TRANSIT

The Newsletter of

05 May 2008

Phobos, one of the two moons of Mars

Front Page Image - Check out this amazing picture of Mars' moon Phobos, captured in colour (and 3D) by NASA's Mars Reconnaissance Orbiter.

The spacecraft snapped the picture on March 23, 2008 during a flyby. It took two separate images of the moon within 10 minutes of each other, which scientists later merged together into a stereo view.

Last Meeting. 11 April 2008, Sir Patrick's 50 Years Celebration by Keith Johnson and George Gargett.

Next meeting : 09 May 2008. Chairman's annual presentation. In the absence of Jack Youdale this year's presentation will be delivered by Dr John McCue. Subject TBA.

Letters to the Editor

Dear Editor and Society members,

Mike Houchen of Guisborough

I was immensely saddened to hear of Mike's sudden passing recently after a short illness. My thoughts, and yours I'm sure, are with his wife Sue.

I first met Mike when I started my studies with John Dormand at the University of Teesside in 1983. Mike was a highly-skilled audio-visual engineer in charge of the university department which administered the needs of the whole educational institution. We were regularly in contact as he helped me prepare my presentations. In those days before Powerpoint, the preparation and projection of visual images was a complicated business and there was no-one better than Mike at this work. It didn't take us long to discover our common interest in observational astronomy.

I have always been interested in variable stars,and so was Mike. Indeed as a boy I did naked-eye estimates of irregular variables, but Mike's technical skills enabled him to go much further than I ever had at that time. We spent many tea-breaks discussing eclipsing binaries, his particular forte, and he always kept me up-to-date with his latest studies and the development of his observing equipment. He used to give me spare equipment to build my own photometer but I'm afraid I was always a disappointment to him on that score. Mike eventually collaborated with Roger Griffin at Cambridge in producing light-curves of variable stars and writing scientific papers announcing the results.

Mike was also keen on solar observing and regularly sent reports to the British Astronomical Association, particularly when flares appeared. Mike always made sure he had a telescope with him, even on holiday! He had an excellent quality 60mm refractor which folded up into a small case, and he could then easily keep up with his tracking of sunspots.

While our society met at Stockton Sixth Form College, Mike came along a gave us the benefit of his observational experience, a talk which I particularly related to and enjoyed. Mike and I met up again regularly when I was doing presentations at the university as part of my planetarium work. I'll miss him.

Sue Houchen has very kindly donated his Meade telescope to the planetarium and it will be a boon on clear nights when members of the public come to view, enjoy and explore the wonders of the universe.

John McCue

Sue also kindly donated Mike's observing notes. These are superb examples of meticulous record-keeping conducted by Mike since the 1970's on his favourite subject of variable stars and later his interest into solar activities and eclipsing binaries. Sue also donated a number of scientific papers written by Mike plus a lot of supporting literature. We are retaining this goldmine of information in the Planetarium library for the interest and use of the Society members and others.

Editor.

How Podcasting Helps Reveal The Secrets Of The Universe

from Neal Aberdeen

What the heck is a Podcast???

A podcast is a digital media file distributed over the internet for playback on portable media players or computers. The term is a portmanteau of 'iPod' and 'broadcast' since the iPod was the first device for which podcasting was developed.

Podcasts differ from e.g. streamed media or files directly downloaded in that one can subscribe to a podcast and have it automatically update when new content is added. For example, I subscribe to the Radio 4 'Friday Night Comedy' podcast and the podcast is updated shortly after every show is broadcast and I can listen to it at my leisure. I work from an office near Blackpool once a week and listen to my podcasts as I drive the journey. Video podcasts are also available.

To subscribe to a podcast, so called 'podcatching' software is required. The most recognised software is 'iTunes' since this is packaged along with every iPod sold. In my case I have iTunes set to check each podcast daily and download new content when available. When I synchronise my iPod with iTunes the new content is transferred for listening on the move.

iTunes is available for non-iPod users here:

http://www.apple.com/itunes/download/

This is all well and good, but why should I be interested?

There are plenty of astronomy-related podcasts out there just waiting for you to subscribe! You will find podcasts covering everything from 'what is in the sky this week' to observing the Cosmic Microwave Background and are produced by both amateur and professional astronomers. By searching iTunes a myriad of interesting and informative podcasts can be discovered, but I have compiled a short list to get you started. All these podcasts are available by searching iTunes but I have included links should you wish to use alternative podcatching software

The Jodcast

www.jodcast.net

Produced monthly (with a regular supplement) by astronomers based at Jodrell Bank. Includes news items, features and interviews.

Astronomy Cast

http://astronomycast.com

A weekly podcast hosted by Fraser Cain from Universe Today and Dr. Pamela Gay from SIUE. Offers discussion on topics ranging from planets to cosmology.

Regulus!

www.reulusastro.com

This regular podcast by John Blackwell (director of Phillips Exeter Academy Grainger Observatory) provides an overview of what you can expect to see in the sky. It might make useful listening on your iPod while out observing?

AstrotalkUK

www.astrotalkuk.org

A weekly 30 minute podcast by and primarily for amateur astronomers in the UK. It is produced by Gurbir Singh, chairman of Salford Astronomical Society and has featured interviews covering subjects such as Astrophotography, studying Astronomy and bringing Apollo astronauts to Pontefract.

Cite de espace, Toulouse

from Ken Stewart

On a recent visit to the south of France with my family, as well as touring the area around Carcassonne, and as far as Narbonne, to my delight we all agreed to go across to Toulouse and visit the CITE-ESPACE. We drove along the A61 and on reaching Toulouse a road leads off to the right.

There is no fear not knowing where to go as just off to the left is a full size replica of ARIANE 5 pointing to the sky.

We are all getting excited now!

Fist impression was WOW, this site covers quite a big area, no expense spared. The queues were quite long at reception, where we all received tickets with bar codes to allow us to enter the various buildings. For those who can't speak French there are head sets provided.

he fun begins. We decided to visit the IMAX theatre first. The screen is huge (6 stories high) with a 3D projection system. Goggles are provided to give the 3D effect. You are completely immersed in the picture as it gives the illusion of being in there with them.

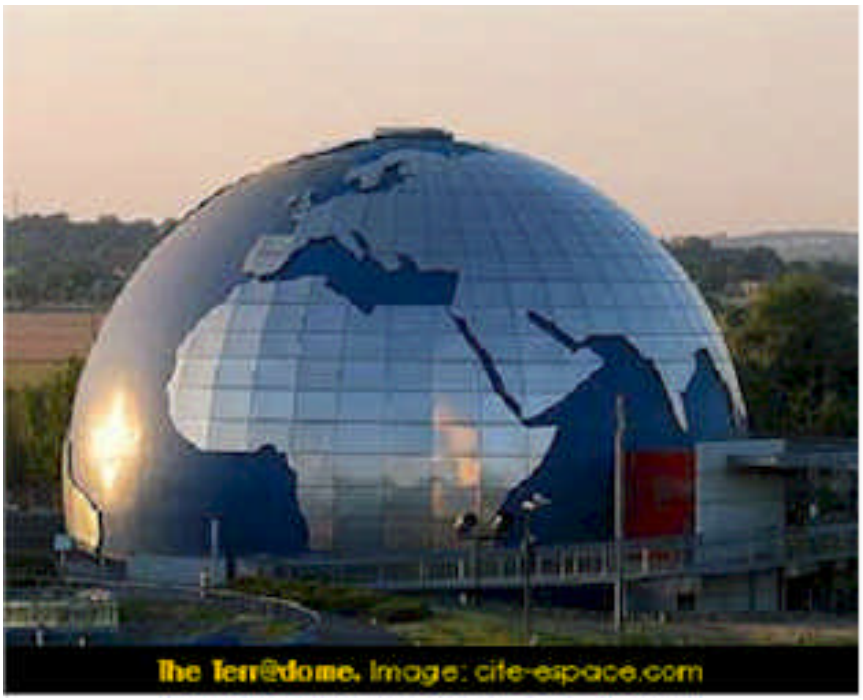
You experience the building of the space station and what it is like to be on board. The astronauts go about their various tasks and doing their exercises. One of them releases an orange towards you and it bounces of your goggles, every one tries to dodge it.

Next stop the planetarium. Keeping up with size of things this again is huge. It seats 280. The dome covers 600sq.m. and the animation is excellent. It has a DIGESTAR III projection system (I am beginning to feel quite small now!). The seats are plush and reclining, any one feeling tired could easily go to sleep. One problem here, for an oldie like me with eye adaptation of about an hour, switching from film sequences to dark sky was a problem for me. The film was about the Egyptian connection with astronomy, i.e. the pyramids and Orion's belt. With the dome being so large I really felt I was sitting outside.

There is a full size replica of the MIR space station as it was between1990-1995. Walking through this gave you experience of the living conditions. There is also a life size replica ERS (Earth Resources Satellite) and a twin of SOHO.

Apart from all 'big things', there are lot of buttons to press, computers to help on the education side and for children, a space version of a playhouse. There were lots more to see and do, you need a full day to see it all.

You will understand I could go on and on. For the more experienced members among us there is nothing new as far as knowledge is concerned. For me, it was seeing what can be done from an educational point of view. This for me is the true learning centre, created at a lot of expense, all very worthwhile. Any one visiting France should certainly include this on the itinerary.



Making Black Holes in Switzerland

A number of Planetarium visitors have voiced their personal worries about the Large Hadron Collider devastating the Earth when it commences its particle collisions in May 2008. Below is a document on safety of the accelerator released by CERN. Editor

Safety at the LHC

The Large Hadron Collider (LHC) can achieve energies that no other particle accelerators have reached before. The energy of its particle collisions has previously only been found in Nature. And it is only by using such a powerful machine that phyicists can probe deeper into the key mysteries of the Universe. Some people have expressed concerns about the safety of whatever may be created in high-energy particle collisions. However there are no reasons for concern.

Modest by Nature's standards

Accelerators recreate the natural phenomena of cosmic rays under controlled laboratory conditions. Cosmic rays are particles produced in outer space in events such as supernovae or the formation of black holes, during which they can be accelerated to energies far exceeding those of the LHC. Cosmic rays travel throughout the Universe, and have been bombarding the Earth's atmosphere continually since its formation 4.5 billion years ago.

Despite the impressive power of the LHC in comparison with other accelerators, the energies produced in its collisions are greatly exceeded by those found in some cosmic rays. Since the much higher-energy collisions provided by Nature for billions of years have not harmed the Earth, there is no reason to think that any phenomenon produced by the LHC will do so.

Cosmic rays also collide with the Moon, Jupiter, the Sun and other astronomical bodies. The total number of these collisions is huge compared to what is expected at the LHC. The fact that planets and stars remain intact strengthens our confidence that LHC collisions are safe. The LHC's energy, although powerful for an accelerator, is modest by Nature's standards.

TGVs and mosquitoes

The total energy in each beam of protons in the LHC is equivalent to a 400 tonne train (like the French TGV) travelling at 150 km/h. However, only an infinitesimal part of this energy is released in each particle collision - roughly equivalent to the energy of a dozen flying mosquitoes. In fact, whenever you try to swat a mosquito by clapping your hands together, you create a collision energy much higher than the protons inside the LHC. The LHC's speciality is its impressive

ability to concentrate this collision energy into a minuscule area on a subatomic scale. But even this capability is just a pale shadow of what Nature achieves routinely in cosmic-ray collisions.

During part of its operation, the LHC will collide beams of lead nuclei, which have a greater collision energy, equivalent to just over a thousand mosquitoes. However, this will be much more spread out than the energy produced in the proton collisions, and also presents no risk.

Microscopic black holes will not eat you...

Massive black holes are created in the Universe by the collapse of massive stars, which contain enormous amounts of gravitational energy that pulls in surrounding matter. The gravitational pull of a black hole is related to the amount of matter or energy it contains – the less there is, the weaker the pull. Some physicists suggest that microscopic black holes could be produced in the collisions at the LHC. However, these would only be created with the energies of the colliding particles (equivalent to the energies of mosquitoes), so no microscopic black holes produced inside the LHC could generate a strong enough gravitational force to pull in surrounding matter.

If the LHC can produce microscopic black holes, cosmic rays of much higher energies would already have produced many more. Since the Earth is still here, there is no reason to believe that collisions inside the LHC are harmful.
Black holes lose matter through the emission of energy via a process discovered by Stephen Hawking. Any black hole that cannot attract matter, such as those that might be produced at the LHC, will shrink, evaporate and disappear. The smaller the black hole, the faster it vanishes. If microscopic black holes were to be found at the LHC, they would exist only for a fleeting moment. They would be so short-lived that the only way they could be detected would be by detecting the products of their decay.

Recent Multiple Star Observations + A Couple Of Planets

from Mike Gregory

O. S. 021/08 – Friday April 4th 2008 – ? ? - A rare event for me as I took my refractor to Wynyard Woodland Park and set it up in the carpark for about 21.00 BST – the first time I have used it at WWP since 2003. Was this a miracle? Two smiling faces above suggest it probably was!

After the Planetarium show had finished I showed Saturn to two ladies, who thought it was a star with handles on it, until I explained what they were looking

at. They seemed amazed! I also showed them gamma Leonis and explained that if they returned in 154 years this pair might have turned some 90 degrees (though I won't be there that night). More people joined in and I showed them Mars, the relatively wide triple, Castor, the tight gravitationally bound triple, 44 Bootes (that was probably beyond there resolving power as it was close and dim), the two doubles I first resolved twenty five years ago with binoculars, Kuma and 17,16 Draco, and the much tighter GB star between them, Alrakis. I hope I had my facts correct!

After the public had departed I explained to new member, Andrew, how to have an early spring view of Albireo, the head of the swan in Cygnus. I also managed to find my old challenge, OS 525 in Lyrae, and wonder if I can bring my refractor back later in the spring for a real go at trying to split this star as well as the even tougher test, 78 UMa!

Finally came away at almost 01.00 (Saturday) and arrived here at 01.20. The evening must have done me some good for I slept soundly through the later hours of the night!

O. S. 022/08 - Monday April 7th – ? - Hopeless weather over the weekend after that clear Friday night. It has rained, hailed, sleeted and snowed for the last forty-eight hours with January temperatures to boot!

It was marginally clear late on so I set my refractor up on the lawn at 23.00 UT, polar aligning and setting up the Gotostar for that time under steadily worsening conditions. To start with, I could barely see the Pole Star, and my aligning looked decidedly off key. Additionally, the limiting magnitude was less than 3.1 as there was little sign of Pherkad in the bowl of the Little Dipper, and the temperature was two degrees below freezing!

My first target was Saturn, which I viewed at 40x, 59x and 118x; I could have done with my astro-seat but... My next target was the yellow and blue epsilon Bootes that was seen almost separated at 59x and quite clear at 118x. Nearby xi Bootes and pi Bootes were both easily split at 59x and quite wide at 118x. Incredible when you consider the hopeless conditions.

As there was a lot of cloud blotting out Bootes, I slewed across to Leo. Problems here though when I aimed for gamma Leonis as the target kept tracking out of the field of view until, that is, I realised I had inadvertently switched off the drive unit. Once I realised that, and had also used the sync mode to properly align with gamma, I was able to track this impressive bronzed gold and antique gold GB pair for many minutes, though to be strictly honest, the colours were more silvery yellow and silvery white. Much clearer here at light-polluted Acklam though, than last Friday at Wynyard.

As more cloud was billowing up towards Leo, I slewed a considerable distance towards Camelopardalis, aiming for 1 Cam, but that area became clouded over too! I decided to wait and after many minutes saw a faint star appearing about half a degree off the centre of a two-degree field. However, before I could increase the magnification, more cloud came along and I almost gave up but about fifteen minutes later my perseverance was rewarded as my target star came into view, clearly double at 25x and impressively so at 59x. The primary did look a bright yellow and the secondary a definite blue, but no sign of the vivid blue shading of nine months previous.

Overall, though the conditions were drastically worse than at Wynyard three nights back, with the exception of Saturn, all the targets looked much neater than those seen at WWP. Maybe this is because I feel happier observing from homebase though it did take quite awhile to set up the refractor and then my polar aligning was not overly impressive. Neither is the lawn for it has taken a real hammering over the winter as I try to hide behind the Forsythia shrub from neighbouring security lights!

Markarian's Chain

from Rob Peeling

We are all familiar with asterisms like The Plough and the Coathanger but here is the Daddy of them all. This asterism contains literally billions of stars not the usual dozen or so. That is because instead the asterism being marked out by individual stars, entire galaxies mark out Markarian's Chain.

Markarian's Chain is a 1.5 degree long arc of galaxies that all belong to the Virgo Cluster, although some of the members are in fact in the constellation Coma Berenices. It was first described by the Armenian astronomer B E Markarian (1913-1985) in December 1961. Markarian thought that the eight galaxies M84 (NGC 4374), M86 (NGC 4406), NGC 4477, NGC 4473, NGC 4461, NGC 4458, NGC 4438 and NGC 4435 where in fact a single system rather than a chance alignment. A paper in 1983 by Litzroth supports this suposition by reporting that seven of the eight do indeed seem to be moving away from us at the same velocity i.e. as a group.

This area of sky is of course rich with galaxies. Photos easily pick out 14 galaxies along the original arc from M84 to NGC 4477. To the observer the chain appears to logically extend an extra degree further north-east to M88 and thus draw in a futher 4 potential members.

On 24th March 2008 I attempted to visual observe Markarian's Chain with my 12" Newtonian from my fairly heavily light polluted back garden. In roughly half an

hour I was able to see seven of Markarian's original eight galaxies plus a further two (including M88) in the extended chain. I found the Chain by star-hopping northwards from the star Vindemiatrix to M58, then finding M87 and working from there to M84 and M86. I then worked up the chain north and east to M88. I was able to repeat this with on the 27th March though the observing conditions were much less favourable.

So here are some challenges to have a go at:

- Astrophotography – there are some wonderful images of the chain using wide-fields (see the example below) . What can you achieve?
- How much of the chain is visible in smaller telescopes or binoculars?
- Can you do better than me and visually observe some of the lesser members of the chain. At least a couple more galaxies should be detectable on a good night at a darker site than my garden.

How Long Does it Take to get to the Moon?

written by Ian O'Neill

In a recent interview, Richard Branson outlined his vision for Virgin Galactic's future. Once tourists are taken into Earth orbit, it seems possible that space hotels could be developed for longer stop-overs in space. He then went on to mention that short "sight-seeing" tours to the Moon could be started from these ultimate hotels. If we are to make travel to the Moon routine enough to send tourists there, the trip would need to be as short as possible. So how long is the commute from the Earth to the Moon anyway? Man and machine have made that trip already, some took a *very* long time, and others were astonishingly fast…

Many missions have arrived in lunar orbit and landed on the lunar surface, but the means of getting there are widely varying. Whether a mission uses a rocket to blast its way there, or a subtle ion engine to slowly edge its payload closer, we have many options open to us when we travel to the Moon in the future. To this end, I'll give a quick rundown from slowest to fastest flights to Earth's natural satellite 380,000 km away.

Slowest: 1 year, 1 month and 2 weeks

The slowest mission to fly to the Moon was actually one of the most advanced technologies to be sent into space. The ESA SMART-1 lunar probe was launched on September 27th 2003 and used a revolutionary ion engine to propel it to the Moon. SMART-1 slowly spiralled out from the Earth to arrive at its destination one year, one month and two weeks later on November 11th 2004. SMART-1 may have been slow, but it was by far the most fuel efficient. The craft used only 82 kg of xenon propellant for the entire mission (ending with a lunar impact in 2006).

Not so slow: *5 days*

The SMART mission is an oddity as it is by far the longest mission to the Moon, the rest of the missions took a matter of days to reach lunar orbit. China's Chang'e-1 mission was launched from Xichang Satellite Launch Center on October 24th 2007 but sat in Earth orbit til October 31st when it began its transit to the Moon. It arrived in lunar orbit on November 5th. Chang'e-1 therefore took five days to cover the distance, using its rocket boosters.

Manned missions do it quicker: 3 days, 3 hours, 49 minutes

Next up, the Apollo missions in comparison were fairly quick to reach the Moon. The Apollo 11 astronauts were launched atop a huge Saturn V multi-stage rocket

on July 16th 1969 from Kennedy Space Centre and sent quickly on their way. They reached lunar orbit after only three days in space on July 19th 1969.

Even the first was fast: *< 2 days*

The first ever mission to the Moon was the Soviet Luna 1 probe that completed a flyby in 1959. This basic, but pioneering probe was launched on January 2nd and flew past the Moon by a few thousand kilometers on January 4th. It only took 36 hours to make the trip, therefore travelling an average speed of 10,500 km/hr.

Record breaking, fast-track to the Moon: *8 hours, 35 minutes*

By far the fastest mission to fly past the Moon was NASA's New Horizons Pluto mission. This mission had a speedy launch, rockets powering the probe to over 58,000 km/hr to give it a good start on its long trip to the outer Solar System and Pluto. Although this is impressive, it's worth keeping in mind that New Horizons was not slowing down to enter lunar orbit (like the Moon-specific missions above), it was probably still accelarating as the Moon was a dot in its rear view window. Still, it took eight hours and thirty-five minutes to cover the 380,000 km distance. Impressive.

So, space tourism companies have a few options for their sight-seeing tours around the Moon. They could offer long cruises, gently gliding to the Moon, using ion engines to slowly let the tourists take in the views, or they could opt for the exhilarating rocket ride of a lifetime, getting tourists there and back in a day or two… not sure which option I'd prefer…

Phoenix Spacecraft Maneuvers for Mars Landing

written by Nancy Atkinson

Looking towards a May 25 landing for the Phoenix Mars Lander, the navigation team for mission adjusted the flight path for the spacecraft on April 10. "This is our first trajectory maneuver targeting a specific location in the northern polar region of Mars," said Brian Portock, chief of the Phoenix navigation team at the Jet Propulsion Laboratory.

The mission's two prior trajectory maneuvers, made last August and October, put the spacecraft on target to

just intersect with Mars. But this recent maneuver put it on course to land at a site called “Green Valley,” a broad, flat valley in Mars north polar region. NASA announced they have "conditionally" approved this site, but a final decision has yet to be made. And why, you ask, hasn’t a final decision
Been made on a landing site at this late date?

Phoenix mission managers are still looking for a safe, yet exciting place to land. The proposed landing area is an ellipse about 62 miles by about 12 miles (100 kilometers by 20 kilometers). In looking at high resolution images of this area, researchers have mapped more than five million rocks in and around that ellipse, each big enough to end the mission if hit by the spacecraft during landing. "The environmental risks at landing — rocks and slopes — represent the most significant threat to a successful mission.

There's always a chance that we'll roll snake eyes, but we have identified an area that is very flat and relatively free of large boulders," said JPL's David Spencer, Phoenix deputy project manager and co-chair of the landing site working group.

MRO's High Resolution Imaging Science Experiment (HiRISE) camera has taken more than three dozen images of the area. Analysis of those images prompted the Phoenix team to shift the center of the landing target 13 kilometers (8 miles) southeastward, away from slightly rockier patches to the northwest. Navigators used that new center for planning the recent trajectory correction maneuver.

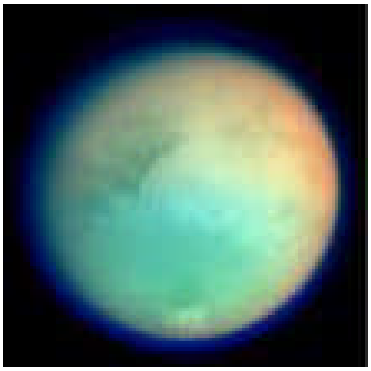
"Our landing area has the largest concentration of ice on Mars outside of the polar caps. If you want to search for a habitable zone in the arctic permafrost, then this is the place to go," said Peter Smith, principal investigator for the mission, at the University of Arizona , Tucson .

When Phoenix lands, it will dig to an ice-rich layer expected to lie within arm's reach of the surface. It will analyze the water and soil for evidence about climate cycles and investigate whether the environment there has been favourable for microbial life. The April 10 trajectory adjustment began by pivoting Phoenix 145 degrees to orient and then fire spacecraft thrusters for about 35 seconds, then pivoting Phoenix back to point its main antenna toward Earth. The mission has three more planned opportunities for maneuvers before May 25 to further refine the trajectory for a safe landing at the desired location.

In the final seven minutes of its flight on May 25, Phoenix must perform a challenging series of actions to safely decelerate from nearly 21,000 kilometers per hour (13,000 mph). The spacecraft will release a parachute and then use pulse thrusters at approximately 914 meters (3,000 feet) from the surface to slow to about 8 kilometers per hour (5 mph) and land on three legs.

Saturn's Titan: A Mirror Image of Earth Before Life Evolved?

posted by Casey Kazan

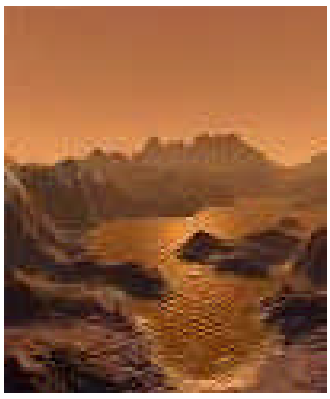


The Cassini spacecraft observations of Saturn's largest moon, the orange-colored Titan, have given scientists a glimpse of what Earth might have been like before life evolved. They now believe Titan possesses many parallels to Earth, including lakes, rivers, channels, dunes, rain, snow, clouds, mountains and possibly volcanoes.

"Titan is just covered in carbon-bearing material -- it's a giant factory of organic chemicals," according to Ralph Lorenz of Johns Hopkins University Applied Physics Laboratory. "We are carbon-based life, and understanding how far along the chain of complexity towards life that chemistry can go in an environment like Titan will be important in understanding the origins of life throughout the universe."

"When we designed the original tour for the Cassini spacecraft, we really did not know what we would find, especially at Enceladus and Titan," said Dennis Matson, the JPL Cassini project scientist. "This extended tour is responding to these new discoveries and giving us a chance to look for more."

Unlike Earth, Titan's lakes, rivers and rain are composed of methane and ethane, and temperatures reach a chilly minus 180 degrees Celsius (minus 290 degrees Fahrenheit). Although Titan's dense atmosphere limits viewing the surface, Cassini's high-resolution radar coverage and imaging by the infrared spectrometer have given scientists a better look.



Titan has hundreds of times more liquid hydrocarbons than all the known oil and natural gas reserves on Earth, according to new data from NASA's Cassini spacecraft. The hydrocarbons rain from the sky, collecting in vast deposits that
form lakes and dunes.

At an eye popping minus 179 degrees Celsius (minus 290 degrees Fahrenheit), Titan has a surface of liquid hydrocarbons in the form of methane and ethane with tholins believed to make up its dunes.

The term "tholins," coined by Carl Sagan in 1979, describe the complex organic Molecules at the heart of prebiotic chemistry

Cassini has mapped about 20 percent of Titan's surface with radar. Several hundred lakes and seas have been observed, with each of several dozen estimated to contain more hydrocarbon liquid than Earth's oil and gas reserves. Dark dunes that run along the equator contain a volume of organics several Hundred times larger than Earth's coal reserves.

Proven reserves of natural gas on Earth total 130 billion tons, enough to provide 300 times the amount of energy the entire United States uses annually for residential heating, cooling and lighting. Dozens of Titan's lakes individually have the equivalent of at least this much energy in the form of methane and ethane.

"This global estimate is based mostly on views of the lakes in the northern polar regions. We have assumed the south might be similar, but we really don't yet know how much liquid is there," said Lorenz. Cassini's radar has observed the south polar region only once, and only two small lakes were visible. Future observations of that area are planned during Cassini's proposed extended mission.

"We also know that some lakes are more than 10 meters or so deep because they appear literally pitch-black to the radar. If they were shallow we'd see the Bottom and we don't, said Lorenz.

"Great Lakes" seen on Titan

The question of how much liquid is on the surface is an important one because methane is a strong greenhouse gas on Titan as well as on Earth, but there is much more of it on Titan. If all the observed liquid on Titan is methane, it would only last a few million years, because as methane escapes into Titan's atmosphere, it breaks down and escapes into space.

If the methane were to run out, Titan could become much colder. Scientists believe that methane might be supplied to the atmosphere by venting from the interior in cryovolcanic eruptions. If so, the amount of methane, and the temperature on Titan, may have fluctuated dramatically in Titan's past.

Cassini's mission originally had been scheduled to end in July 2008. A newly-announced two-year extension will include 60 additional orbits of Saturn and more flybys of its exotic moons. These will include 26 flybys of Titan, seven of Enceladus, and one each of Dione, Rhea and Helene. The extension also includes studies of Saturn's rings, its complex magnetosphere, and the planet itself.

"This extension is not only exciting for the science community, but for the world to continue to share in unlocking Saturn's secrets," said Jim Green, director, Planetary Science Division, NASA Headquarters, Washington. "New discoveries are the hallmarks of its success, along with the breathtaking images beamed back to Earth that are simply mesmerizing."

Cassini spacecraft and Huygens

Based on findings from Cassini, scientists think liquid water may be just beneath the surface of Saturn's moon Enceladus. The small moon, only one-tenth the size of Titan and one-seventh the size of Earth's moon, is one of the highest-priority Targets for the extended mission.

Cassini discovered geysers of water-ice jetting from the Enceladus surface. The geysers, which shoot out at a distance three times the diameter of Enceladus, feed particles into Saturn's most expansive ring. In the extended mission, the spacecraft may come as close as 25 kilometers (15 miles) from the moon's surface.

Other activities for Cassini scientists will include monitoring seasons on Titan and Saturn, observing unique ring events, such as the 2009 equinox when the sun will be in the plane of the rings, and exploring new places within Saturn's magnetosphere.

Cassini has returned a daily stream of data from Saturn's system for almost four years. Its travel scrapbook includes nearly 140,000 images, and information gathered during 62 revolutions around Saturn, 43 flybys of Titan and 12 close Flybys of the icy moons.

More than 10 years after launch and almost four years after entering into orbit around Saturn, Cassini is a healthy and robust spacecraft. Three of its science instruments have minor ailments, but the impact on science-gathering is minimal.

The spacecraft will have enough propellant left after the extended mission to potentially allow a third phase of operations. Data from the extended mission could lay the groundwork for possible new missions to Titan and Enceladus.

Cassini launched Oct. 15, 1997, from Cape Canaveral, Fla., on a seven-year journey to Saturn, traversing 3.5 billion kilometers (2.2 billion miles).

.

The Universe -The 1st 10 Billion Years

posted by Josh Hill

Science has analyzed the motion of galaxies around us, and found that they were expanding as a result of reactions set off at the time of the Big Bang. Science has added those findings with studies of radiation and found that our current universe was born 13.7 billion years ago; that's give-or-take 200 million years or so.

But more than that, science has begun to piece together those opening moments of the first, or simply the latest, universe. While it may not be entirely comprehensive – how would we know if it was or not – what we are seeing is mind blowing.

Right up there at the very beginning – or as close to the beginning as scientists have gotten – is what is known as the Planck Era. It takes place 10^-43 seconds after the big bang, or, for those of us who aren't mathematically inclined, a decimal point, 43 zeroes, and a 1; in other words, a very short amount of time (you can figure out the amount of zeroes on the rest for yourself).
It is believed that at this time, all of the fundamental forces that make up our universe today – gravity, electromagnetism, strong and weak nuclear forces, etc – were thought to be all unified, in a roiling mass of inconceivably hot and dense mayhem.

Next up is 10^-35 seconds, at which point the universe expands from a form much smaller than a subatomic particle to a form much larger than what we can see today. It is thought that this was preceded by a temperature decrease, which saw a decay of X and Y bosons, which is thought to have violated certain laws and given birth to a small excess of matter over antimatter.
This transition period is thought to have triggered the previously mentioned expansion.

This is quickly followed at 10^-32 seconds by the appearance of particles of matter via Einstein's famous $e=mc^2$, which initially saw a mix of matter and antimatter annihilate each other in a burst of radiation, leaving behind only scattered pockets of matter.

10^-11 seconds is the next point at which scientists have pinpointed an event, an event known as the electroweak era. (*note* if you are looking to research any of this, ensure to swap the word era for epoch, and you'll find what you're looking for.) It is at this point that the temperature of the universe was low enough to separate the strong force and the electroweak force – the last two unified forces.

And, moments before we make a huge time jump, at 10^-6 seconds, the universe is still expanding, but reaches a point where it is cool enough to allow

those particles we're friendly with today – protons and neutrons – to form from quarks.

At this point we make a huge leap to 200 seconds… yes, that is a huge leap! But after just being told the universe has been cooling, you may find it surprising to see that the temperature was sitting around the one billion degrees Celsius mark.

At 200 seconds, protons and neutrons start to come together, forming nuclei. But within 20 minutes the temperature of the universe has dropped, so that it is too cold to drive the process any further.

The last thing those brave protons and neutrons created were the first nuclei of hydrogen and helium, those simplest and most common chemical elements we have witnessed in our own little universe.

At this point, we make truly tremendous leaps of time, due to a combination of a slow forming universe, and a good old lack of knowledge.

At 300,000 years in from the Big Bang, the universe has cooled to 1,000 C, allowing for electrons to pair up with nuclei to form the first atoms.

At this point, the end of what is known as the Recombination Era (or epoch), the universe consists of roughly 75% hydrogen and 25% helium. With electrons now bound to atoms, the universe finally becomes transparent to light, thus making it the earliest point in time that is observable today.

200 million years in, and small dense regions of cosmic gas begin to collapse under their own collective gravity, creating enough heat to create nuclear fusion between hydrogen atoms, thus forming the very first stars to light up the universe.

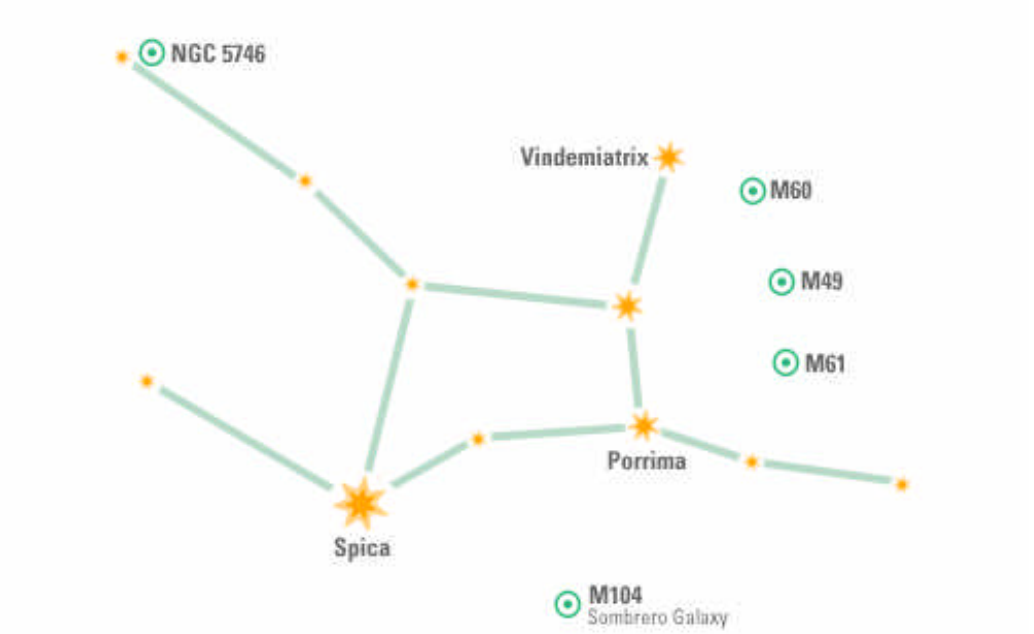
0.5 billion to 1 billion years, and gravity is beginning to play a large part, pulling together huge regions of cosmic gas forming galaxies of stars. From these galaxies came clusters of such; ie, the Milky Way galaxy belongs to the Local Group cluster.

At 9 billion years dark energy begins to exert its anti-gravitational effects upon the universe, counteracting gravities attempt to slow the expansion. Dark energy thus becomes the prime accelerator of the universe from that point on.

And then, at 9.1 billion years from the moment everything went kablooie, a region of gas and dust from ever exploding stars in what we now call the Milky Way, begins to collapse under its own gravity, subsequently forming one of billions of small stars, which will then be surrounded by a disk of rocky material and gas, which became our Solar System and a blue water planet.

Constellation Virgo

from Sean O'Dwyer



Don't let the scale of the diagram above fool you. Representing the goddess of justice, Virgo is the second largest constellation in the sky.

Spica, a first magnitude blue-white spectroscopic binary star, 280 Ly away, is easy to spot, shining as it does in a fairly dark part of the sky.

M49 and **M60** are elliptical galaxies in the Virgo Cluster (containing about 3,000 galaxies) at about 45 million light years away. Being one of the brightest ellipticals, M49 was the first member of the Virgo-Supercluster to be discovered by Charles Messier. M60 is some 60,000,000 light years distant and is as luminous as 60 billion copies of our sun.

Most of the galaxies in Virgo are part of the Virgo-Supercluster. Not so **M104**. At about 50,000 lightyears, this galaxy's dark dust lane and close to edge-on angle (just 6°) makes it look a little like a sombrero.

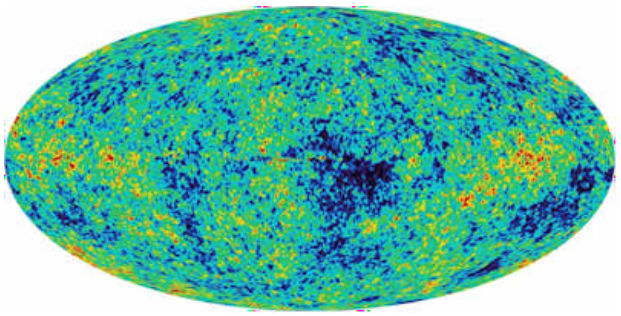
M61 is a lovely *face-on* spiral galaxy while **NGC 5746** is an *edge-on* spiral galaxy that's best observed in small scopes.

Porrima is a fine double-star at 2.8 magnitude (combined) at 36 light years with an orbit of 169 years worthy of a peek.

Vindemiatrix is a yellow giant star at 2.8 magnitude at 100light years away.

13.73 Billion Years - The Most Precise Measurement of the Age of the Universe Yet

Written by Ian O'Neill



NASA's Wilkinson Microwave Anisotropy Probe (WMAP) has taken the best measurement of the age of the Universe to date. According to highly precise observations of microwave radiation observed all over the cosmos, WMAP scientists now have the best estimate yet on the age of the Universe: 13.73 billion years, plus or minus 120 million years (that's an error Margin of only 0.87% not bad really…)

The WMAP mission was sent to the Sun-Earth second Lagrangian point (L_2), located approximately 1.5 million km from the surface of the Earth on the night-side (i.e. WMAP is constantly in the shadow of the Earth) in 2001. The reason for this location is the nature of the gravitational stability in the region and the lack of electromagnetic interference from the Sun. Constantly looking out into space, WMAP scans the cosmos with its ultra sensitive microwave receiver, mapping any small variations in the background "temperature" (anisotropy) of the universe. It can detect microwave radiation in the wavelength range of 3.3-13.6 mm (with a corresponding frequency of 90-22 GHz). Warm and cool regions of space are therefore mapped, including the radiation polarity.

This microwave background radiation originates from a very early universe, just 400,000 years after the Big Bang, when the ambient temperature of the universe was about 3,000 K. At this temperature, neutral hydrogen atoms were possible, scattering photons. It is these photons WMAP observes today, only much cooler at 2.7 Kelvin (that's only 2.7 degrees higher than absolute zero, -273.15°C). WMAP constantly observes this cosmic radiation, measuring tiny alterations in temperature and polarity. These measurements refine our understanding about the structure of our universe around the time of the Big Bang and also help us understand the nature of the period of "inflation", in the very beginning of the expansion of the Universe.

It is a matter of exposure for the WMAP mission, the longer it observes the better refined the measurements. After seven years of results-taking, the WMAP mission has tightened the estimate on the age of the Universe down to an error margin of only 120 million years, that's 0.87% of the 13.73 billion years since the Big Bang.

Transit Tailpieces

For Sale :

1) **Opticron 15x70mm binoculars, mint condition** http://www.binoculars-uk.co.uk/acatalog/opticron_Oregon_Observation.html

These binoculars are virtually brand new. Why am I selling? Unfortunately the eye relief is not sufficient enough for me to wear spectacles, and since I'm no longer considering laser correction, I can't use them. Make me an offer…

2) **Meade LX200 7inch maksutov.**

They don't make them like this anymore! A truly magnificent instrument, planetary viewing is spellbinding. I will be having the telescope refurbished before I sell it so it will be good as new. 20mm, 26mm and 32mm Meade Plossl eyepieces, electric focuser, flexible dewshield, field tripod.

Why am I selling? I don't want my kids learning their way around the sky from a computer, I have a larger Dobsonian and the Maksutov isn't being used as much. It deserves a good home where it will gather photons – not dust. Make me an offer… both above items available at :- darran.summerfield@ntlworld.com

Late Letter to CaDAS Transit Editor:

Neil's talk on the possibilities of intelligent life "out there" and the likelihood of making contact caused some Deep Thought. Using the numbers Neil put into Drake's expression confirm one's suspicion that life out there is inevitable. Craig Venter, the American DNA biologist, is producing some amazing results by being able to design what he calls "digital DNA", designing bacteria on a computer and then being able to produce that bacterium in the laboratory.

On the current TED web site there is a talk by him given in March this year, which took my breath away. Once again, the science is pointing to the conclusion that the molecules required for life, and life itself, are very common in the unlikeliest of places.

So, taking it that there is an intelligence to communicate with "out there", is it possible to get in touch? The new thought, which occurred to me as I was listening to Neil's talk, was "We have had the technology to send and receive radio waves into space for about 100 years. Receiving a communication acknowledging our transmissions can only come from a star about 50 light years away. How many stars are there within 50 light years?" This is the number to put into Drake's expression. It may only be a few hundred thousands, not millions and billions, denying the possibility of communication.

I have searched for a graph of the numbers of stars against distance from us but failed to find such information. The only thing I've found is a table showing there are about 20 stars within 10 light years or so. Can I put two questions to members, please? Does anyone have the graph I am looking for and is there a clanger in my logic?"

Many thanks, Alex Menarry

Contents –May 2008