Reflections

Journal of the Northern Sydney Astronomical Society Inc.

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Welcome to the first issue of Reflections for 2009. As you can see, we are trying a new format for our magazine. This issue is far from perfect but with your help we'll try to improve it.

Reflections has an important role to play in the life of our society. It is your magazine and all members can contribute: articles, reports, events, photos, news, cartoons... anything that can be of interest to other members is welcome; we are eagerly expecting your contribution and suggestions.

You can mail them to

NSAS, PO Box 56
Lane Cove NSW 1595

or e-mail them to me at jean-luc@ozemail.com.au

Cheerio,

Jean-Luc Gaubicher

In this issue

The President's Message

It is now April and the we are halfway through the club's year.

Apart from a very poor showing in January the meetings have been well attended. It goes without saying that we do need members to attend the meetings. A good turn-up offers good feedback to our guest speakers; this will be become known in the astronomical community and will encourage future guest speakers to come to the society.

I would like to welcome to the society the following new members: Gordon Osbourne, Julie Jardine and Tom Rogerson. And welcome back to Bruce Retalik who has rejoined. Some others have indicated they would like to join and there are indications from the Willoughby star party that there will be more.

The committee is working hard to bring the society to the point where we are compliant with our constitution and professional in how it is run. Soon we will have an information CD-ROM for new members and old. This will give you all the information you need to know about the society.

Laser pointers and the use of: to ensure all members in the society are aware of the correct use of laser pointers we will be EMAILING an information pack to everyone. This will show the society is diligent in seeing that lasers are used within the guidelines. The society is on the register as an approved Astronomical Society so it means members are allowed to own and use a laser. So please make sure you are aware of the guidelines on using lasers, even if you do not own one yourself. Who knows, you may be handed one by a member to point something out so knowing the rules means you do not have to worry about using it.

Events coming up are the Macquarie open night. We need a couple of volunteers to man our stand on Saturday May 9th. Contact anyone on the committee if you can help.

The annual BBQ will be on as usual sometime in June or July depending on arrangements with the college.

Now that the magazine is back and going, articles by members are needed. Articles about field trips to dark skies, do it yourself articles on devices you may have made to help you in the pursuit of your hobby, in fact any article you think may be of interest to other members.

I hope to start some traveling soon so, in my absence, the Vice President Bob Fuller will take charge of the day-to-day running of the society. I do not expect to be away for longer than a month or so at a time.

As I have been acting as observation officer we need someone who would be interested in being the observation officer while I am away. If you would like to help, please contact a committee member.

Hope you all had a happy Easter.

Regards to all,

Ron Washington

Calendar

General Meetings:
April 21st — Speaker: A/Professor Scott M. Croom. His talk will be on "Dark Energy".
May 19th — Speaker: TBA
June 16th — Speaker: TBA

Observation Nights:
April 24th / May 1st
May 22nd / May 29th
June 19th / June 26th

Deadline: Please send your contributions to the July issue of Reflections in time to reach the editor **before June 12th**

Important communication

Please note the society's new postal address:
PO Box 56 Lane Cove NSW 1595

and the mobile number: 0423 971 374

IYA2009 – International Year of Astronomy

The International Year of Astronomy 2009, is a year long event celebrating the 400th anniversary of Galileo's use of a telescope to make astronomical observations. The program was conceived during the IAU (International Astronomy Union) meeting in Sydney in 2003, and is endorsed by UNESCO.
The theme is "The Universe, Yours to Discover" and it is intended to be a global celebration of astronomy, both professional and amateur.
As the IAU says, astronomy is one of the oldest fundamental sciences, and it still has a profound impact on our culture.

IYA 2009 is being supported by 140 countries, each country's activities being overseen by a country node. In the case of Australia, this is represented by the AAO and CSIRO.

The goals of IYA 2009 are clearly stated on its website, www.astronomy2009.org but can be summarised as using this opportunity to educate the general public scientifically, promote access to universal knowledge, empower astronomical communities as well as anumber of other goals such as dark sky awareness.

The IYA2009 program is based on a number of cornerstone programs and events, such as 100 Hours of Astronomy, the low-cost Galileoscope replica, professional astronomy focus on dark skies, UNESCO and the IAU, astronomical imaging collections, astronomy in schools and a number of special projects. The one of most interest to us amateur astronomers is 100 Hours of Astronomy that took place on 2-5 April this year. Professional astronomers ran research observatory webcasts and there were science centre webcasts as well.

The 24-hour Global Star Party on April 4th was an opportunity for the public to visit observatories and amateur star parties in what was a global period of observation sweeping around the world from New Zealand and Australia.
NSAS cooperated with Willoughby City Council to support such a Star Party at Bicentennial Park, Willoughby, on the 4th of April. This was supported by the Heritage Council of Australia, but was also a registered event of IYA2009 and one of the only IYA2009 Star Parties in Sydney during the 24-hour Global Star Party.
NSAS enlisted the aid of a number of our members with telescopes and lectures were also presented to the public in the hope that we may attract new members. While the observing was clouded out (again!) the public did turn up in smaller but enthusiastic numbers and enjoyed the program.
Despite the unfavorable weather, Willoughby Council was pleased with the result and they have already suggested we try and do the program again during their Spring Festival in September.

Australia, as one of the cornerstone countries in IYA2009 and also as a strong supporter of astronomy and astrophysics, has been reasonably active in developing a program for IYA2009.
Looking at the Australian node, www.astronomy2009.org.au, it appears there has been a lot support from amateur astronomical societies throughout the country. I recommend you look at the event calendars of both the IYA2009 and the Australian node, and take advantage of the many events that are to take place over the year.

[Article provided by Bob Fueller]

Please go to page 8 for a selection of pictures taken at the Willoughby Star Party

Two Galaxies for a Unique Event

To celebrate the 100 Hours of Astronomy, ESO is sharing two stunning images of unusual galaxies, both belonging to the Sculptor group of galaxies. The images, obtained at two of ESO's observatories at La Silla and Paranal in Chile, illustrate the beauty of astronomy.

As part of the International Year of Astronomy 2009 Cornerstone project, 100 Hours of Astronomy, the ambitious "Around the World in 80 Telescopes" event is a unique live webcast over 24 hours, following night and day around the globe to some of the most advanced observatories on and off the planet. To provide a long-lasting memory of this amazing world tour, observatories worldwide are revealing wonderful, and previously unseen, astronomical images. For its part, ESO is releasing outstanding pictures of two galaxies, observed with telescopes at the La Silla and Paranal observatories.

The first of these depicts the irregular galaxy NGC 55, a member of the prominent Sculptor group of galaxies in the southern constellation of Sculptor. The galaxy is about 70 000 light-years across, that is, a little bit smaller than our own Milky Way. NGC 55 actually resembles more our galactic neighbour, the Large Magellanic Cloud (LMC), although the LMC is seen face-on, whilst NGC 55 is edge-on.

By studying about 20 planetary nebulae in this image, a team of astronomers found that NGC 55 is located about 7.5 million light-years away. They also found that the galaxy might be forming a bound pair with the gorgeous spiral galaxy NGC 300.
This image, obtained with the Wide Field Imager on

the 2.2-metre MPG/ESO telescope at La Silla, is dusted with a flurry of reddish nebulae, created by young, hot massive stars. Some of the more extended ones are not unlike those seen in the LMC, such as the Tarantula Nebula. The quality of the image is clearly demonstrated by the remarkable number of background galaxies seen, as well as the huge numbers of individual stars that can be counted within NGC 55.

The second image shows another galaxy belonging to the Sculptor group. This is NGC 7793, which has a chaotic spiral structure, unlike the class of grand-design spiral galaxies to which our Milky Way belongs.
The image shows how difficult it is to identify any particular spiral arm in these chaotic structures, although it is possible to guess at a general rotating pattern. NGC 7793 is located slightly further away than NGC 55, about 12.5 million light-years from us, and is about half the size of NGC 55.

NGC 7793 was observed with one of the workhorses of the ESO Paranal Observatory, the FORS instrument, attached to the Very Large Telescope.

Notes

ESO, the European Southern Observatory, is the foremost intergovernmental astronomy organisation in Europe and is supported by 14 countries.
ESO operates three world-class observing sites in the Atacama Desert region of Chile: La Silla, Paranal and Chajnantor.

This press release and the high-resolution images can ve downlodead from ESO's web site: http://www.eso.org/public/outreach/press-rel/pr-2009/pr-14-09.html

Elusive Binary Black Hole System Detected

Finding a needle in a haystack might be easy compared to finding two very similar black holes closely orbiting each other in a distant galaxy.

Astronomers from the National Optical Astronomy Observatory (NOAO) in Tucson have found what looks like two massive black holes orbiting each other in the center of one galaxy. It has been postulated that twin black holes might exist, but it took an innovative, systematic search to find such a rare pair.

The newly identified black holes appear to be separated by only 1/10 of a parsec—a tenth of the distance from Earth to the nearest star. This discovery of the most plausible binary black hole candidate ever found may lead to a greater understanding of how massive black holes form and evolve at the center of galaxies.

After a galaxy forms it is likely that a massive black hole can also form at its center. Since many galaxies are found in cluster of galaxies, individual galaxies can collide with each other as they orbit in the cluster. The mystery is what happens to these central black holes when galaxies collide and ultimately merge together. Theory predicts that they will orbit each other and eventually merge into an even larger black hole.

The signature of a black hole in a galaxy has been known for many years. The material falling into a black hole emits light in narrow wavelength regions forming emission lines that can be seen when the light is dispersed into a spectrum. These emission lines carry the information about the speed and direction of the black hole and the material falling into it. If two black holes are present, they would orbit each other before merging and would have a characteristic dual signature in their emission lines. This signature has now been found.

Todd Boroson and Tod Lauer used data from the Sloan Digital Sky Survey, a 2.5-meter diameter telescope at Apache Point in southern New Mexico to look for this characteristic dual black hole signature among 17,500 quasars discovered by the survey. More than 100,000 quasars are known, with most being found in the Sloan Digital Sky Survey and at distances that are billions of light-years away.

Quasars are the most luminous versions of the general class of objects known as active galaxies, which can be a hundred times brighter than our Milky Way galaxy, and powered by the accretion of material into supermassive black holes in their nuclei. The matter falling into the black hole doesn't go directly in, but orbits around the black hole forming a flat accretion disc, much like the soap scum on water orbiting around an open drain.

It has long been thought that all large galaxies must have a massive black hole in their center and that some galaxies must have two or more black holes, at least until the black holes merge. The black holes would be so close together that it would be nearly impossible to see them or their accretion disks separately. However, the light emitted from the accretion disks, and the galaxy containing the black hole, ought to be identifiable.

Boroson and Lauer had to be especially careful to eliminate the possibility that they were seeing two galaxies, each with its own black hole, superimposed on each other. To try to eliminate this superposition possibility, they determined that the quasars were at the same red-shift determined distance and that there was a signature of only one host galaxy.

If the two quasars were independent objects at different distances, the spectral signature of both host galaxies should have been seen and each would have different red shift and thus different distance, even though they would be in the same line of sight. Determining the spectral signature was critical as it would be impossible to see the host galaxies directly against the glare of the quasar.

"The double set of broad emission lines is pretty conclusive evidence of two black holes," Boroson argues. "If in fact this were a chance superposition, one of the objects must be quite peculiar. One nice thing about this binary black hole system is that we predict that we will see observable velocity changes within a few years at most. We can test our explanation that the binary black hole system is embedded in a galaxy that is itself the result of a merger of two smaller galaxies, each of which contained one of the two black holes." The smaller black hole has a mass 20 million times that of the sun; the larger one is 50 times bigger, as determined by the their orbital velocities.

Nature Paper Authors:
Dr. Todd Boroson & Dr. Tod Lauer
National Optical Astronomy Observatory

Artist's impression of the binary supermassive black hole system. Each black hole is surrounded by a disk of material gradually spiraling into its grasp, releasing radiation from x-rays to radio waves. The two black holes complete an orbit around their center of mass every 100 years, traveling with a relative velocity of 6000 kilometers per second.

Credit: p. Marenfeld and NOAO/AURA/NSF

Roman Contribution to Space-Age Design

The US standard railroad gauge (distance between the rails) is 4 feet, 8.5 inches.

Now, that's an exceedingly odd specification isn't it ?

Q: Why was that gauge used in the States?

A: Because that's the way they built them in England, and English ex-pats built the early US Railroads.

Q: Why did the English build their own like that?

A: Because the first rail lines were built by the same people who built the pre-railroad tramways, and that's the gauge they used.

Q: Why did "they" use that gauge then?

A: Because the people who built the tramways used the same jigs and tools that they used for building wagons, which used that wheel spacing.

Q: Okay! Why did the wagons have that rather odd wheel spacing?

A: Well, if they tried to use any other spacing, the wagon wheels would break on some of the old, long distance roads in England, because that's the spacing of the wheel ruts.

Q: So who built those roads, so rutted over the years?

A: Imperial Rome built the first long distance roads in Europe (and England) for their legions. The roads have been used ever since.

Q: And the ruts in the roads?

A: Roman war chariots formed the initial ruts, which everyone else had to match for fear of destroying their wagon wheels. Since the chariots were made for Imperial Rome, they were all alike in the matter of wheel spacing.

The United States standard railroad gauge of 4 feet, 8.5 inches is derived from the original specifications for an Imperial Roman war chariot. And bureaucracies live forever.

So if you are ever confronted by a railroad specification, and wonder what horse's ass came up with it, you may be exactly right, because the Imperial Roman army chariots were made just wide enough to accommodate the back ends of two war horses !!

Now, the twist to the story:

When you see a Space Shuttle sitting on its launch pad, you cannot avoid noticing two big booster rockets attached to the sides of the main fuel tank. These are solid rocket boosters, or SRBs. The SRBs are made by Thiokol at their Utah factory. The engineers who designed the SRBs would have preferred to make them a bit fatter, but the SRBs had to be shipped by train from the factory to the launch site.

The railroad line from the factory happens to run through a tunnel in the mountains and the SRBs had to fit through that tunnel. The tunnel is slightly wider than the railroad track, and the railroad track, as you now know, is about as wide as two horses' behinds. So, a major Space Shuttle design feature of what is arguably the world's most advanced transportation system was determined over two thousand years ago by the width of a horse's ass.

And you thought being a HORSE'S ASS wasn't important ?

[Forwarded by Bob Roeth]

Asteroid's near miss

An asteroid about the size of the one that leveled more than 2,150 square kilometres of forest in Siberia a century ago just buzzed the Earth.

The asteroid named 2009 DD45 was at an altitude of about 63,000 km from Earth when it zipped past on Monday March 2, NASA's Jet Propulsion Laboratory reported.

That is just twice as high as the orbits of some telecommunications satellites and about a fifth of the distance to the Moon.

"This was pretty darn close," according to Timothy Spahr of the Harvard-Smithsonian Center for Astrophysics.

The space rock measured between 20 and 45 m in diameter. The Planetary Society said that made it about the same size as the asteroid that exploded over Siberia in 1908.

Scientists at the Siding Spring Observatory in Australia spotted 2009 DD45 and began tracking it in late February when it was about 1 million miles away.

Spahr said he knew within an hour of that discovery that it would pose no threat to Earth.

Of the known space rocks, the next time an object will get closer to Earth will be in 2029 when an 350-m asteroid called 99942 Apophis comes within 33,000 km, said Donald Yeomans of NASA's Near-Earth Object Program at the Jet Propulsion Laboratory in Pasadena.

Last year, the asteroid 2008 TC3 harmlessly burned up in Earth's atmosphere over Africa 19 hours after it was discovered. Astronomers gave a six-hour notice warning of that fiery plunge.

Sydney Observatory - A brief history

On January 15, 2008, the Manager of Sydney Observatory, Mr. Geoff Wyatt, presented a lecture to the members of N.S.A.S. on the value of Sydney Observatory.

Location

At 45 metres above sea level, Sydney Observatory is located on a hill now known as "Observatory Hill" in The Rocks area.

The site evolved from a fort built on "Windmill Hill" in the early 19th century to an astronomical observatory during the 19th century.

It is now a working museum where evening visitors can observe the stars and planets through a modern 40 cm Schmidt-Cassegrain telescope and a historic 29 cm refractor telescope built in 1874, the oldest telescope in Australia in regular use.

Its coordinates are -33.859574, 151.204576, i.e. 33°52'00"S, 151°12'16.5"E.

Early Use Of The Site

In 1796, early on during the European settlement of New South Wales, Australia, a windmill was built on the hill above the first settlement.

Within ten years the windmill had deteriorated to the point of being useless; the canvas sails were stolen, a storm damaged the machinery, and already by 1800 the foundations were giving way. The name of Millers Point remembers this early land use.

In 1803, Fort Phillip was built on the site under the direction of Governor Hunter to defend the new settlement against a possible attack by the French and also from rebellious convicts.

The fort was never required to be used for any such purposes. In 1825 the eastern wall of the fort was converted to a signal station. Flags were used to send messages to ships in the harbour and to the signal station on the South Head of the harbour.

Observatory

An early observatory was established in 1788 at Flagstaff Hill on Dawes Point, at the foot of Observatory Hill, in an ultimately unsuccessful attempt to observe the return of Halley's Comet in 1790. A second observatory was established at Parramatta in 1821 by Governor Sir Thomas Brisbane.

In 1848, a new signal station was built by the Colonial Architect from 1835 to 1849, Mortimer Lewis, replacing part of the fort buildings on Windmill Hill. At the instigation of the Governor, Sir William Denison, it was soon agreed to expand the tower to a full observatory.

The first Government astronomer, William Scott, was appointed in 1856, and work on the new observatory was completed in 1858.

The first role of the observatory was as a time-ball tower, built near the signal station. Every day at exactly 1 pm, the time-ball on top of the tower would drop to signal the correct time to the city and harbour below. At the same time, a cannon on Fort
Denison was fired.

The first time-ball was dropped at noon on June 5, 1858 but the drop was rescheduled to one o'clock soon after.

The time-ball is still dropped daily at 1 pm but with the aid of an electric motor and a recording of a cannon fire is also symbolically played.

The Observatory is a group of sandstone buildings in the italian style. There are two domed observatories on octagonal bases and a four storey tower about 15m high which was used for the time-ball. The tower is 60.5m above sea level. The 1858 buildings designed by the Colonial Architect from 1856 to 1862, Alexander Dawson, comprised a domed chamber to house the equatorial telescope, a room with long, narrow windows for the transit telescope, an office for calculation, and a residence for the astronomer.

A western wing was added in 1877 with office and library space and a second domed chamber for more telescopes.

Some of the first astronomical photographs were taken at the observatory, under the direction of Henry Chamberlain Russell. The Observatory also took part in the compilation of the first atlas of the whole sky, The Astrographic Catalogue. The part completed at Sydney took over 70 years, from 1899 to 1971, and filled 53 volumes.

Although, from the federation of Australia in 1901, meteorology became a function for the Commonwealth Government, the observatory continued to contribute observations to The Astrographic Catalogue, kept time and provided information to the public. For example, each day the Observatory supplied Sydney newspapers with the rising and setting times of the sun, moon and planets.
A proposal to close the observatory in 1926 was narrowly avoided when Premier Jack Lang sacked the Government Astronomer, W.E.Cooke because he requested £70,000 to upgrade the observatory's equipment.
However, by the mid 1970s the increasing problems of air pollution and city light made work at the observatory more and more difficult. In 1982, Sydney Observatory was converted into a museum of astronomy and related fields, becoming a part of the Powerhouse Museum.

[Article provided by Arthur Boyd
Photographs by Charles Kerry Studio,
Tyrrell Collection, Powerhouse Museum, Sydney]

Don't miss our next issue where Arthur will be exploring the history of Fort Denison.

Has the nearest galaxy just been identified?

Nature sometimes plays tricks to scientists.
A team of astronomers headed by Eva Noyola and Karl Gebhart has just identified our nearest galaxy, a gathering of more than a million stars at just 17,000 light-years from Earth!

A very close neighbour considering that the Large Magellanic Cloud, the biggest satellite galaxy of the Milky Way is 10 times farther, and a remarkable discovery indeed considering that Omega Centauri, that's its name, was already known to the ancient Greeks…
How come that astronomers who have been looking for galaxies for decades have missed the brightest and nearest one?

For more than twenty centuries, Omega Centauri has successively been classified as a star by the Greeks, as a nebula by Edmond Halley and finally as a globular cluster by John Herschel.
As a cluster, it was well out of the ordinary in view of its size and its number of stars, but a mere cluster altogether, not a galaxy.

The difference is important: clusters are simple structures created by the collapsing of a massive cloud of gas. They are therefore made of stars born at the same time in the same place. Galaxies, on the other hand, are complex structures born from the interaction and coalescence of stars and clouds from various origins.

So, it was not by chance that Eva Noyola, Karl Gebhart and their team have targeted Omega Centauri. Intrigued by its extreme size (more than 200LY), mass (10 times the mass of other big globular clusters), rotation speed and flattened shape they suspected it might not be a globular cluster after all but the remnant of a dwarf galaxy.

Their proposition could only be confirmed by the discovery of a black hole at its centre.
Invisible by definition, this hypothetical black hole had proved so far to be elusive; so Noyola and Gebhart went all out. Firstly, they used the Hubble Space Telescope to precisely map the heart of Omega Centauri. Then, they systematically studied all its central stars with the Gemini Multi-Object Spectrograph (GMOS) that allows the analysis of 700 stars at a time.

The plan was to observe the motion and brightness of the central stars in order to calculate the mass of the cluster. Good guess: the velocities of the stars were enormous, far higher than expected from the estimated mass of the visible stars.

Continued overleaf

Continued from page 7

And this could only be explained by the existence of something considerably massive at the centre of the cluster and something… invisible.

The calculations showed that it had to be 40,000 solar masses. And the most likely object would be an intermediate-mass black hole.

This discovery is crucial for 2 reasons. Firstly it confirms the galactic nature of Omega Centauri. Nothing can explain the presence of such a mass at the heart of a plain star cluster.

And secondly this intermediate-mass black hole may be the missing link between lightweight stellar black holes and super massive galactic black holes.

"We may be on the verge of uncovering one possible mechanism for the formation of super-massive black holes. Intermediate-mass black holes like this could be the seeds of full-sized super-massive black holes."

Noyola explains: "Omega Centauri has crisscrossed our own galaxy many times. Each time it has lost a number of its own stars, snatched up by the Milky Way. And so, the gradual loss of a large amount of its mass had prevented its black hole to reach maturity."

Which explains its intermediate mass.

Considering that Omega Centauri needs approximately 100 millions years to circle the Milky Way it must have collided with it more than a 100 times.

"To-day, Omega Centauri contains approximately 2.5 million solar masses. Each time it has crossed it, our galaxy must have trapped some of its peripheral stars that were loosely bound by a weaker gravitation. Initially Omega Centauri ought to have been roughly 10 million solar masses." explains Gebhart

But the study of Omega Centauri does not stop there. Noyola and Gebhart have already booked time on ESO's Very Large Telescope to conduct follow-up observations

[Article provided by Jean-Luc Gaubicher
Source: NASA/ESA press release April 2008]

Selection of pictures taken at the Willoughby Star Party on April 4, 2009

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