AUCKLAND ASTRONOMICAL SOCIETY

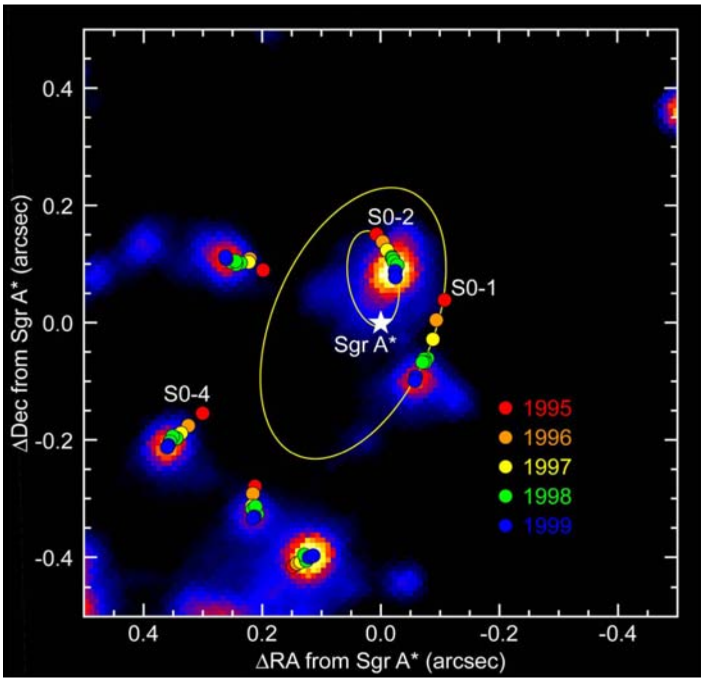
August 2010

SOCIETY JOURNAL

Society Meetings

Monday 9th August at 8:00pm. The Black Hole in the Milky Way Galaxy, With Dr. Philip Sharp.

Monday 30th August. Lightning's Angels, with Peter McLeish



Images of Sagittarius A and some of the stars that orbit it*

On February 13, 1974, American radio astronomers Bruce Balick and Robert Brown were using an interferometer to investigate the central region of our galaxy when they discovered a complex radio source. This source became known as Sagittarius A* and has been the subject of much research. Many astronomers believe that there is a super-massive black hole very near Sagittarius A*. The authors of a 2009 article published in "The Astrophysics Journal" stated that their study had delivered "what is now considered to be the best empirical evidence that super-massive black holes do really exist. The stellar orbits in the galactic centre show that the central mass concentration of four million solar masses must be a black hole, beyond any reasonable doubt."

Philip will begin with an introduction to black holes, including misconceptions about them, and then describe what astronomers believe is going on at and about Sagittarius A*.

Philip has been interested in astronomy since he was in single digits but has not always followed this interest. He went to the University of Canterbury to study astronomy but decided because there were few jobs in astronomy to switch to mathematics. After finishing his PhD in applied mathematics, he spent nine years at two Canadian universities. He returned to New Zealand and is now a senior lecturer in the Department of Mathematics at the University of Auckland.

Since 2000 his main research area has been computational astronomy. He is currently a collaborator on a NASA grant and visits NASA's Jet Propulsion Laboratory in Pasadena three times a year. As well as lecturing in mathematics, Philip gives evening courses entitled "The Modern Solar System", "Stars, Galaxies and Cosmology", and "Planet Earth". Outside work, Philip is a bushcraft instructor for the New Zealand Mountain Safety Council, and recently joined the North Shore Civil Defence Initial Response team.

July Society Meeting

Wonders of the Solar System with Professor Brian Cox

By Clive Bolt

Two more of the outstanding BBC documentaries from the *Wonders of the Solar System* series were shown to the members. The first was entitled *Dead or Alive* and explored the variety of different worlds that have formed, all of them bound by the same set of laws of physics. The principal law that drives the formation is, of course, gravity. It is the weakest of the natural forces of nature but it has the longest reach. In the case of the Sun, the gravitational influence stretches to the outer reaches of the Oort Cloud, more than 50,000 astronomical units from the Sun.

The vast gravitational field of Jupiter affects the orbits of objects in the Asteroid Belt causing some of their orbits to elongate to the extent that they cross the orbit of the Earth. The town of Middlesboro, in Kentucky, is built in a giant crater some 200 million years old. That crater resulted from the impact of a large object, possibly as much as a kilometre across, large enough to threaten the existence of life on Earth as we know it.

Professor Cox highlighted the difference between objects of similar size, but due to their different locations and histories, they have very different characteristics now. The Moon is essentially geologically dead, but Jupiter's moon Io is a similar size to our Moon. Io, though, is extremely active due to tidal forces generated by the huge gravitational field of Jupiter and a resonance with two of Jupiter's other moons. Io orbits about the same distance above the cloud tops of Jupiter as the Moon does above the Earth. The Earth and Venus are similar in size but while the Earth has an atmosphere that supports life, Venus is extremely hot due to the retention of greenhouse gases from active volcanism in the past. Because Venus is closer to the Sun, it lost its liquid water into the atmosphere where the hydrogen was stripped and lost leaving the oxygen to combine with sulphur to form sulphuric acid. On Earth, the carbon became largely sequestered in carbonate rocks. On Venus the carbon dioxide remained in the atmosphere. The atmospheric pressure on Venus is 90 times that on Earth.

Brian Cox watches the Solar eclipse of 2009 from the banks of the Ganges River

Those who stayed on after supper were treated to the first in the BBC series, *Empire of the Sun*. In this episode, Professor Cox explores the effect of the Sun on the dynamics of our planet: from the Sun's output cycles and the effect on the water flow of the Earth, to the solar wind and its effect on the atmosphere and electronic communications. Significant was a study done on a tributary of the Amazon that highlighted a Solar output cycle with a period of about 30 years.

The Moon is about 400 times smaller in diameter than the Sun but it is also, rather uniquely, 400 times further away from the Earth than the Sun so that they subtend the same angle in the sky. This makes the total Solar Eclipse possible as we know it. Professor Cox showed sumptuous travel scenes of crowds of people watching the 2009 eclipse from the banks of the Ganges River. Then we saw images of a partial eclipse of the Sun by Mars' moon Phobos, taken by the Martian rover *Spirit*.

Professor Cox showed a simple experiment to measure the output of the Sun by measuring the time it took for water in a 4 litre tin (probably actually a US Gallon) to rise one degree Celsius on a clear summer's day in Death Valley. From this he estimated the Sun's heat output to be about 1kilowatt per square metre on Earth. Integrating that over the surface area of a sphere with the diameter of the Earth's orbit produces the huge heat output of our nearest star. Of course the Sun has radiated heat at something like this level for almost 5 billion years. Without this huge energy output, life as we know it would not be possible. The source of this energy baffled early astronomers. Two very good documentaries that were well worth staying for.

The Beaumont Memorial Prize for Journalism

The Beaumont Memorial Prize is awarded for the best article published in the Society Journal in the last year. That is including the November 2009 issue and up to , and including, the October 2010 issue. The article must be on an astronomical subject. It must be an original article of at least 500 words and written entirely by an individual author who is a current financial member of the Society. Any supporting images or graphics should contain a significant proportion of original input from the author.

The winner will be announced at the Annual Burbidge Dinner on Saturday the 9th October 2010 and the winning author will receive a cash prize. It is important to maintain a high standard of writing. If there are no articles deemed by the judges to be of sufficient standard, no prize will be awarded. The judges' decision will be final.

You have a month to get an article into the next magazine. Remember that Astronomy is just as much a practical subject as it is an academic one. Articles about observing, personal experiences and the use and maintenance of equipment meet the judging criteria perfectly.

The Annual Burbidge Dinner

Saturday 9th October, Alexandra Raceway

The popular Burbidge Dinner will be on Saturday, October 9th at the Rutherford Room, Alexandra Raceway. Support this annual event for the Society - get your tickets!

The keynote Speaker is Prof. John Hearnshaw, recently retired from the University of Canterbury and author of a recent book, Cosmic Essays. There will be a door prize of a gift hamper. The draw will be made using your ticket number.

The prizewinners for the Harry Williams Astrophotography Competition and the Beaumont Prize for the best original journal article by a Society member will be announced.

Ticket price is $70-00 per person, incl. GST

Purchasing Tickets: Please contact Andrew Buckingham 09 473 5877 or 027 246 2446 or by email: treasurer@astronomy.org.nz. Payment can be made by Internet Banking (Direct Credit) or deposit at any ASB branch, Account No.: 12-3061-0321397-00. Please use your member number or name as the reference. Credit Cards: Visa or Mastercard or by phone to 09 473 5877.

Payment by Cheque: Make out to 'Auckland Astronomical Society' and post to PO Box 24187, Royal Oak, Auckland 1345.

Harry Williams Astrophotography Competition 2010

Hosted by the Auckland Astronomical Society

This competition is open to all New Zealand Astronomical Societies, clubs and groups. Each entrant must have taken the image they submit.

The Categories are:

Solar System: Moon, Planets, comets, asteroids, meteorites, dwarf planets, auroras.

Deep Sky : Nebulae, galaxies, star clusters, deep sky objects.

Miscellaneous: Artistic and interesting subjects with an astronomical theme .

Competition Entries Due by Friday 19th September 2010. The winners will be announced at the Burbidge Dinner in Auckland on Saturday October 9th 2010. Entry forms and conditions of entry can be downloaded from the society website or by request from the email address below.

The winning entry in the Solar System category in 2009 by winner Kenric Ma of Auckland with his image of the Solar Corona taken during the solar eclipse in 2009

Send entries by email (max 2MB per email) or copied onto CDROM/ or USB memory stick and posted with accompanying Entry Forms to:

2010 Harry Williams Astrophotography Competition Postal Delivery Address: 2/24 Rapallo Place, Farm Cove, Pakuranga, Auckland 2012. Printed images will not be accepted.

Email: farmcoveobs@xtra.co.nz Subject Header: 2010 HW

Calendar of Events

August Programme

Mon	2	8:00pm	Practical Astronomy
Fri	6	7:30pm	Young Astronomers with Margaret Arthur
Mon	9	8:00pm	Society Meeting. Philip Sharp, The Sgr A* Black Hole
Mon	16	8:00pm	Film Night with Gavin Logan
Wed	18	7:30pm	Council Meeting
Mon	23	8:00pm	Introduction to Astronomy Comets, Asteroids, meteors
Mon	30	8:00pm	Sprites with Peter McLeish

September Programme

Fri	3	8:00pm	Young Astronomers.
Mon	6	8:00pm	Practical Astronomy
Mon	13	7:30pm	Society Meeting
Mon	20	8:00pm	Film Night with Gavin Logan
Wed	22	7:30pm	Council Meeting
Mon	27	8:00pm	Introduction to Astronomy Astronomy course continues with Bernie Brenner. .

Practical Astronomy August 2 8:00pm

This Month: Names & Catalogues
Ever wondered why objects in the sky have so many different names and naming systems? This session will give a guide to some of the different cataloguing systems for objects in the night sky.

Film Night Monday August 16 8:00pm

Aliens of the Deep.
A Walt Disney film, with Academy Award winning director James Cameron, about Astro-Biologists' trips to the deepest part of the ocean to study life forms that can give us clues about what type of life forms could exist on other planets and in extreme conditions. This film has some incredible photography, including scenes of volcanic activity on the ocean floor and unusual life forms living in the deepest parts of the ocean.

The 2010 Council

President	Grant Christie	(021) 024-04992
Vice President	David Britten	(09) 846-3657
Treasurer & Membership	Andrew Buckingham	(09) 473-5877
Secretary	Michelle Knowler	(021) 148-6764
Curator of Instruments	Ivan Vazey	(09) 535-3987
Librarian	Tony Reynolds	(09) 480 8607
Journal Editors	Clive Bolt	(09) 534-2946
	Shaun Fletcher	(09) 480-5648
Webmaster	Nick Moore	(09) 537-1500
Council	Gavin Logan	(09) 820-6001
Council	Bernie Brenner	(09) 445-3293

Welcome to New Members

Neelesh Rampal (junior)
Antonia Mathers (student)
Jennifer Perwick (ordinary)
Lucy Beban (junior)
Samantha Vegar (junior)

Waharau Dark Sky Weekend

The next date for the Waharau Dark Sky weekend in 2010 is Friday 10th September to Sunday the 12th. See separate notice. Mark the date in your diary.

Lightning's Angels. Stardome Monday August 30th 8:00pm

Peter McLeish will talk to the Society about Sprites. Atmospheric discharges in the atmosphere that are often seen from the Space Shuttle and the International Space Station.

Society Contacts

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Journal	journal@astronomy.org.nz
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Membership inquiries contact Andrew Buckingham at treasurer@astronomy.org.nz or by phone on (09)-473-5877 or 027-246-2446

Very Practical Introduction to Astronomy Evening

"Phases of the Moon"

By Gavin Logan

The phases of the Moon, how eclipses work and other interesting facts about our nearest celestial neighbour, were the subject for May's Introduction to Astronomy night. Members were shown in a very practical way, why we get the different views of the Moon at different times. The different types of Solar and Lunar eclipses were explained. Transits of Venus and Mercury across the Sun were discussed. As an added bonus, Andrew Buckingham showed slides from his visit to China to witness last year's Total Solar eclipse.

Attendees also learnt that when two full moons occur in a single month, the second full Moon is called a "Blue Moon." And yes, it is a fallacy that the weather is fine more often when there is a Full Moon! Ken Ring and his followers may like to disagree.

Andrew demonstrating orbital movement and Moon phases by holding a globe of the Moon and moving around Dipika Patel who is holding a globe of the Earth, while Warwick Goold stays stationary, holding a torch to represent the Sun.

Mars, Dead or Alive

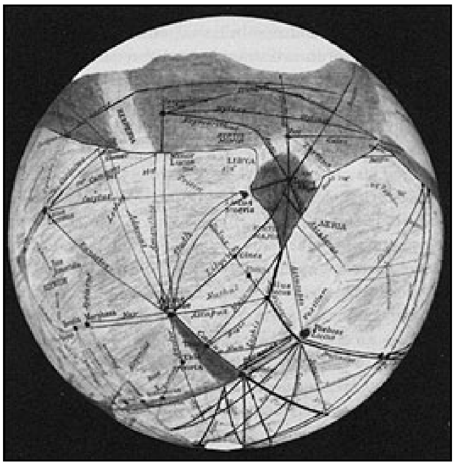
Talk by Nigel Henbest & Heather Couper

Report by Clive Bolt

On Sunday the 18th July, Nigel Henbest and Heather Couper presented a history of the exploration of the planet Mars to the Society at the Observatory. The story started with images drawn by Percival Lowell in the late 19th Century showing Mars and its now rather infamous canals, which were presented as evidence of intelligent life on the planet. It seems that the canals are optical figments caused by a small aperture on a large telescope.

Mariner was the first of the probes to orbit Mars and it returned images that showed the red planet looking a little like the Moon, with a sparse landscape pock-marked with craters and showing no sign of life or water. It did show a Karst formation that seemed to look like a face carved on top of an eroded terrace. The fanatics became involved and the face became a cult symbol for people who wanted to believe in life on Mars. It was not until the arrival of the Mars Global Surveyor that the question was finally resolved. There was no face, but even then, the fanatics still offered explanations consistent with life on Mars.

In 1975 NASA sent the first of two Viking probes to Mars to answer the question of life on the red planet once and for all. As usually happens in cases of scientific endeavour, the answer was not definitive. Viking had four experiments, two specifically designed to look for the signs of life. Gilbert Levin designed the now almost famous labelled-emission experiment that



Channels on Mars as depicted by Percival Lowell in the late 1800s

offered carbon 14 labelled nutrients to a sample of Martian soil. They found that gases emitted from the soil contained the labelled carbon 14 but also that the emissions were attenuating in a cycle that matched the length of the Martian day, a likely circadian rhythm. If the Viking sample arm had penetrated another 15 centimetres it would have found water ice. The two findings from the labelled emission experiment are considered by biologists to be a strong indicator for the existence of at least single-celled life on Mars.

The other experiment was a GCMS in which a sample of soil was heated and the released gases analysed for the presence of carbon containing compounds. The results were negative for life indicating materials. It seems that the scientist in charge of the GCMS experiment was considered to be senior to Levin and when a definitive conclusion was demanded by the US Congress, NASA's administrator chose to conclude that there was no life on Mars. Black and White, no life on Mars meant the end of any attempt to find it as far as the politicians in America were concerned. Laboratory work subsequently determined that the GCMS experiment was not sufficiently sensitive to detect the organic material in a soil sample that contained a normal concentration of bacteria (300,000 bacteria per cubic centimetre of soil). That left just the positive result from Levin's experiment.

In the meantime, there has been a substantial study of the red planet by a host of robotic probes and landers and we are now becoming familiar with the images from the surface of the planet. We now know from samples dug from the surface that there is frozen water on Mars. The pressure and temperature mean that water ice will sublime, rather than survive for long as a liquid. Gamma Ray spectroscopy has determined large areas of frozen water underneath the surface, and recently, there has been evidence of glacial flow from layered craters. Then there is the Martian meteorite alh84001 that seemed to show fossilised bacteria when examined by electron microscope. The jury is still out on that, although the official line is probably explained by a mineral formation. It is significant that no experiments to look for signs of life have been included on any of the successful probes subsequent to the Viking landers. Heather and Nigel were present in the control centre when the Beagle 2 probe was released from the ESA's Mars Express Orbiter to land on Mars in December 2003. Beagle contained experiments to search for organic compounds that could indicate life. They were able to share the disappointment of the team when they realised the probe was lost after 10 years of hard work.

Dr. Gilbert V. Levin, President and CEO of Biospherics Incorporated and Principal Investigator for the Viking Labelled Release Life Detection Experiment.

Question time produced a lively discussion of life on Mars, the evolution of humans living in the Martian environment and the prospect of terraforming the planet. All of this is rather speculative, considering that we have not managed to get a person onto the surface yet. Then there was the question of controlling the naming of geographical features when it is considered likely that the Chinese will be the ones doing the naming!

A very interesting and quite thought provoking evening. Thanks to Heather and Nigel and to Grant for organising the evenings.

HELP Please!

We would like to update the Society records for Telescope Hire.

If you have hired a 200mm Dobsonian mounted telescope from the Society this year would you please contact the curator by email giving your name or your membership number plus the approximate month you hired it (Ivan finds it hard to hear you on the phone).

Your help will be greatly appreciated.

Contact Ivan at ivazey@surfer.co.nz

Obituary: Jim McPhillips

By David Britten

I was saddened to learn of the recent passing of Jim McPhillips, who was a member of the AAS for 15 years, attending many of our monthly and other meetings.

Jim was employed in 1994 to work on the financial aspects of the Observatory Extension and Planetarium Project during my time on the Observatory Trust Board as AAS President.

His role was extended to leading the fundraising efforts and the development of a business plan for the reopening in 1997. Jim made presentations to every Community Board in the four major Auckland cities, raising awareness and garnering support for the project.

Subsequently appointed Observatory Director, Jim led the fledgling commercial and educational enterprise until retiring in 1999, and returned as interim CEO for a short period in 2001.

Jim always showed a quiet interest in astronomical concepts and events, and readily related his enthusiasm for Stardome's role in communicating celestial matters to the public and the media when opportunities arose.

Jim's other passion was the restoration of Auckland's last double-ended steam ferry, the Toroa. He was a leading figure in the Toroa Preservation Society, serving as Treasurer until earlier this year. Jim had worked earlier as an electrician for the Auckland Harbour Board, and after gaining his NZ Certificate in Engineering held a number of managerial positions with the engineering firm Mason Mesco.

Jim McPhillips (bottom left) admiring the newly installed Zeiss ZKP3 star projector in the planetarium, with Max Pow and John Dunlop in the background

He is Survived by his wife, Elwin, three daughters and two grand-daughters, Jim died aged 74 on June 5th.

The Night Sky in August

by Alan Gilmore

Venus, the brilliant 'evening star' (planet really), appears in the northwest soon after sunset. (You can see it in daylight, if you know where to look.) It sets in the dark mid-evening sky, an eye-catching object bright enough to cast shadows in dark places. In a telescope it looks like the Moon at first quarter, but pure white. Venus is the same size as the Earth and around 110 million km from us at mid-month.

At the beginning of August **Mars** and **Saturn** are close together above Venus. Mars, on the left, is orange; Saturn cream-coloured. Well below Venus is **Mercury**, setting before 8 pm. Mercury keeps about the same distance from Venus till mid month then sinks down into the twilight as it passes us on the inside lane. Saturn slips steadily down the sky, too, passing Venus around the 10th. Mars falls below Venus after the 20th.

This is all line-of-sight, of course. Mercury is catching up on us from the far side of the Sun, then passing between us and the Sun. It is 94 million km away at closest. Venus is also catching up on us, but more slowly. It is at its maximum swing out from the Sun around the 20th. Mars and Saturn are being left behind on the far side of the Sun. Mars is 310 million km from us at mid month; Saturn is 1550 million km away.

Jupiter (not shown) rises due east about 10 pm at the beginning of the month and is up around 8 pm by the end. It is the second brightest 'star' after Venus and shines with a steady golden light. Binoculars will show the disk of Jupiter and perhaps one or two of its bright moons. A small telescope easily shows all four moons and the parallel stripes in Jupiter's clouds.

Canopus, the second brightest star, is near the south skyline at dusk. It swings upward into the southeast sky through the morning hours. On the opposite horizon is **Vega**, one of the brightest northern stars. It is due north in mid-evening and sets around midnight.

Midway down the southwest sky are 'The Pointers ', Beta and **Alpha Centauri**. They point down and rightward to **Crux,** the Southern Cross. Alpha Centauri is the third brightest star and the closest of the naked eye stars, 4.3 light-years* away. Beta Centauri, like most of the stars in Crux, is a blue-giant star hundreds of light years away and thousands of times brighter than the Sun.

Arcturus, in the northwest at dusk, is the fourth brightest star and the brightest in the northern hemisphere. It is 120 times the Sun's brightness and 37 light-years away. When low in the sky, Arcturus twinkles red and green as the air splits up its orange light. It sets in the northwest around 10 pm.

Just north of overhead the orange star **Antares** marks the heart of the Scorpion. The Scorpion's tail hooks around the zenith like a back-to-front question mark. Antares and the tail make the 'fish-hook of Maui' in Maori star lore. Antares is a red-giant star: 600 light-years away and 19,000 times brighter than the Sun. Below or right of the Scorpion's tail is 'the teapot' made by the brightest stars of **Sagittarius**. It is upside down in our southern hemisphere view.

The **Milky Way** is brightest and broadest overhead in Scorpius and Sagittarius. In a dark sky it can be traced down past the Pointers and Crux into the southwest. To the northeast it passes Altair, meeting the skyline right of Vega. The Milky Way is our edgewise view of the galaxy, the pancake of billions of stars of which the Sun is just one. The thick hub of the galaxy, 30,000 light years away, is in Sagittarius. The actual centre is hidden by dust clouds in space. The nearer dust clouds appear as gaps and slots in the Milky Way. Binoculars show many clusters of stars and some glowing gas clouds in the Milky Way.

The Large and Small Clouds of Magellan **LMC** and **SMC** look like two misty patches of light low in the south, easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The LMC is about 160,000 light years away; the SMC about 200,000 light-years away.

*A **light-year** (**l.y**.) is the distance that light travels in one year: nearly 10 million million km or 10^{13} km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes four years to reach the nearest star, Alpha Centauri.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand.

www.canterbury.ac.nz

Society Telescopes For Hire

The society has a wide range of telescopes for hire to members.

If you are looking to purchase or upgrade a telescope and are not sure what to buy, this is a very good way to evaluate some of the available equipment. See also the advertisement on the back page.

To inquire about hiring or for advice on what to buy and for information about equipment, contact Ivan Vazey, curator of instruments, on (09) 535-3987

Solar System Events for August 2010

Source RASNZ Diary events derived from Dave Herald's OCCULT 4

August 3	Moon at last quarter 4:59 pm NZST (04:59 UT).
August 6	Moon furthest north, so lowest southern hemisphere transit for the month.
August 7	**Mercury** at greatest elongation, 27° east of the Sun.
August 8/9	**Venus** about 2.75° from **Saturn**, evening sky.
August 10	New Moon at 3:08 pm NZST (03:08 UT).
August 11	Moon at perigee, its closest to the Earth for the lunar month, 357860km.
August 12	7% lit crescent Moon, 3.5° above **Mercury**, early evening sky.
August 13	14% lit crescent Moon, 4° to left of **Venus**, 6.5° from **Mars** and 7.2° from **Saturn**, evening sky.
August 14	24% lit Moon just over 4.5° from Spica, magnitude 1.1, evening sky.
August 17	Moon at first quarter at 6.14am NZST (Aug 16, 18:14 UT).
August 18	66% lit Moon 4.5° from Antares, magnitude 1.1, brightest star in Scorpius.
August 19	Moon furthest south, so highest southern hemisphere transit for the month.
August 20	**Venus** at greatest elongation, 46° east of Sun. **Mercury** stationary. **Neptune** at opposition.
August 20/21	**Venus** 2° from **Mars**, evening sky.
August 25	Full Moon at 5.05am NZST (Aug 24, 05:05 UT).
August 25	Moon at apogee, its greatest distance from the Earth for the Lunar month, 406388 km.
August 28	93% lit Moon, about 7.5° below **Jupiter**, and **Uranus**, late evening.

Waharau Dark Sky Weekend 10th-12th September

The Society has arranged another astronomical weekend at the Waharau Outdoor Education Centre, located in the Waharau Regional Park, north of Kaiaua on the Firth of Thames. Waharau is a sufficient distance away from Auckland to be not affected by light pollution. The skies here are dark and we have had many great observing nights at this excellent facility. This time Andrew has arranged for better weather.

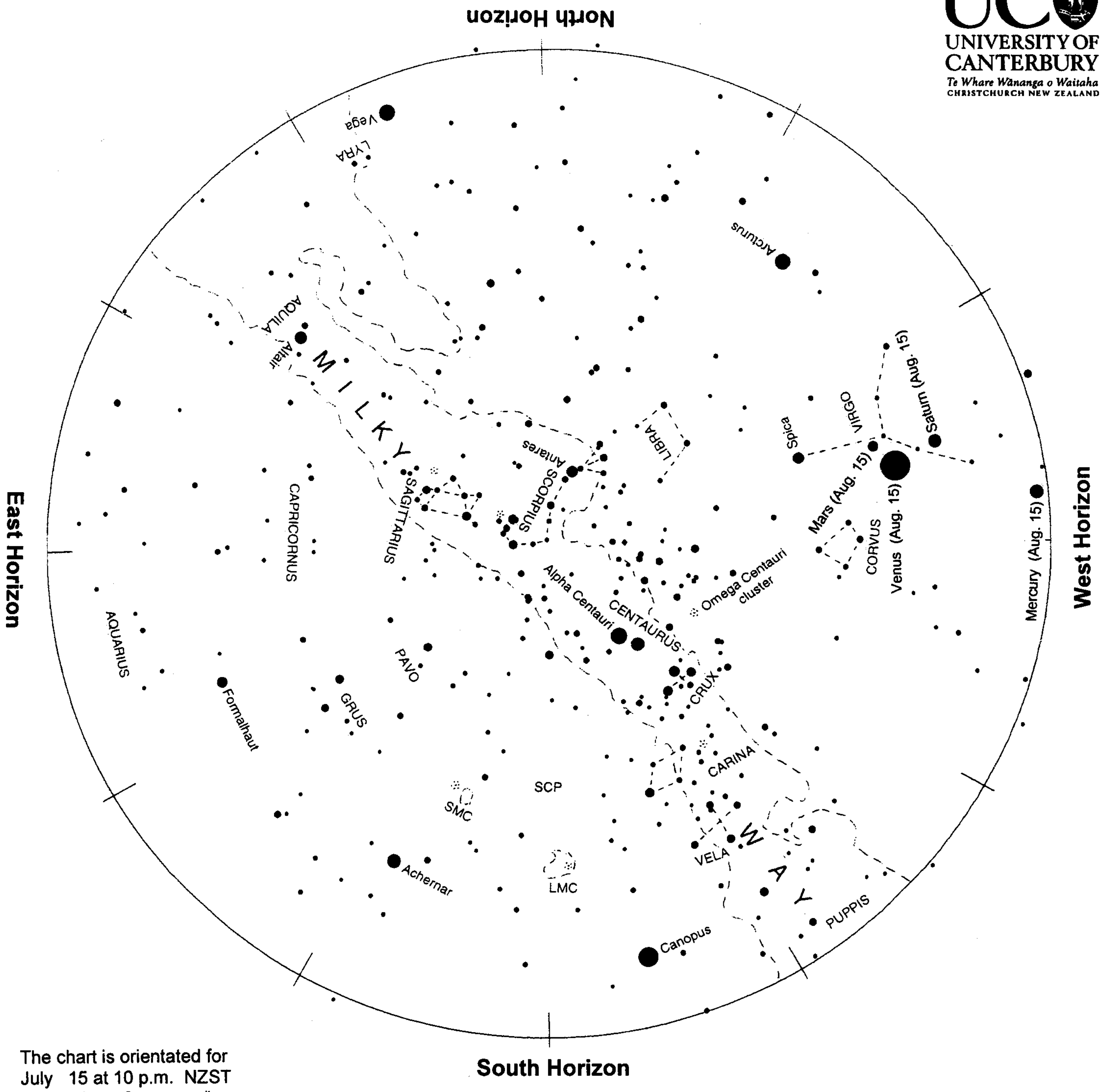
These weekends are an ideal way for new and established members to meet each other, find out more about the different types of telescopes which many members bring to the occasion and learn about new aspects of the night sky and its wonders.

The Waharau Outdoor Education Centre incorporates a lodge, five chalets and an ablutions block. There are five chalets, each with two rooms. Each room can accommodate 10 people. The lodge has a fully equipped kitchen and tables and chairs to seat 100 people. The Society does not provide food at these weekends. However tea / coffee / sugar and biscuits will be provided by the society. If you require food, there is a Pub and a Fish and Chip shop in Kaiaua. There is also a Gas Station and a Dairy where you can pick up supplies.

You can arrive from about 5PM on Friday and when you arrive, check in and pay your fees. Allow 90 minutes travel time from the city centre, but do allow extra time if travelling down on Friday evening, due to traffic.

Cost: $20 per person per night . For more information or to make a booking: Ph Dave Moorhouse on 027 481 9089 or email acrux@orcon.net.nz Payment: Prepayment by Internet banking, Visa or Mastercard can be made by contacting Andrew Buckingham on 09 473 5877 or by email at treasurer@astronomy.org.nz. Otherwise payment can be made on -site by cash or cheque.

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND



The chart is orientated for
July 15 at 10 p.m. NZST
Aug. 1 at 9 p.m. "
Aug. 15 at 8 p.m. "
Sep. 1 at 7 p.m. "

Evening sky in August 2010

To use the chart, hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge. As the earth turns the sky appears to rotate clockwise around the south celestial pole (SCP on the chart). Stars rise in the east and set in the west, just like the sun. The sky makes a small extra clockwise rotation each night as we orbit the sun.

Venus, the brilliant silver 'evening star', appears in the west at sunset. Nearby are Mars, Saturn and Mercury. Orange Arcturus in the northwest often twinkles red and green. The Pointers and Crux, the Southern Cross, are midway down the southwest sky. Canopus is low in the south. The Milky Way spans the sky from northeast to southwest with its broad centre overhead. The Scorpion's tail curls around the zenith. Vega crosses the northern sky, staying low. Jupiter rises due east in the later evening, the second brightest 'star' after Venus.

Chart produced by Guide 8 software; www.projectpluto.com. Labels and text added by Alan Gilmore, Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo 7945, New Zealand. www.canterbury.ac.nz

Killer Asteroids

By Andrew Buckingham

Introduction

In this report I shall examine asteroids that have the potential to collide with Earth. First, I shall look at how these objects were formed, where they come from and how they get classified as dangerous or not. This is followed by a brief history of the search for these asteroids and the current situation. Second, I shall look at the chances of an impact with Earth and what the effect of an impact would be, and lastly what we can do about it.

Origin of PHAs

When the Solar System was forming 4.5 - 5 billion years ago, the material in the solar nebula that did not become part of the Sun accreted into planetesimals. Most of these planetesimals further combined to form the planets and moons. The icy, dusty, leftover material further out in the solar system formed comets. In the region between Mars and Jupiter, some stony and metallic planetesimals were unable to coalesce into an object large enough to form a planet, due to the gravitational influence of Jupiter. These planetesimals became asteroids, and have diameters ranging from a few hundred kilometres to the size of dust particles. Most reside in the Asteroid Belt, located between the orbits of Mars and Jupiter. However, gravitational influences from the planets, especially Jupiter, can cause asteroids to fall out of their main belt orbit, and some of these new orbits can take them close to the Earth's orbit. We classify these as Near Earth Asteroids (NEAs). Due to the many variations and inclinations of possible orbits, most of these have a very low probability of colliding with the Earth. Those with orbits that could potentially impact with the Earth are classified as Potentially Hazardous Asteroids (PHAs).

NASA's Near-Earth Object Program website defines PHAs as:

"…currently defined based on parameters that measure the asteroid's potential to make threatening close approaches to the Earth. Specifically, all asteroids with a minimum orbit intersection distance (MOID) of 0.05AU or less and an absolute magnitude (H) of 22.0 or less are considered PHAs. In other words, asteroids that can't get any closer to the Earth (i.e. MOID) than 0.05AU (roughly 7,480,000 km) or are smaller than about 150m in diameter (i.e. H = 22.0 with assumed albedo of 13%) are not considered PHAs."

This does not mean a PHA will impact Earth — it just has the potential to do so. This justifies more observations of the object which will help produce more accurate calculations of the likelihood of an impact. Another way that asteroids can fall out of their main belt orbits is the Yarkovsky Effect. This is caused by the solar heating on the morning side of a rotating asteroid being less than the heating on the afternoon side. The energy radiating from each side of the asteroid is different and can cause a slow thrust, forcing it out of orbit, either towards or away from the Sun.

History of Observing NEAs

All asteroids were thought to orbit between Mars and Jupiter until the beginning of the twentieth century with the discovery of Eros inside the orbit of Mars. During the 1930s to 1960s few NEAs were observed and this was mainly by chance. The first deliberate searches for NEAs started in the 1970s, then increased during the 1980s. Influenced by some recent close passes, in 1990 a US House of Representatives committee directed for "*a program for dramatically increasing the detection rate of Earthorbit- crossing asteroids*" and "*developing technologies to alter the orbits of or destroy such asteroids*". Subsequently in 1992 the International Astronomical Union formed a Near- Earth Object working group. This kick-started the active search for NEAs. So many NEAs were discovered to have no chance of colliding with Earth that it was decided to rationalise and focus on PHAs. Early PHA research was with photographs, but the development of automated telescopes with CCD cameras enabled more of the sky to be covered, more often and in greater detail. Once new objects were discovered, they could be tracked. With these continual observations, the orbital data of the NEA could be refined to help determine if it was a PHA. Other observatories were able to provide follow-up astrometric data. In 1998, mandated by the US Congress, NASA formed the Spaceguard[1] effort with the goal of:

"…discovering and tracking over 90% of the Near-Earth Objects larger than one kilometre by the end of 2008."

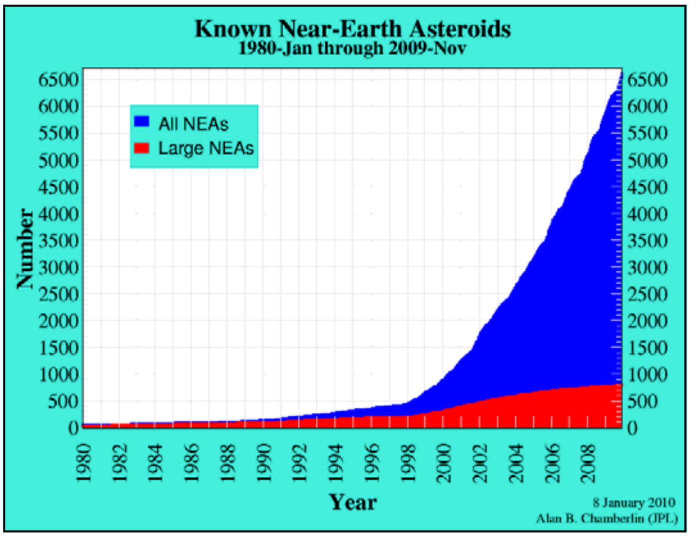
An impact from an object of this size would have global consequences. Spaceguard is a worldwide effort designed to coordinate the data from the many observatories doing NEA searches[1]. This has now been extended to include 90% of NEAs over 140m in diameter by 2020.

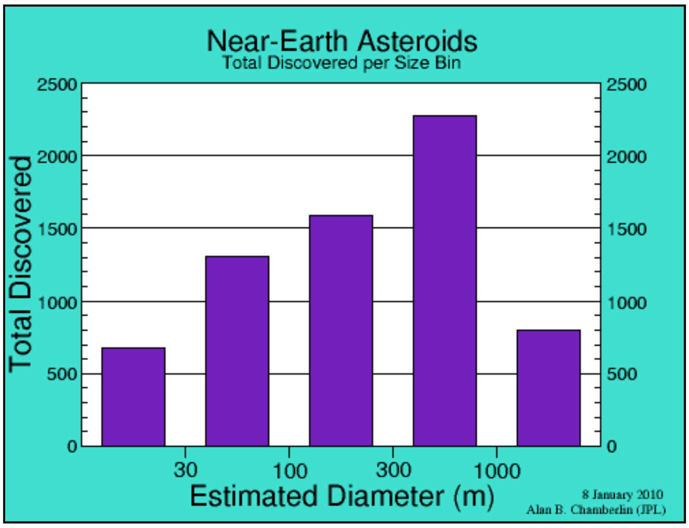
Current Data

The size of an asteroid size is inferred based on its absolute magnitude and the average asteroid albedo. An asteroid with an absolute magnitude (H) of 18.0 is estimated to have a diameter of one kilometre and an H of 22 equals a diameter of 150m. These figures are still being refined, after the discovery that NEAs have a brighter albedo than first thought. It is estimated that there are over 1,100 NEAs with a diameter over one kilometre, and over one million with a diameter over 150m. The first chart on the next page shows the total number of known NEAs. The second breaks them down by size (source: JPL, NASA). The large increase over the last decade is significant.

As at 25 March 2010, the Near Earth Object Program (JPL) has

1. *Observatories in the Spaceguard programme include; Lincoln Near-Earth Asteroid Research (LINEAR), Near-Earth Asteroid Tracking (NEAT), Spacewatch - University of Arizona, Lowell Observatory Near-Earth Object Search (LONEOS), Catalina Sky Survey, Japanese Spaceguard Association (JSGA) and Asiago DLR Asteroid Survey (ADAS) - source JPL, NASA. Also researching NEAs is CLOMON2 at the* University of Pisa, Italy.





recorded discoveries of 6,920 Near-Earth Objects, with 804 having a diameter of over one kilometre and 1,103 being classified as PHAs. While a lot of effort is being put into discovering and tracking as many PHAs as possible with dedicated telescopes, there are still limitations such as our ability to constantly keep track of the Object in order to refine its orbital information, our estimates on an Object's size and our ability to see smaller bodies. There are also blind-spots, e.g. if a PHA comes from the direction of the Sun, we potentially cannot observe it, until it is too late. Larger telescopes will make discovering and tracking smaller NEAs easier and more reliable.

Likelihood and Effect of a Collision

The chance of an NEA impacting with the Earth depends on its size and its orbit. The potential damage of an impact depends on factors such as the angle of impact, where it impacts (sea or land) and the composition of the asteroid. The NEA is more likely to collide with the Earth if it has a low-inclination orbit rather than one steeply crossing the Earth's orbital plane. However, estimating the number of these objects this would apply to is difficult as they are more likely, by gravitational interaction, to be cleared out by the Earth. Dr Allan Harris (Space Science Institute) presented a paper in 2003 estimating the frequency of an NEA impact using a statistical model and a sample of 600 objects. He calculated that the per object impact frequency of all NEAs (with an orbit of less that 1.3AU diameter) is 1.7×10^{-9} per year. An asteroid with a diameter of less than 40 metres will most likely to burn up in Earth's atmosphere. The friction of the atmosphere will slow the asteroid down and the heat generated combined with the aeronautical pressure will cause the rock to vaporise — often in a spectacular explosion. Several such explosions are seen each year, mostly from rocks that are just a few metres or less in diameter.. An asteroid whose diameter is over 40m but less than one kilometre will most likely survive passage through the atmosphere. While it will slow down and lose some mass during entry, the impact will have severe and probably devastating local consequences, on the scale of a large nuclear bomb. An impact 40,000 years ago by an asteroid estimated to be 50m in diameter hit what is now Arizona, USA and created the Barringer Crater. This crater is about 1.2km wide. An asteroid of over one kilometre in diameter is unlikely to slow down in the atmosphere and will probably have globally devastating consequences. While the area closest to the impact site would be completely laid waste, the dust from the impact explosion would be thrown up into the stratosphere, blocking sunlight and cooling the Earth. This would impact on plants and our food chain. This type of impact happened about 65 million years ago, with an estimated 15km diameter asteroid, and may have contributed to the extinction of many species, including dinosaurs. While estimates are still being refined by new data, it is estimated using this and historical impact information from known craters on the Earth that one of these large extinction-type impacts happens on average once every 100 million years. There are two scales for gauging the hazard level of a NEA impacting the Earth: the Torino Scale and the Palermo Scale. The Torino Scale is designed to communicate risk to the public. It is a scale from zero (no risk) to ten, combining the probability of an impact happening and the size (in energy) of that impact. The Palermo Scale is for astronomers and uses a metric method , based on a logarithmic scale, which considers a wide range of impact dates, energies and probabilities to help astronomers assess the priority an object has for observation.

What Can We Do About It?

While there are now programmes in place to discover and track PHAs, there is no organisation or government agency responsible for planning how to avoid an impact. In March 2009 in a report to the US congress, NASA suggested a nuclear explosion was the best method for deflecting an asteroid. However the majority of PHAs are in orbits unattainable by current or planned spacecraft. Any explosion could also have the side effect of just breaking a large rock up into many smaller ones. Another theory is that, if we start early enough, we could use a spacecraft to very slowly and softly nudge the asteroid to alter its orbit. However this would have to start a vast distance from Earth and we face difficulties of range and trajectory capabilities of current spacecraft. The amount of notice we would get of a potential impact is also an issue. In April 2029, Asteroid 99942 Apophs is expected to come extremely close to the Earth (about 1/10th of the Moon's orbit). Although it will narrowly miss the Earth, there is a low probability that the gravitational pull of the Earth will modify its orbit and cause it to impact Earth seven years later. This medium-size asteroid has the potential to obliterate a sizable portion of a country and affect millions of people. Could we do anything about it with only seven years notice?

The Barringer Crater in Arizona created by an asteroid impact about 40,000 years ago. Credit: Andrew Buckingham

Conclusion

The serious effort of discovering and keeping track of PHAs has only been happening for the last 10-20 years and we are just beginning to comprehend the potential danger. The increased focus on NEAs and PHAs is the first step in dealing with the issue. Luckily, the vast majority are small enough to be burnt up by the Earth's atmosphere. The probability of a larger asteroid impacting Earth, especially in the near future, is very low, and while a large impact is likely to happen in the future, such an extremely rare event could be millions of years away. This is fortunate, for with our current or even envisaged technology, there is probably very little we could do about it.

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The Historic Search for Red Sprites:

Art Meets Science in *Lightning's Angels*

By Peter McLeish, Stardome Monday August 30th 8:00pm

Sprites are fleeting, luminous shapes that shoot into the upper atmosphere during large thunderstorms as lightning simultaneously reaches down to Earth. For at least a century, scientists have attempted to confirm and explain the existence of sprites with visual images and data. The author's series Lightning's Angels supplements the documentation of sprites by exploring the properties of this natural phenomenon through digitally enhanced oil portraits set to music and displayed in a large-scale multimedia format, such as at a planetarium.

A Red Sprite reaching 40-90 km into the atmosphere from a thunderstorm about 400 km away from the observer.

Peter McLeish is a painter and multimedia artist. For the past 14 years, he has exhibited his work around the world. His work on sprites has appeared in many international forums. His video Lightning's Angels was recently presented in a lecture by Colin Price entitled "Lightning and Sprites" at the Tel Aviv University Astronomy Club in January 2004, and at the NATO Advanced Study Institute conference Sprites, Elves and Intense Lightning Discharges, held in Corte, Corsica, France, in July 2004.

The Lost Siblings of the Sun

Most stars are born in clusters rather than singly, and there's plenty of evidence that the Sun was too.

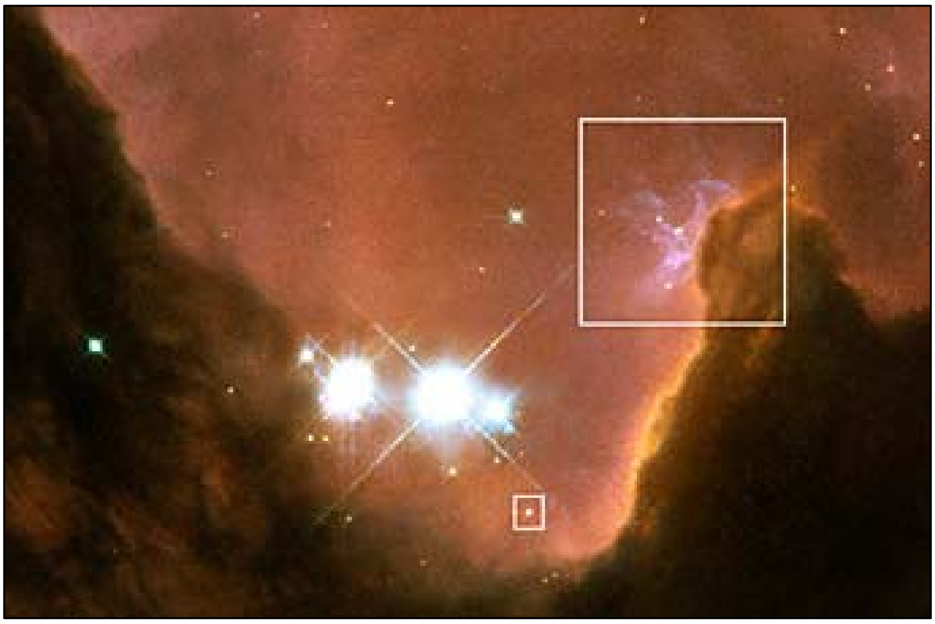
From Sky and Telescope

For one thing, the material of the infant solar system (as preserved in the earliest meteorites) was enriched by fresh supernova debris from at least one very young, massive star (having 15 to 25 solar masses) that exploded less than 5 light-years away, no more than 2 million years after the Sun's formation. Today no such massive star exists within 300 light-years of the Sun. Clearly, the early solar system had stars close around it.

But that was 4.57 billion years ago. Where are the Sun's cluster-mates now?

Some of them, it turns out, should remain surprisingly nearby. An analysis by Simon F. Portegies Zwart (University of Amsterdam) finds that the Sun's birth cluster started off with about 500 to 3,000 solar masses and a diameter smaller than about 20 light-years — typical for open clusters. Evidence for the cluster's mass and size, Zwart writes, is preserved in the anomalous chemical abundances and structure of the solar system's Kuiper Belt — the realm of small, icy objects out beyond Neptune. Some of the Kuiper Belt's objects are dynamically "hot"; they were stirred up and scattered by the gravity of at least one nearby cluster star making a close pass in early days.

Like other open clusters, the Sun's birth cluster disintegrated with time. Most of its stars have long since drifted away and are mixed irretrievably into the swarms of the Milky Way — strung out during the approximately 27 orbits that they and the Sun have made around the galaxy since their origin long ago.



This Hubble close-up of part of the Trifid Nebula in Sagittarius shows the kind of environment where the Sun and solar system were probably born. Massive hot stars dominate the scene; they will run through their brief lives quickly and explode as supernovae. The larger white box shows several more modest stars that recently formed in the retreating gas-and-dust pillar to their right. The small box highlights a "proplyd," a protoplanetary disk around a star that may end up like our Sun.

NASA / ESA / Hubble Heritage Team (AURA / STScI)

However, about 10 to 60 of the Sun's nest mates (a few percent) should still remain closer than 300 light-years from us and are still travelling in parallel with us, according to Portegies Zwart. The European Space Agency's upcoming Gaia astrometry satellite should be able to sort them out by their space motions. Their exact chemical abundances might then give them away for sure.

"Finding even a few," writes Portegies Zwart, "will strongly constrain the parameters of the parental star cluster and the location in the Galaxy where we were born."

Don't expect them to look like anything special, though. The Sun is very ordinary among stars, and so were the circumstances of its origin.

Sun's Strange Behaviour Baffles Astronomers

From Space.com

The Sun's temper ebbs and flows on what scientists had thought was a pretty predictable cycle, but lately our closest star has been acting up.

Typically, a few stormy years would knock out a satellite or two and maybe trip a power grid on Earth. Then a few years of quiet, and then back to the bad behaviour. But an extremely long stretch of low activity in recent years has scientists baffled and scrambling for better forecasting models.

An expected minimum of solar activity, between 2008 and 2009, was unusually deep. And while the Sun would normally ramp up activity by now, heading into its

next cycle, the Sun may be on the verge of a weak solar cycle instead, astronomers said at the 216th meeting of the American Astronomical Society in Miami.

"We're witnessing something unlike anything we've seen in 100 years," said David Hathaway of NASA's Marshall Space Flight Center in Huntsville, Ala.

The Sun's constant interaction with Earth makes it important for solar physicists to keep track of solar activity. Stormy periods can force special safety precautions by satellite operators and power grid managers, and astronauts can be put at risk from bursts of radiation spat out by solar storms. Scientists need to more reliably predict what's in store.

At the conference, four solar physicists presented four very different methods of measuring and tracking solar cycles.

The Sun has spots

Sunspots are areas of concentrated magnetic activity that appear as dark dots on the solar surface. The ebb and flow of the Sun's magnetic activity, manifested in the appearance of sunspots, make up the solar cycle.

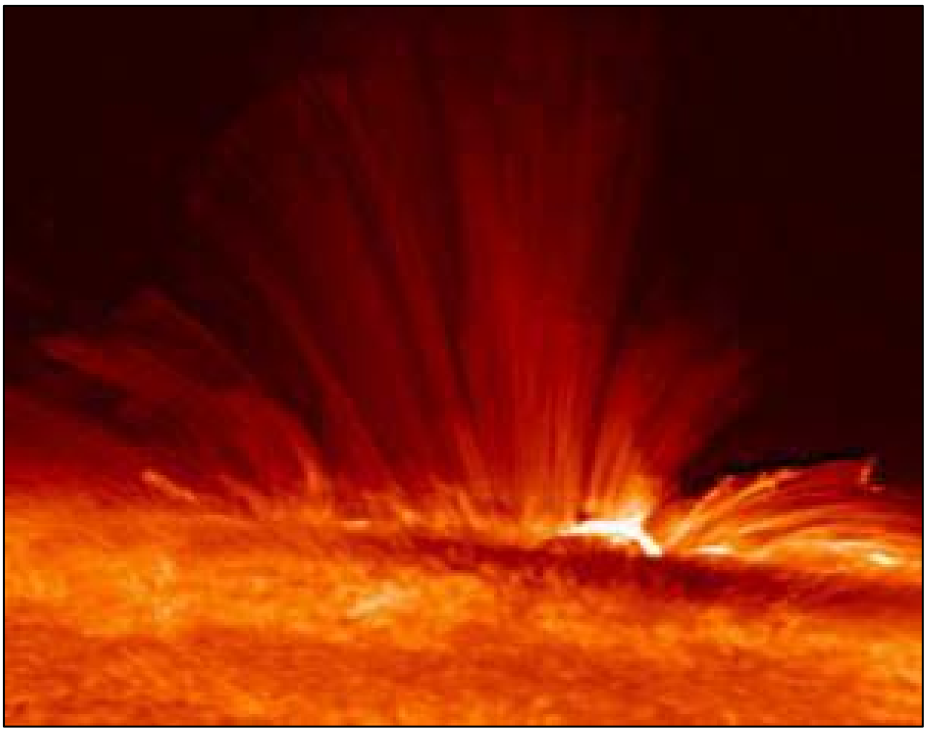
Typically, a cycle lasts about 11 years, taking roughly 5.5 years to move from a solar minimum, a period of time when there are few sunspots, to peak at the solar maximum, during which sunspot activity is amplified.

The previous cycle 23's extraordinary minimum recorded the highest number of days without sunspots that researchers had seen since 1913, said Hathaway.

Hathaway and his team of researchers measured what is called the meridional flow, which is the circulation of stellar material from the Sun's equator toward the poles and back again. This flow can often influence a cycle's strength.

The scientists examined the changes in the structure of the flow, and the levels of geomagnetic activity, as they corresponded to the minimums and maximums of the previous solar cycles.

"We found that there were variations in the strength of that flow," Hathaway said. "The last minimum in 1996, had a velocity of about 11 meters per second (about 22 miles an hour), which is pretty slow for an object as big as the sun. That flow slowed down as we went to maximum in 2001."



This image of the solar 'chromosphere' was obtained on 20 November 2006 by the Hinode solar observatory, and reveals the structure of the solar magnetic field rising vertically from a sunspot (an area of strong magnetic field), outward into the solar atmosphere. The chromosphere is a thin 'layer' of solar atmosphere 'sandwiched' between the Sun's visible surface (or photosphere) and its outer atmosphere (or corona). The chromosphere is the source of ultraviolet radiation. (Credit: Hinode JAXA/ NASA/PPARC)

The meridional flow then quickly increased again, and by 2004, it was faster than it was at the last maximum, said Hathaway. This flow continued to stay fast on the approach to this most recent minimum.

"My suspicion is that this sunspot cycle 23 was a weaker cycle than the last two, with fewer sunspots and weaker magnetic fields. These may feed into what happens with the meridional flow that is going to lead to another weak cycle."

Hathaway predicts that cycle 24 should reach its peak in mid-2013 at about half the size of the last three cycles.

The Sun's is out of sync

In a different approach, Sushanta Tripathy of the National Solar Observatory used the frequencies of acoustic oscillations to look for signatures of changes in the solar activity cycle.

Tripathy found that changes in acoustic frequencies were, for the most part, in phase with solar activity. But, during the extended minimum, he noticed that the frequencies of waves that cover a large portion of the solar interior became out of sync with solar activity.

"We find that the frequencies of sound waves that travel to the deep interior show an early minimum during late 2007, while the waves that are confined to near the surface show the signature of minimum in late 2008, nearly coinciding with solar activity minimum."

The two seismic lulls detected using acoustic oscillation have not been seen before in previous cycles, said Tripathy, leading researchers to conclude that the extended minimum between cycles 23 and 24 is quite unusual.

Jet streams on the Sun

Frank Hill, also of the National Solar Observatory, took a separate approach, attempting to predict the sunspot cycle based on a phenomenon on the Sun that can be likened to solar jet streams.

This east-west flow on the surface of the Sun was first discovered in 1980, and is known as "torsional oscillation."

The jet stream exists at a depth of at least 65,000 miles (about 105,000 kilometres) below the solar surface, and Hill and his team of researchers were able to examine its behaviour at a depth of 600 miles (966 km).

"The position of the magnetic field is very highly correlated with the position of this flow," Hill said. "From helioseismology, we see the flows for two prominent cycles – Cycle 23, the cycle that we're coming out of, and Cycle 24, the cycle that we're in now."

It turns out that the flow appears well before the level that solar activity spikes. This led the researchers to conclude that there is some sort of triggering mechanism that appears before the onset of activity.

While observations of the solar jet could one day be useful for predicting the timing of the solar cycles, a larger data set is still required to ensure the method's accuracy.

"We're definitely going to need several cycles to improve the predictions," Hill said.

Further investigation will also be needed to determine whether the jet stream is a cause or effect of the solar cycle.

Our magnetic star

In yet another approach, Julia Saba of SP Systems and NASA's Goddard Space Flight Centre in Greenbelt, Maryland., used X-ray and magnetic field strength indicators in order to predict the precise time mark for the onset of solar cycles.

Saba used magnetic maps of the Sun, called synoptic charts, to observe solar cycles 21 through 23 and into 24. By evaluating trends in X-ray activity, Saba was able to predict the onset approximately 18 months ahead of time, and was accurate to within two months.

"By May of 2010, we see that cycle 24 is clearly underway, though things are still pretty quiet in the southern hemisphere in general," Saba said.

This method of determining a solar cycle's onset could be a valuable way to compare the different phases in solar activity because it can be observed in near real-time, Saba explained.

"It's a little easier to tell in real time than by solar maximum or solar minimum," she said.

While the four ways of monitoring solar activity take different approaches, the researchers are all in agreement that we are witnessing an interesting minimum. And while these methods could be useful for future studies of solar cycles, they all require further research.

"One problem we have with all solar cycle studies is the statistics of small numbers," Hathaway said. "Even with 23 sunspot cycles, it's not enough. What we've seen today are some newer measurements that weren't available even two cycles ago that are shedding new light. We need to be careful with using what we've seen from one or two cycles to make inferences for all of them."

Planck captures 'embers' of Big Bang

ABC *Science*

A space telescope designed to peer into the enigma of the Big Bang has served up its first overall image of the cosmos, say scientists.

The picture "is an extraordinary treasure chest of new data for astronomers," according to a press release from the European Space Agency (ESA).

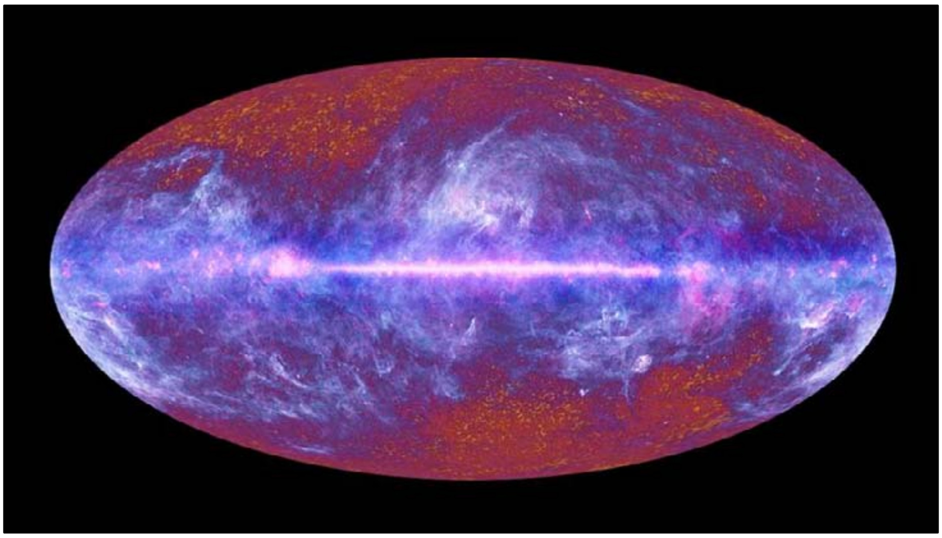
The image was painstakingly built up, slice by slice, by a 700 million euro (A$1.039 billion) telescope, Planck, which ESA put in orbit in May last year.

Planck is designed to look at radiation in the microwave part of the energy spectrum.

Microwave signatures point to the birth and death of stars and galaxies, as well as the embers of the Big Bang which, according to theory, brought the Universe into existence 13.7 billion years ago.

This primeval energy, known as cosmic microwave background radiation (CMBR), washes across the sky.

But in order to spot it in Planck's first "all-sky" image, scientists will have to filter out background noise from our own galaxy, the Milky Way.



The universe seen through the microwave eyes of the Planck telescope (Source: ESA/LFI and HFI Consortia)

"We are opening the door to an Eldorado where scientists can seek the nuggets that will lead to a deeper understanding of how our Universe came to be and how it works now," says Dr David Southwood, ESA's director of science and robotic exploration.

"The image itself and its remarkable quality is a tribute to the engineers who built and have operated Planck. Now the scientific harvest must begin."

Named after the 20th-century German physicist, Max Planck, who founded quantum theory, the mission is equipped with a 1.5-metre telescope that focuses radiation onto two arrays of microwave detectors, each cooled to almost absolute zero.

By the end of its mission in 2012, Planck should have completed four all-sky scans. The data release of the CMBR - in essence a map of the Big Bang - is also scheduled for 2012.

Red Dwarfs May Be Safe Havens For Life

Ray Villard, Discovery Space

Article provided by the AAVSO Writers Bureau

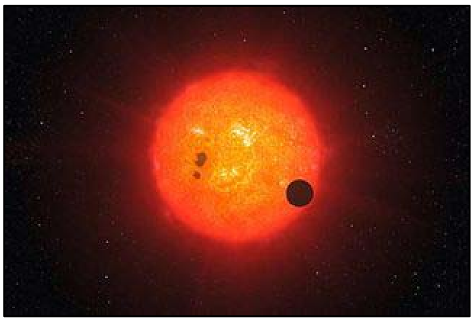
It's been 15 years since astronomers first discovered a planet beyond the solar system orbiting a normal star. We've found lots of unusual exoplanets since then, but nothing where we think life could exist. In two to three years NASA's Kepler space telescope will provide the statistical bedrock for estimating the number of Earth clones in the galaxy. But the Kepler planets will be too far away –- hundreds or thousand of light-years -- for any follow-up observations to be able to determine if they are inhabited. All we will have from the Kepler data is planet mass, diameter, orbital period, and parent star type The Earth clones will forever remain a blip on the exoplanet radar when it comes to determining true habitability. But enough exoplanet research has been done so far that a cautious prediction can be made about where the first inhabited planet will be found.

WIDE ANGLE: The Age of the Exoplanet

The planet will orbit a nearby red dwarf star found in surveys taken within 100 light-years of Earth. Why? Because red dwarfs are much more numerous than

sun-like stars and so provide many more targets. Because red dwarfs are dim, planets orbiting them will not be as swamped by starlight and so their light is easier to measure. The planet will be in the habitable zone around a red dwarf –

a sweet spot where liquid water can remain stable on a planet's surface. The zone will be only a fraction the distance from the cool star to Earth's habitable zone is from our hotter Sun.



For those planets with orbits tilted edge-on to Earth, detecting them will be straightforward. Astronomers will see if the star dims slightly when the planet passes in front of it, or transits. A planet in the habitable zone of a red dwarf would complete its racetrack orbit in just two weeks. This would allow multiple transits to be observed quickly. Also, because it is so close to the red dwarf, a planet is more likely to be in an orbit aligned along our line of sight, and will be more likely to be discovered transiting.

But there is one big catch. Young red dwarfs have a petulant youth stretching over billions of years. Titanic stellar flares erupt without warning and blast out lethal doses of ultraviolet radiation. Ocean life on a planet may be safe from the UV just a few metres underwater and still extract enough light for photosynthesis. But anything living on the surface could get fried without a liberal coating of Sunscreen 2000. But we now have a glimmer of hope for red dwarf planets. Astrobiologist Antigona Segura of the Universidad Nacional Autónoma de México (UNAM) in Mexico City, simulated how a 1985 flare from the nearby red dwarf AD Leonis would have affected a hypothetical Earth-like planet orbiting a dwarf.

He found that UV radiation actually split molecules of oxygen to create more ozone than it destroyed. The simulation made a thicker ozone layer in the planetary atmosphere such that the surface experienced no more radiation than is typical on a sunny day on Earth. What's more, as the dwarf settles down to a quiescent existence, there would be very little ultraviolet light and an UV filtering ozone layer would not even be needed. To be sure, there are other oddball characteristics to worry about. Potentially habitable red dwarf planets may keep one hemisphere locked onto their star due to gravitational tidal forces. The resulting slow rotation may give them anaemic magnetic fields that do not block cosmic rays effectively. But the best solution is to simply go looking. The light-gathering power of the James Webb Space Telescope, scheduled for launch in 2014, would be used to spectroscopically 'sniff' out the exoplanet's atmosphere for chemistry that might be a by-product of organisms on the surface. If we get lucky, and these planets do develop a natural UV shield, then the discovery of an inhabited world may be no more than a decade away.

Bean Nebula's Bubbles of Glowing Gas

By Jennifer Ouellette

Article provided by the AAVSO Writers Bureau

Today's dose of spectacular space imagery comes courtesy of the Hubble Space Telescope: a colourful close-up view of one of the many bright bubbles of glowing gas that make up the Large Magellanic Cloud. First catalogued in 1956 by American astronomer Karl Henize, LHA 120-N -- whose distinctive shape earned it the nickname the Bean Nebula because it looks for all the world like a giant ball of cotton candy, thanks to billowing clouds of pink gas.

The Bean Nebula is the second-largest stellar nursery within the Large Magellanic Cloud, and its offspring include some of the most massive stars known to astronomers. But it's not just another pretty face: the distinctive appearance of the Bean Nebula reveals some important clues about the life cycle of stars, as well as its own history. It's a great-grandparent of sorts, having birthed three generations of stars. Each generation produced a "shell" of gas and dust, and with each successive generation, those shells moved further away from the nebula's centre. Per the NASA/ESA press release, "These shells were blown away from the newborn stars in the turmoil of their energetic birth and early life, creating the ring shapes so prominent in this image." I am blown away yet again by the amazing glimpses of our Universe that Hubble has been steadily providing since it first launched in April 1990. It's an expensive instrument, but we've reaped huge scientific and aesthetic rewards from the investment, not to mention great good will; the public loves Hubble. Twenty years later, it's still going strong, having had one last servicing mission in 2009 that should keep Hubble in good working order through 2014. That's when the James Webb Space Telescope is due to launch. Here's hoping that instrument gives back as much as Hubble.

Leo. The Lion of Nemaea

A constellation & its mythology

By Ivan Vazey

After killing his entire family in a maddened rage, Hercules, to atone for his sins, agreed at the Oracle of Delphi*, to perform 12 labours for the king of Mycenae, Eurystheus

The first labour was to kill the monstrous man-eating lion of Nemaea (the unfortunate Leo). He had little success with traditional weapons such as arrows and clubs. These shattered like clay.

He literally took the matter into his own hands, strangling Leo and completing his first task.

Hercules donned the Lion skin as a cloak and returned to the city.

Eurytheus fled in horror at this monstrous apparition and refused Hercules entry to the city unless summoned. However, all's well that ends well (except for Leo).

Hercules kept Leo's hide with him till the end of his days.

Both Leo and Hercules were placed in the sky as Constellations, to be remembered for all eternity.

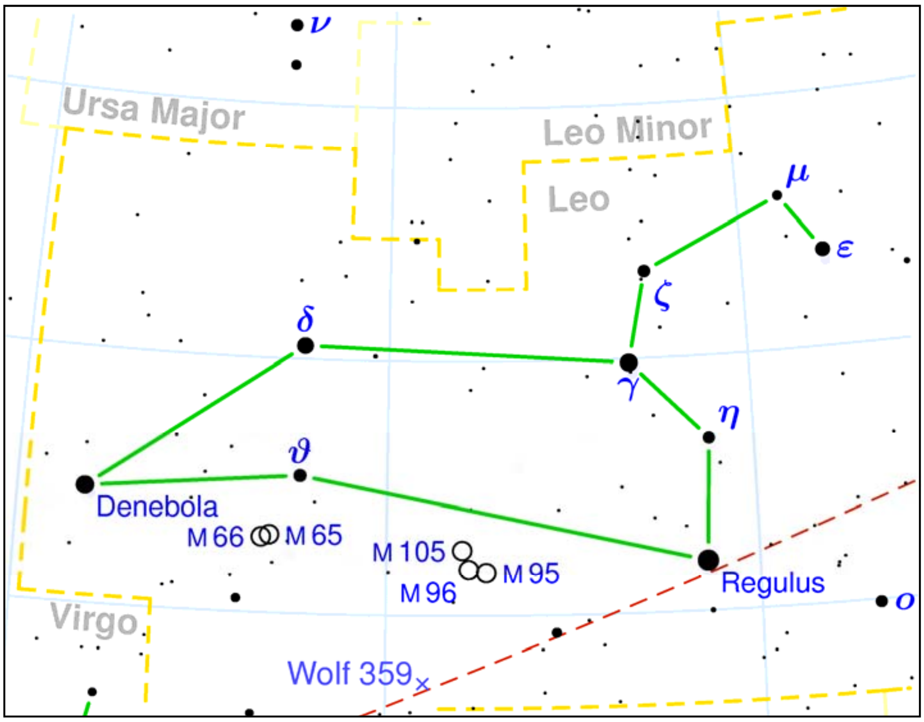
Noteworthy Viewing in Leo.

M65 (NGC 3623) (10.1) M66 (NGC 3627) (9.6) and Best 64 (NGC 3628) (10.4) are a pretty trio in the hind quarters of Leo, 2.5 deg. SW of Chertan A 1 deg field will easily show all three.

Caldwell 40 (NGC 3626) (10.9(is a bright, small elongated spiral galaxy with a pronounced brighter core. It lies 2.6 deg SE of Zosma (Delta Leonis) Just to the right in this 1 Deg field, find NGC 3608 (11.8) and below (south) lies NGC 3607 (Best 63) (11.0) At the SW edge of 3607 is a tiny companion, NGC 3605.

M95 (NGC 3351) (10.7) is a bright, large Spiral galaxy 3.6 NE of Rho Leonis in the centre of Leo's body.

Best 60 (NGC 2903)(9.6) is a beautiful Spiral galaxy 1.5 deg S of Alterf (Lambda Leonis) in the head of Leo.

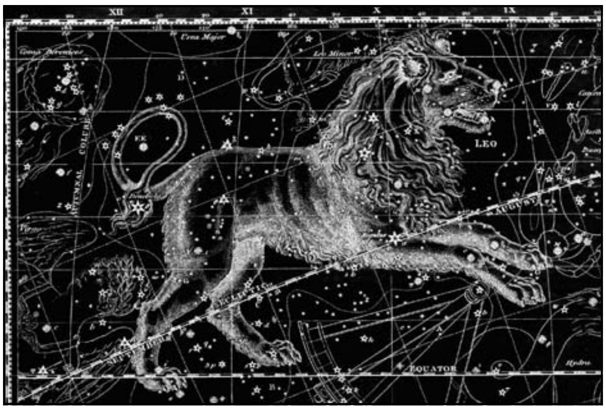


Leo as seen by northern hemisphere viewers. We see it upside down and laterally inverted. Regulus is on the Ecliptic, exactly north at midnight in February

Dreyer noted this Galaxy as bright,(9.6) **ve**ry large, extended and gradually brightening toward the middle. The nucleus appears off centre toward the East.

Footnotes:

*The oracle of Delphi is a pit in the ground at one end of the great temple in Delphi where a young maiden would sit with a stone lid to cover the pit. Hydrocarbon gases seeped into the pit and the maiden's brain would become addled, much in the same manner as a modern glue sniffer. A priest would then make a suitably expedient interpretation of the maiden's utterings to whoever wanted the prophesy.



Leo, as depicted in Urania's Mirror, a set of constellation cards published in London c.1825.

Leo is a summer constellation for southern hemisphere viewers. It is far enough away from the Milky Way to have many galaxies, yet close enough to contain plenty of good objects of interest from our own galactic neighbourhood.

.....ED