchers say this analysis is just the start of a larger program to compare both of these black holes in detail using data from RXTE, NASA's Swift satellite and the European XMM-Newton observatory.

"Until this study, GRS 1915 was essentially a one-off, and there's only so much we can understand from a single example," said Tod Strohmayer, the project scientist for RXTE at NASA's Goddard Space Flight Center in Greenbelt, Md. "Now, with a second system exhibiting similar types of variability, we really can begin to test how well we understand what happens at the brink of a black hole."

Launched in late 1995, RXTE is second only to Hubble as the longest serving of NASA's operating astrophysics missions. RXTE provides a unique observing window into the extreme environments of neutron stars and black holes.

Provided by NASA

Courtesy: PhysOrg.com

Aliens hanging out in the Kuiper Belt? We could see the light from their cities

December 19, 2011 by Tammy Plotner, Universe Today

When it comes to searching for ET, current efforts have been almost exclusively placed in picking up a radio signal – just a small portion of the electromagnetic spectrum. Consider for a moment just how much lighting we here on Earth produce and how our "night side" might appear as viewed from a telescope on another planet. If we can assume that alternate civilizations would evolve enjoying their natural lighting, wouldn't it be plausible to also assume they might develop artificial lighting sources as well?

Is it possible for us to peer into space and spot artificially illuminated objects "out there?" According to a new study done by Abraham Loeb (Harvard), Edwin L. Turner (Princeton), the answer is yes.

For gathering light, the array of Earthly telescopes now at science's disposal are able to confidently observe a light source comparable in overall brightness to a large city — up to a certain distance. Right now astronomers are able to measure the orbital parameters of Kuiper belt objects (KBOs) with the greatest of precision by their observed flux and computing their changing orbital distances.

However, is it possible to see light if it were to occur on the dark side? Loeb and Turner say that current optical telescopes and surveys would have the ability to see this amount of light at the edge of our Solar System and observations with large telescopes can measure a KBOs spectra to determine if they are illuminated by artificial lighting using a logarithmic slope (sunlit object would exhibit alpha=(dlogF/dlogD) = -4, whereas artificially-illuminated objects should exhibit alpha = -2.)

"Our civilization uses two basic classes of illumination: thermal (incandescent light bulbs) and quantum (light emitting diodes [LEDs] and fluorescent lamps)" Loeb and Turn write in their paper. "Such artificial light sources have different spectral properties than sunlight. The spectra of artificial lights on distant objects would likely distinguish them from natural illumination sources, since such emission would be exceptionally rare in the natural thermodynamic conditions present on the surface of relatively cold objects. Therefore, artificial illumination may serve as a lamppost which signals the existence of extraterrestrial technologies and thus civilizations."

Spotting this illumination difference in the optical band would be tricky but by calculating the observed flux from solar illumination on Kuiper Belt Objects with a typical albedo, the team is confident that existing telescopes and surveys could detect the artificial light from a reasonably brightly illuminated region, roughly the size of a terrestrial city, located on a KBO. Even though the light signature would be weaker, it would still carry the dead give-away – the spectral signature.

However, we currently don't expect there to be any civilizations thriving at the edge of our solar system, as it is dark and cold out there.

But Loeb has posed that possibly planets ejected from other parent stars in our galaxy may have traveled to the edge of our Solar System and ended up residing there. Whether a civilization would survive an ejection event from their parent system, and then put up lamposts is up for debate, however.

The team isn't suggesting that any random light source detected where there should be darkness might be considered a sign of life, though. There are many factors which could contribute to illumination, such as viewing angle, backscattering, surface shadowing, outgassing, rotation, surface albedo variations and more. this is just a new suggestion and a new way of looking at things, as well as suggested exercises for future telescopes and studying exoplanets.

"City lights would be easier to detect on a planet which was left in the dark of a formerly-habitable zone after its host star turned into a faint white dwarf," Loeb and Turner say. "The related civilization will need to survive the intermediate red giant phase of its star. If it does, separating its artificial light from the natural light of a white dwarf, would be much easier than for the original star, both spectroscopically and in total brightness."

The next generation of optical and space-based telescopes could help to refine the search process when observing extra-solar planets and preliminary broad-band photometric detection could be improved through the use of narrow-band filters which are tuned to the spectral features of artificial light sources such as light emitting diodes. While such a scenario on a distant world would need to involve far more "light pollution" than even we produce – why rule it out?

"This method opens a new window in the search for extraterrestrial civilizations," Loeb and Turner write. "The search can be extended beyond the Solar System with next generation telescopes on the ground and in space, which would be capable of detecting phase modulation due to very strong artificial illumination on the night-side of planets as they orbit their parent stars."

More information: Read Loeb and Turner's paper: **Detection Technique for Artificially-Illuminated Objects in the Outer Solar System and Beyond**.

This article was inspired by a **discussion on Google+**

Source: Universe Today