

Reflections

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President's Message

Welcome all to NSAS 2013 and, hopefully you have survived both the Mayan Extinction Gala Event and the hottest day the country has experienced. By my reckoning, Tuesday 8 January 2013 was significantly more difficult to survive than 21 December 2012.

As most will be aware, I was elected President of our Society at the October AGM, and I look forward to an interesting and challenging twelve months.

The AGM saw a number of significant changes to the Committee make-up, including the stepping down of Bob Fuller as President after a period of some five years, including several years as Vice President.

Peter Nosworthy stepped down as Secretary when he departed for the mountains and his replacement, John Blanch, has other demands on his time and did not stand again. John retains his position, however, as Esteemed Barbequer-in-Chief.

Gordon Ogborne as Vice President, Ken Schoefield as Treasurer and Irene Justiniano as Secretary make up the office bearers, with Chris Anderson, Peter Korber and Anna Koeneman as Committee Members Without Portfolio (but who will have lots to do, I guarantee!)

On behalf of the Society I again express our thanks to the outgoing group, especially to Bob during his (at times) difficult period, and I look forward to working with the new Committee over the year.

I will in a moment outline a few of the matters we will be pursuing for the year, but as a very new Committee, we need to acquire a higher level of understanding in quite a few operational areas before we will be fully functional. Please bear with us if there are, for a time, a few areas where things don't travel as smoothly as they have in the past – we're working on it.

I joined the Society in its early days, when we met at the Christie Park premises near Macquarie Uni, before moving to Riverview.

I later had a rather long absence, due mainly to other activities and only became active again a year or so ago.

We are now a much more ordered and involved organisation, with the Internet playing a very prominent role and allowing many activities to be undertaken to a far higher level than was possible previously. It was former member Graham Davies in fact who introduced many of us to this "internet" thing soon after our move to the College. Imagine it now – no internet!

But that leads me to an observation: I do have some concern that whereas there is ease of communication, there are also now, as a consequence, many more tasks and activities on our agenda. Therefore we need to take note of the number of active or participating members we have and ensure we are not spread too thinly.

Too often the burden can fall on the same people. So I would like to ensure we are well balanced in our activities and our ability to perform them.

And that means we need to have a pretty good understanding of what our collective experience and abilities actually are, so we may need to spend some time on upgrading our database of information.

We also intend to develop a more defined view on what we are or should be all about – a "mission statement" – and this would also be driven by members' needs and desires. We just need to know what those needs and desires are, so we can best provide the service our members would like.

Further, we need to continually attract new blood. We seem to have the same number of overall members that we have "always" had, 70 odd, but we lose as many as we gain. So we need to improve our performance with respect to our guests and new members to ensure we improve our retention rate. Maybe our new members can offer a few thoughts?

None of the above points is new, but it's probably about time we did something

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about them and the Committee, in the first instance, will work on it.

Over the last twelve months or so there has been strong field trip activity (Parkes, Coonabarrabran, Tidbinbilla / Mt Stromlo), all of which were most successful, if a little cold on occasion (unlike at Coona / Siding Spring during the fires, where the recorded temperature apparently went to 100°C).

The subgroups have all gone well and we are looking to re-start the New Astronomers Group in February or March.

The Theory Group concept is being given a fresh look, to revitalise and add variety and broader interest.

Observations and Outreach remain strong, though Outreach can be demanding on members.

Visits to Linden and gaining a degree of access to the Macquarie Uni Observatory remain on the agenda, as does a possible relocation of our meeting room from Regis Hall to an adjacent classroom – Regis is great, but will be more suitable when 70 members are turning up for our meetings and the AV equipment can be used to its full.

Finally, we are going to have quite a bit on during the year, so please put your hand up to help where you can.

We have a great little club on our hands, and between all of us we can ensure it stays that way.

See you soon.

Bruce Retallick

Calendar

General Meetings:	February 19 th March 19 th	Speaker: Gayandhi de Silva (AAO) on Galactic Archeology and HERMES Speaker: TBA
Theory Group Meetings:	February 12 th March 12 th	
NAG Meetings:	TBA	
Observing Nights:	Consult NSAS' web site at http://nsas.org.au/observing/	
Deadline:	Please send your contributions to the July issue of Reflections in time to reach the editor before March 15th to nsas.editor@ozemail.com.au	

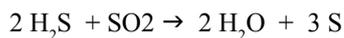
If You Have Heard Of Sulphur And Treacle

Several generations of Australian Skids had a regular Saturday morning meeting with a desert spoonful of treacle or molasses mixed with 'flowers of sulphur', the yellow form of the element.

Exact repetitions of those meetings are now much less likely especially since the international spelling in English, "SULFUR", has overtaken, officially at least, the original English spelling.

Though your own proteins are well supplied with sulfur compounds and much of the foods we eat and some of the medications we take are composed in part of sulfur, you can be asphyxiated by three of the simplest of the compounds of sulfur: hydrogen sulfide (rotten egg gas), sulfur dioxide and the volatile carbon disulfide.

The first two are belched out by many terrestrial volcanoes so much so that active craters are not necessarily safe areas without suitable respirators. Strangely, if the rocks around the crater were heavily coated by yellow material, you could be a little safer because these two gases react immediately in the atmosphere to produce water vapour and sulfur vapour according to the chemical equation:



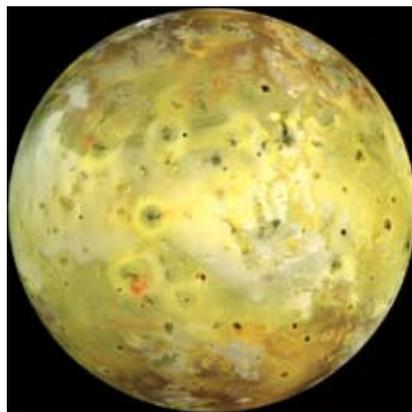
The surrounding rocks are usually cooler than the boiling point of sulfur at local atmospheric pressure, 445°C so the sulfur condenses on the rocks in its yellow form

and builds up into thick layers that can easily be harvested.

On the surface of things, this method of producing yellow elemental sulfur around Earth's volcanoes seems very different from the sulfur produced by the volcanoes on Jupiter's moon Io.

In the latter case, each of the many vents emits fountains of hot sulfur vapour. Two puzzles emerge: what is the source of the sulfur and what is the source of the heat energy?

It has long been accepted that non-stop gravitational strains and associated deformations of the small moon by the enormous parent planet could be a source of heat more than sufficient to melt and vapourise any free sulfur or sulfur released



Picture of Io taken by NASA's Galileo spacecraft showing a distinct yellow hue associated with sulfur deposits.

Image credit: NASA/JPL/University of Arizona

<http://photojournal.jpl.nasa.gov/catalog/PIA02308>

from heated rocks fairly close to the surface of Io.

If both hydrogen sulfide and sulfur dioxide are produced below the surface in the hot mix of rock and if the temperature and pressure conditions allow it, the sulfur could be strongly expelled along with water vapour.

Sulfur exists in a few different forms of which yellow is best known to us but the molten state is a reddish brown. Io presents a mottled appearance of pale orange and dark brown.

Many terrestrial rocks contain minerals that are partly composed of sulfides and sulfates and, as sulfur rates highly in the list of common elements, we can therefore expect Io to be composed partly of sulfur.

An American professor, Robert W. Wood (1868 – 1955), gained fame in many areas but one of them involved ultra-violet photography in the solar system.

In 1911, he discovered that the yellow rim of the large lunar crater Aristarchus was actually coated with sulfur. Remembering that impact energy is largely transformed into heat and that this particular crater subsequently filled with molten anorthosite, we can consider that the sulfur may have been produced from sulfurous gases released by a molten mix of meteoritic material and local lunar regolith.

Bob Roeth

Six New Exocomets Discovered

Comets trailing wispy tails across the night sky are a beautiful by-product of our solar system's formation, icy leftovers from 4.6 billion years ago when the planets coalesced from rocky rubble.

The discovery by astronomers at the University of California, Berkeley, and Clarion University in Pennsylvania of six likely comets around distant stars suggests that comets, dubbed "exocomets", are just as common in other stellar systems with planets.

Though only one of the 10 stars now thought to harbor comets is known to harbor planets, the fact that all these stars have massive surrounding disks of gas and dust, a signature of exoplanets, makes it highly likely they all do, said Barry Welsh, a research astronomer at UC Berkeley's Space Sciences Laboratory.

"This is sort of the missing link in current planetary formation studies," Welsh said. "We see dust disks, presumably the primordial planet-forming material, around a whole load of stars and we see planets but we don't see much of the stuff in between: the asteroid-like planetesimals and the comets. Now, I think we have nailed it. These exocomets are more common and easier to detect than people previously thought."

Three of the new exocomets were reported in the October 2012 issue of the journal *Publications of the Astronomical Society of the Pacific* by Welsh and colleague Sharon L. Montgomery of the Department of Physics at Clarion University.

Welsh summarized the current theory of planet formation as "interstellar dust under the influence of gravity becomes blobs, and the blobs grow into rocks, the rocks coalesce and become bigger things, planetesimals and comets, and finally you get planets.

Many stars are known to be surrounded by disks of gas and dust, and one of the closest, beta-Pictoris (β -Pic), was reported to have comets in 1987.

In 2009, astronomers found a large planet around β -Pic, about 10 times larger than Jupiter. Three other stars, one discovered by Welsh in 1998, were subsequently found to have comets.

"But then, people just lost interest. They decided that exocomets were a done deal, and everybody switched to the more exciting thing, exoplanets," Welsh said. "But I came back to it last year and thought, 'Four exocomets is not all that many compared to the couple of thousand exoplanets known – perhaps I can improve on that.'"

Detecting comets may sound difficult after all, the snowballs are typically only 5-20 kilometers (3-13 miles) in diameter. But Welsh said that once comets are knocked out of their parking orbit in the outer reaches of a stellar system and fall toward a star, they heat up and evaporate.

The evaporating comet, which is what we see with comets

such as Halley and this year's highly anticipated Comet ISON, creates a brief, telltale absorption line in the spectrum of a star.

The six new exocomets were discovered during three five-night-long observing runs between May 2010 and November 2012 using the 2.1-meter telescope of the McDonald Observatory in Texas.

The telescope's high resolution spectrograph revealed weak absorption features that were found to vary from night to night, an outcome that Welsh and Montgomery attributed to large clouds of gas emanating from the nuclei of comets as they neared their central stars.

All of the newly discovered exocomets, 49 Ceti (HD 9672), 5 Vulpeculae (HD 182919), 2 Andromedae, HD 21620, HD 42111 and HD 110411, are around very young type A stars, which are about 5 million years old, because Welsh's detection technique works best with them.

With a higher resolution spectrograph, he might be able to detect comets around the older and yellower G and F stars around which most exoplanets have been found. Nevertheless, all evidence suggests that these dusty A stars should have planets, and planets are the only thing that could knock a comet out of its orbit and make it fall toward its star.

"If it quacks, waddles and has feathers, then it's probably a duck," he said.

Robert Sanders

UC Berkeley Press Release

<http://newscenter.berkeley.edu/2013/01/07/exocomets-may-be-as-common-as-exoplanets/>



Artistic depiction of dust and comets around the young star Beta Pictoris as seen from the outer edge of its disk.

NASA image by Lynette Cook.



The Binocular and Telescope Shop
84 Wentworth Park Road
Glebe NSW 2037
Phone: (02) 9518 7255
www.bintelshop.com.au

Right Time, Wrong Place...

Some members of our Society made their way to Far North Queensland in preparation for the November 14th eclipse.

Jeff and Julie Byron, Colin Fenning and myself and wife Jacqueline had joined the SASI tour; Peter and Yuko Nosworthy went independently and so did Anna Koeneman.

As for Paul Shallow, he had booked onboard a cruise ship and you can read his extensive own report on page 6.

The 77-strong SASI group flew in on Sunday 11th and settled down in Trinity Beach, 20 km North of Cairns.

Though the weather forecast was already ominous most of us were up early on Monday and Tuesday mornings to scout the place for the best spots for their equipment.

I won't tell you about the Monday cruise to the Barrier Reef (bumpy) or the trip to the Atherton tablelands (wet and windy); but will go straight away to Wednesday morning.

5am, a quick look outside reveals the crowd starting to gather on the beach and a sun rising behind scattered clouds: everybody is still hoping for the best; a lucky break is yet a possibility and as time goes by we can get short glimpses of the eclipse progresses.

But, alas, a thick dark band of clouds that all of us wished would go away or at least stay where it was closes in and... totality is lost to us.

Maddening, even more so when we get reports that people less than one kilometre left or right have been able to see it at least for a few seconds!

And, as you would expect it, 10 minutes later, breaks in the clouds started to develop, which allowed us to follow the end of the eclipse.



So no Bealleys' beads, no diamond ring, no shadow bands, no rushing shadow for us. All we could observe was a definite darkening during totality. Actually, it was more like twilight than dark night but that was enough for the street lamps to switch on and for Saturn to be visible in a small patch of clear sky.

Disappointed, you bet we were as, for Jacqueline and me, it was our first ever total eclipse but, as they say, we did what we could and the rest was a matter of luck.

Ah well, next time! Maybe this year in Africa (03/11/13) or in a latter year...

Jean-Luc Gaubicher

The Diamond Ring as seen from Ellis Beach.

Trinity Beach is to the right, under the band of clouds...

Picture courtesy Alex Cherney (www.terraastro.com)



The SASI group

Picture courtesy Jimmy Liu (www.cbtholidays.com.au)

How NOT to Survive a Killer Comet

Every amateur astronomer dreams about discovering their own comet but what do you do when your dream turns into a nightmare when your comet is found to be on a collision course with earth?

One thing you should not do is to go down to your local video store and hire a DVD on how Hollywood thinks you survive a comet impact. There are several such DVDs (such

as Deep Impact and Armageddon) that you should be ignoring.

The standard Hollywood approach is to send a group of astronauts (or rough necks) to the comet (or asteroid) and “nuke” it. Pity we don’t have any rocket big enough to do this.

The majority of rockets we have (such as Intercontinental Ballistic Missiles) don’t have the power to reach Earth orbit, let alone deep space.

Also, the scientific opinion is that deflecting the comet is a much better but less dramatic option. Breaking the comet into smaller pieces does no change the energy that it will deliver when it strikes the earth.

If anything, the area “impacted” by the comet pieces would be larger than if the comet impacted whole.

If destroying the comet failed, the standard Hollywood backup plan is to build an underground shelter for key personnel to rebuild our civilisation. These people invariably include scientists, politicians, the army and selected Hollywood directors.

Convincing the general population to build such shelters for the rich and powerful will be difficult when they know they have no chance of being included.

Also, these types of people are the exact opposite of who you would need survive such an event and repopulate the world. A better choice would be builders, farmers, mechanics (of the female variety) with plenty of amateur astronomers thrown in.

David Wallace



Artist impression of an impact event

Image Credit: NASA

2012 - Gone But Not Forgettable

The anonymity of the internet allows all sorts of claims to be made there. A friend sends to me anything that looks to him like an interesting mathematical statement. One ‘recently found’ is about the year 2012 and it apparently appeared only a few months ago. It involves the current calendar.

The story goes like this:

“In the coming December, we will have five Saturdays, five Sundays and five Mondays and this will not happen again for 824 years.”

Initially suspicious of the number 824, I remembered that the change from the Julian Calendar to the Gregorian Calendar made the Gregorian 400 year cycle an integer number of weeks and no days.

The Julian Calendar had leap days added every fourth year so the cycle was $(400 \times 365 + 100)$ days which is 20871 weeks plus three days.

The Gregorian scheme omitted leap days from centurial years that are not divisible by 400. For example, the year 2000 was a leap year but 1900, 1800 and 1700 would not have leap days added.

As soon as the number of weeks was made an integer, the 400 year cycles repeated exactly the full set of day names and dates. This guarantees that if December of 2012 was to have five each of Saturdays, Sundays and Mondays, then there would be a repeat

in 400 years and another in 400 years etc. This argument only puts a lower limit on the number of times the event repeats but that is enough to brand the original story false.

If you have taken down your 2012 calendars but not yet thrown them away, look at February with 29 days, then at months with 30 days and finally at months with 31 days. You should be able to anticipate the situation for 2013’s February with only 28 days.

You should have found plenty of cases of months with three sets of five days alike but only in one case, December, will the three days be Saturdays, Sundays and Mondays.

You will probably not have enough old calendars to check back 400 years to see whether that event only occurs once in 400 years. However, a Perpetual Calendar will do the job very quickly. Such a calendar has every possible combination listed and there are not 400 in the list but 14 since there are 7 day names for 01 January and there are two types of year, leap and clear. Most perpetual calendars come with a table showing which of the 14 you should consult for your year of interest.

Notwithstanding the material above, I think that 2012 was a great year.

Who was unaware that a rare transit of the Sun by Venus was on the menu?

Perhaps many were not aware that the black spot was bigger than in 2004 because Venus was closer to the Earth this time. Also, who was unaware that Australia would have another total eclipse with a totality phase about 2 minutes longer than that of our previous one in 2002?

I admit to not knowing the term ‘super moon’ when the year began but now I know the correct astronomical name for it, perigee syzygy, and that the previous rival to our view in May was 18 and a bit years previous. The term for such a separation is a saros.

The 2012 event on the evening of May 6th was followed a lunation later by a partial lunar eclipse on June 4th which tells us that for the super moon, the Moon was very close to the ecliptic. The combination of full moon at perigee and very near the ecliptic certainly made the Moon’s appearance spectacular.

The new year has some promise with an annular solar eclipse crossing near Tennant Creek and also a couple of bright comets

Bob Roeth.

Paul's Corner

On general, beaches near and North of Cairns were very crowded by spectators from before dawn but seeing was very cloudy and disappointing for these gathered crowds. However, Holloway Beach, which was my original choice for observing this eclipse, reported some success.

Meanwhile some more intrepid travelers were reported to have landed at Undine Cay, over 30km out to sea in the Pacific Ocean, near the Northern line of totality, to avoid the clouded out shore line.

On approach some concerns were shared at the size of the observing point: one could not determine its actual location, hidden in the waves ahead of us. Not an island, not a tree in sight, even not a bush, maybe just a seagull soaring around.



The Author holding the Sun

We had been advised that it would be a wet landing and in fact it was just that as we stepped off the glass bottom boat that acted as our ship-to-shore transport: water and sand in our shoes and soaking wet trousers could not be avoided.



The Author: beaming despite wrecked shoes, soaked trousers and sand in the pants



*The crowd on Undine Cay Front...
...and Back*



A stiff cool wind was blowing the sand around, which made use of a tripod somewhat too difficult.

The first good omen was a gap leading upwards from the eastern horizon followed by the bright golden orange sun sitting in a break between the clouds. Some wide-angle shots reveal a lovely panorama of color and with the lens zooming directly into the Sunshine gave us – without a Sun Filter – a very pleasing result of the Sun at 20x

optical zoom with spotted highlights of cloud tips, a silver lining, to forget those wet and sandy legs,

The Sun was still too dull to need the filter in place, but it rapidly gained strength as it rose higher up but a bit of a worry as there was some high cirrus clouds higher up that could block the fine details of totality but, at least, we could see the Sun with no big blocks of solid clouds in the way.

The Eclipse in progress



Undine Cay or what's left of it after our departure

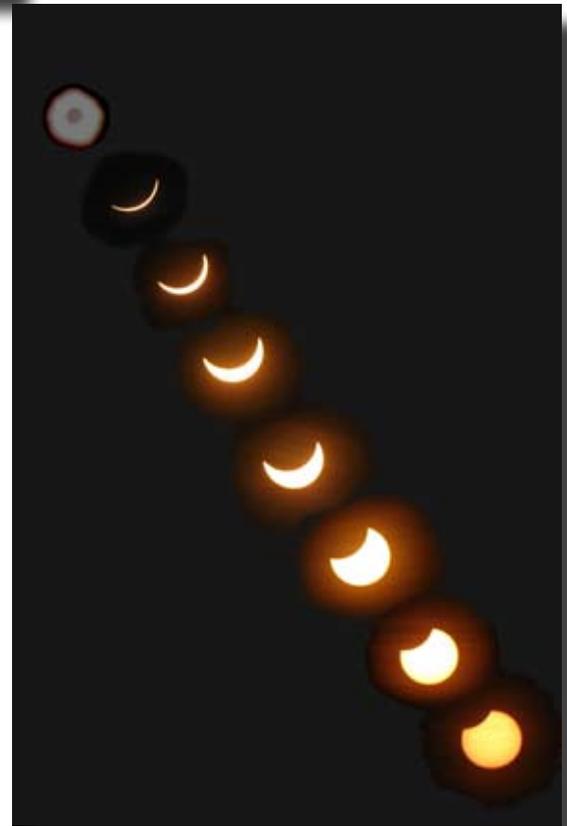
Later, some larger clouds started to wander our way and in doing so we noticed odd-looking Sunrays streaming in all directions.

The birds sighted have only been of the gull type and hat are usually a bit silent when at sea,

but maybe a hush had started to be noticed?

Or maybe it was just the silent group of Observers, overcome by the early morning or the anticipation of events to come, maybe even some silent prayers to the Rain Gods to be good to us for our extra efforts to observe one of nature's wonders.

Continued next page



High cirrus clouds are still present and I'll later blame them for smudging the total eclipse into a solid ring of light around the Sun,

Lying on the sand to keep out of the wind made it difficult to take images but was great to get some silhouetted images of the expectant crowd against the brightening Sun.

To shoot the partial stages I used a 1000 Oakes full glass filter hand held in front of my Canon Powershot SX10IS with 20 x optical Zoom camera; note that I didn't use a telescope or tripod.

Now then, watch out for that rising tide carefully: what would you expect of a king tide associated with the alignment of the Sun, Moon and Earth?

My shoes are wrecked, my trousers soaked wet and I have sand in my pants so lets just go and get back for a cuppa tea. And then think about diving at Lizard Island.

Now, to 2013, we have some potentially remarkable sights to look forward to, with the prospects of two bright comets in 2013:

- Comet C/2011 L4 (PANSTARRS), discovered in June 2011, will swing through the inner solar system in March 2013 and promises to be a visual treat, brightening to 1st magnitude.
- Sungrazing comet C/2012 S1 (ISON) may appear brighter than full Moon as it passes Earth in November/December.

Some have already dubbed it the "comet

of the century, a dazzling astronomical display". And, as astronomer David Whitehouse wrote in *The Independent*, "it may give us earthlings a once-in-a-lifetime light show".

I will advise in due course as more info comes to light on these.

Clear and bright skies at night.

Best wishes

Paul Shallow

All pictures by the Author

Montage of the Eclipse by the Editor from pictures by the Author

Largest-known Galaxy Revealed

The spectacular barred spiral galaxy NGC 6872 has ranked among the biggest stellar systems for decades. Now a team of astronomers from the United States, Chile and Brazil has crowned it the largest known spiral, based on archival data from NASA's Galaxy Evolution Explorer (GALEX) mission.

Measuring tip-to-tip across its two outsized spiral arms, NGC 6872 spans more than 522,000 light-years, making it more than five times the size of our Milky Way galaxy.

"Without GALEX's ability to detect the ultraviolet light of the youngest, hottest stars, we would never have recognized the full extent of this intriguing system," said lead scientist Rafael Eufrazio, a research assistant at NASA's Goddard Space Flight Centre.

The galaxy's unusual size and appearance stem from its interaction with a much smaller disk galaxy named IC 4970, which has only about one-fifth the mass of NGC 6872. The odd couple is located 212 million light-years from Earth in the southern constellation Pavo.

Astronomers think large galaxies, including our own, grew through mergers and acquisitions -- assembling over billions of years by absorbing numerous smaller systems.

Intriguingly, the gravitational interaction of NGC 6872 and IC 4970 may have done the opposite, spawning what may develop into a new small galaxy.

"The north eastern arm of NGC 6872 is the most disturbed and is rippling with star formation but, at its far end, visible only in the ultraviolet, is an object that appears to be a tidal dwarf galaxy similar to those seen in other interacting systems," said team member Duilia de Mello, a professor of astronomy at Catholic University. The tidal dwarf candidate is brighter in ultraviolet than other regions of the galaxy, a sign it bears a rich supply of hot young stars less than 200 million years old.

By analysing the distribution of energy by wavelength, the team uncovered a distinct pattern of stellar age along the galaxy's two prominent spiral arms. The youngest stars appear in the far end of the northwestern arm, within the tidal dwarf candidate, and stellar ages skew progressively older toward the galaxy's centre.

The southwestern arm displays the same pattern, which is likely connected to waves of star formation triggered by the galactic encounter.

The bar in NGC 6872 measures about 26,000 light-years in radius, or about twice the average length found in nearby barred spirals, it is a bar that befits a giant galaxy. "Understanding the structure and dynamics of nearby interacting systems like this one brings us a step closer to placing these events into their proper cosmological context, paving the way to decoding what we find in younger, more distant systems," said team member and Goddard astrophysicist Eli Dwek.

NASA Press Release 10/01/13



This composite of NGC 6872 combines visible light images from the ESOs VLT with far-ultraviolet (1,528 angstroms) data from NASA's GALEX and 3.6-micron infrared data acquired by NASA's Spitzer Space Telescope.

A previously unsuspected tidal dwarf galaxy candidate (circled) appears only in the ultraviolet. IC 4970, the small disk galaxy interacting with NGC 6872, is located above the spiral's central region. The spiral is 522,000 light-years across from the tip of one outstretched arm to the tip of the other, which makes it about 5 times the size of the Milky Way.

Credit: NASA's Goddard Space Flight Center/ESO/JPL-Caltech/DSS

NSAS Christmas Party

NSAS 2012 Christmas Party was held on December 18th.

As usual, the attendance was very good and, as you will see from the pictures, the food quantity and variety was more than adequate to satisfy all tastes and appetites.

The range of conversations was as diverse, some taking the opportunity to catch up with old friends or greet new members

while other explored the secrets of Chinese cuisine or went (late in the night...) as far as discussing the convolution of black holes and their associated event horizons.

Our new president, Bruce Retallick, took the opportunity to formally introduce himself for the benefit of the members who don't come regularly to our meetings and to outline his views for the year ahead.

