The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER MAY 2012

Next meeting

Venue: The auditorium behind the main building at Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.
Date and time: Wednesday 23 May at 19h15.
Programme:

- **Beginner's Corner:** "Observational astronomy " by Percy Jacobs.
- **What's Up?** by Johan Smit.
- 10 minute break — library will be open.
- **Main talk: "Neutron stars and pulsars" by Sheldon Herbst.**
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Danie Barnardo.

Next observing evening**:** Friday 18 May at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road. Arrive from sunset onwards.

CONTENTS OF THIS NEWSLETTER	

Last month's meeting - by Michael Poll

The meeting was chaired by Michael Poll, in place of Fred Oosthuizen who was not able to attend due to family commitments. Some notices were read out, and important dates mentioned, including May 16th, when we will be at Menlo Park Primary school, and May 25th when Johan Smit will be doing an event for the Voortrekkers at the Johannesburg Observatory. Our Northern Star Party will be held on July 13th -15th at Shekina Camp, which is within the Mabula Nature Reserve near Bela-Bela. The annual Scopex Exhibition will be on July 21st, at the War Memorial Museum in Johannesburg, and we will doing an astronomy outreach at High School Wagpos, near Brits, on July 27th.

For Beginner's Corner, Johan Smit gave a report back on the weekend at Kambro, near Britstown. The fact that members from other Centres attend this event means that it can now be termed a "National Star Party". Johan outlined the history of the event, the first one being in 2009. Unfortunately this year's event was marred by clouds, although some observing was done. Johan documented a number of daytime activities, with pictures of scenery and wildlife, and some night time message writing with laser beams.

Percy Jacobs presented "What's up?" Percy drew attention to the star Eta Carinae, with a picture of its lobes of ejecta. The whereabouts of the planets in the night sky were indicated, and Percy noted that Venus was best observed telescopically before the sky becomes too dark. Star maps showing the constellations currently visible were presented, and we were taken on a tour of the galaxies around Leo and Virgo. Percy drew attention to a number of clusters visible at present and put it to us that, perhaps, NGC3293 "the Gem Cluster", near Eta Carinae is more impressive than the Jewel Box. Other mentions were of the Eta Aquarid meteor shower on May 5th and 6th, and, although on cannot see it, one can look at the location of a black hole by looking at Eta Cygni. The annular solar eclipse of May 20th was noted but this is not visible in South Africa. Percy ended by showing the numbers of ASSA 100 objects submitted by the various observers. George Dehlen has currently logged more than 60 of these objects.

Our main speaker for the evening was Professor Ansie Harding, professor at the Department of Mathematics and Applied Mathematics at the University of Pretoria, where she teaches and researches mathematics. Her talk was entitled "Fractals", which she indicated would discuss things that got "smaller and smaller".

Ansie introduced her talk by showing that numbers from 1 through 9 to 0 can be written in such a way that the number itself is represented by the number of angles in the depiction. She then gave an outline of the history of natural numbers, stating that their history goes back to about 3500 BC. The Egyptians (5000 BC) had no system for numbers, they used symbols for each decade of 10. The symbol 0, for zero, appeared around 200 BC and "0" became a positional holder around 900 AD.

Negative numbers were in use by about 1500 AD, but problems had arisen when trying to divide irrational numbers such as the square root of -1 ($\sqrt{-1}$). A Greek mathematician called Hippasus (5th century BC) is said to have discovered irrational numbers – in particular he showed that the square root of 2 ($\sqrt{2}$) is such a number. The concept of irrational numbers horrified the Pythagorean school who had taught that all numbers could be expressed as the ratio of integers. As an aside, Ansie posited that Pythagoras was a plagiarist, as some of the mathematics attributed to him were known to the Babylonians, and Pythagoras often just re-iterated their knowledge.

The problem of irrational numbers can be addressed by imagining that numbers are two dimensional, and are not in a progressive sequence on a line – the analogy was that it was a like unrolling a rolled up carpet. The numbers are on a complex plane, with a real axis and an imaginary axis. Ansie showed us that the solution to $x^2 = -1$ was i, i.e i is the square root of -1, and that $i^2 = -1$. This led to the concept of complex numbers, e.g $2 = 2+0i$, and the fact that complex numbers can be added together or multiplied, with the result also being a complex number.

As bit of a breather at this stage, Ansie told us about the Cubic Dispute in the 1500s. In those days, in order to get a post as a professor, on had to challenge the incumbent to some in-

tellectual exercise. She told us about Niccolo Tartaglia being challenged by Antonio del Ferro. Each gave the other 50 days to solve 30 problems. Tartaglia had solved the problem of cubic equations. Gerolamo Cardano persuaded Tartaglia to reveal his solution by promising not to publish them. Several years later, Cardano happened to see unpublished work by del Ferro who had independently found a solution, so Cardano published Tartaglia's solution. Although Cardano acknowledged Tartaglia's work, Tartaglia was very upset and spent time thereafter insulting Cardano. Cardano is the first person known to have introduced complex numbers.

Ansie then told us about the behaviour of fractals, - a figure or picture repeats itself on a smaller and smaller scale. Examples were the picture on the Royal Baking Powder tin, cauliflower florets, alveoli in the lung, lightning, coral, and even the graphs of the financial markets. She showed us the Sierpinsky Triangle, where an inverted triangle of a different colour is placed within a larger one and the process is repeated ad infinitum, and the Koch Snowflake, where the edge of the figure becomes infinitely long.

Ansie then introduced us to the Julia sets (Gaston Julia 1893 – 1978), where patterns can be created using what is termed a jump formula e.g . $x^2 + 2 + 3i$ with a starting point of $x – i$. One can then get a fractal shaped like a 'rabbit'. If a jump formula is started with zero, and the complex number is varied, one gets a one of the most complex figures in mathematics, which is called a Mandelbrot Set (Benoit Mandelbrot 1924 – 2010). We were shown some wonderful examples of these various sets, and Ansie ended her talk by showing some examples of fractals and art, with fascinating patterns and colours. She referred us to the www.fractalarts.com website.

After a most interesting talk, we moved to the classroom for cookies, coffee and chat.

Last month's observing evening - by Michael Poll

There was quite a clear sky, no clouds, and not too cold. However, there was a glaringly bright floodlight at the University of Pretoria grounds, a light which wasted a lot of Eskom energy by illuminating the CBC hockey field where we were, and probably illuminated a lot of other unintended places as well. Grrr.

We had 10 or 12 telescopes and perhaps 30 or more people present. As usual, a variety of objects were looked at, but the westward march of the summer constellations (e.g Orion and Canis Major; Taurus and Gemini) towards the sunset, was noticeable.

Venus was still a fine sight in the northwest, now showing a distinct crescent phase, which indicates that it is moving rapidly towards inferior conjunction on June 6th. In the west we looked at the Orion Nebula (M42), and noted the four stars of the Trapezium and the row of three close to it. In binoculars, the scene shows as a double star – Theta Orionis – one of the components is the unresolved Trapezium, (Theta^1 Orionis) and the other component (Theta^2 Orionis)is brightest two stars of the "row of three", but also unresolved.

Some double stars were on the menu – Castor (Castor A and Castor B) is a tight pair in a 6 inch telescope, but the third, and fainter, component – Castor C – could be seen a little further from the main pair. Castor C seems to have a slight brownish tinge. Gamma Leonis (Algieba) and Gamma Virginis (Porrima) were not split in Michael's 6 inch on the night. Later on we looked at Alpha Crucis, and all three components were seen – there is a very close pair, and a third star a little way off. We also looked at the double star Alpha Centauri.

Mars was still high in the north, near the star Regulus, in Leo. The planet showed a disc, but no surface detail was seen. Saturn was well up, and was admired by all.

Favourite southern clusters were well placed. Possible the three brightest and easiest to locate and see are the Southern Pleiades (IC 2602, the brightest star of the group is Theta Carinae), the Wishing Well Cluster (NGC 3532) and the Eta Carinae region (the nebulosity around Eta is designated as NGC 3372). The dark "V" which cuts the Eta Cari-

nae nebula was easily seen, and it was also noted that the bright stars in the immediate area outlined the edges on either side of the V. The other cluster we looked at was the Jewel Box, near Beta Crucis.

Nigel brought his 4 ½ inch telescope which gave wonderful low power views, and a couple of us spend some time comparing his 22x field with 30x and 60x fields in other telescopes.

Johan Smit had with him the Bennett telescope, which he has beautifully restored and refurbished. He has put the lens in one of the original Moonwatch tubes, and fixed the mounting such that one can sit comfortably at the eye piece. Johan also opened the dome of the Centre 12 inch, treating everyone to some wonderful views of Saturn.

Reminder: transit of Venus 5 - 6 June 2012

http://www.transitofvenus.org/june2012/where-to-be

www.transitofvenus.org

Some announcements & requests for volunteers - by Johan Smit

- **Wednesday, 16 May 2012.**
  Annual astronomy event at Menlo Park Primary school.
  17:30 - short talk in the hall and telescope viewing afterwards.
  Need volunteers with scopes - as many as possible
- **Friday, 25 May 2012.**
  Astronomy event at the Johannesburg observatory for some scouts (Voortrekkers).
  I do a talk and there will be some telescope viewing afterwards.
  Volunteers with scope needed.
  Johannesburg will also provide volunteers, but if someone from our Centre wants to see the historic 26 inch refractor in action, he is welcome to join me.
- **Northern Star Party, weekend 13 to 15 July 2012.**
  At Shekina Camp, inside the Mabula nature reserve near Bela-Bela (Warmbaths). Details on our website.
  Contact Bosman Olivier or Percy Jacobs for more details.
- **ScopeX:** Saturday 21 July 2012 at the Military History Museum, Saxonwold, Johannesburg, from 9 am to 9 pm. http://www.scopex.co.za/
- **Friday, 27 July 2012.**
  Astronomy outreach at High School Wagpos near Brits.
  From 17:30 on.
  I do a talk and then we need telescopes for viewing.
  Food and drinks provided for volunteers - and reasonably dark skies.
  Contact me for details.

Summary of "What's Up?" to be presented on 23 May 2012 - by Johan Smit

This is the month to see what we cannot see. Allow me to explain this statement.
During the early morning hours of 06 June 2012 the last transit of Venus, this century, will be taking place. Most news reports list the date as June, the 5th. This is because the transit will take place during the afternoon/evening of June the 5th in North America. That is early morning at our location on the 6th of June.
If you did not experience the transit in 2004, this is the last one that you will see. Unfortunately we in South Africa are not favourably placed to see the transit. The last few seconds/minutes of the transit will be visible at sunrise in the north-eastern regions, but where we stay it may be over at sunrise.

Unless you can undertake an expedition (holiday) to a faraway place you will not see it. To see a full transit you need to be in eastern Australia, Japan, New Zeeland, eastern China or Hawaii. What better time for holiday there.
If you cannot make a plan to see it live, do what the rest of us will do. Follow it on the internet. A quick search will bring up numerous possibilities. Links will be supplied at the monthly meeting as well.

Before the event, you can follow Venus all the way down to the horizon as it gets closer and closer to the sun. The crescent of Venus will get thinner and thinner and larger as it also gets closer to us. It will be spectacular in even the smallest of telescopes and may even be distinguishable in binoculars. As Venus gets closer to the sun you will need binoculars to find it just after sunset. A clear western horizon is needed. And take care that you do not accidentally look directly at the sun. Scan the area just above the point where the sun has set with binoculars or your finder telescope to locate Venus as it gets closer to the evening of the 5th of June.

While you follow Venus up to its historic transit, you will see Mercury starting to get closer to Venus, with the two close to each other on June the 1st. Mercury will pass Venus at an angular distance of less than a full Moon diameter on the 1st. A low power eyepiece in your telescope should show both of them in one field of view.

Continue to follow Mercury as it rises higher each night, because this is the best month to see Mercury, this year, in the evening.

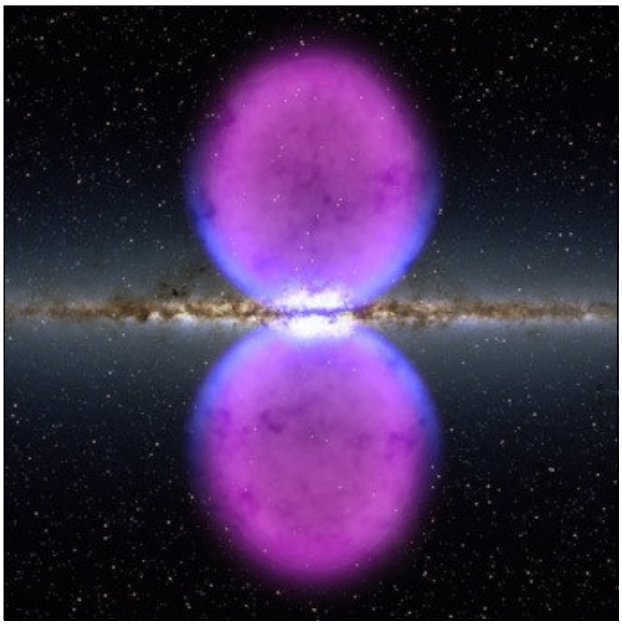
After you have hunted down Venus or Mercury, look towards the North and find Mars east of Regulus in Leo. Notice how fast Mars is moving eastwards, every night, away from Regulus towards Spica in Virgo. On the 1st it will be closer to Regulus and on the 30th it will be about halfway towards Spica. Watch that planet move!!!

While you are in that area, look just below Spica to find Saturn. Saturn is just completing a retrograde motion and will be nearly stationary with respect the Spica for the most of June.
After spending the early hours of the 6th following the transit of Venus on the internet (It starts at 00:09 on the 6th of June local time, and will last until after 06:00), do not rest too long.
After the transit Venus will start to appear in the morning sky, and will start to be visible just before sunrise. Jupiter will rise at 05:45 on the 1st and at 04:20 on the 30th. Venus will rise at 04:32 on the 30th. If you follow Jupiter's early morning rise, you will soon after the 6th start to see Venus as well, and you can watch how fast Venus catches up with Jupiter. Watch that planet move!!!
In between hunting down the planets, you can use the time from about the 10th to the 22nd to do some dark sky viewing. That is the times that the Moon will be below the horizon for most of the night. Full Moon will be on the 4th, Last quarter on the 11th, New Moon on the 19th and First quarter on the 27th. Suggested dark sky targets will be supplied at the meeting.

In between this all there will be a partial lunar eclipse that we will not be able to see. It happens on the 4th of June, in most of the areas where the transit of Venus will be visible, just on the day before. So if you happen to have taken a holiday to see the transit, you should also be able to see the partial lunar eclipse.

If you cannot take a holiday to see the transit, happy planet hunting in June 2012.
And do not forget to celebrate the winter solstice on June the 21st. Summer is on its way again!!!!

Feature of the month: Fermi bubbles



The Fermi Gamma-ray Space Telescope is named after the late Italian nuclear physicist, Enrico Fermi. It is a space observatory being used to perform gamma-ray astronomy observations from low Earth orbit.

In November 2010, it was announced that two gamma-ray bubbles (or lobes) were detected above and below the Milky Way. They were dubbed Fermi bubbles.

The two bubbles are symmetric, and each appears to originate at the Milky Way's center, where a black hole, with mass equal to 4 million solar masses, lurks. Each bubble is about 25 000 light-years in diameter and appears to have well-defined edges. The bubbles stretch from Sagittarius up to Grus and to Virgo in the night sky of the southern hemisphere. (But they are not visible through optical telescopes, and that demonstrates again that there is more in the Universe than meets the eye.)

The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release - the source of which remains a mystery. There is nothing visible inside these spheres that could produce the gamma rays.

An artist's conception (above right) shows the approximate scale of the newfound bubbles in false colour above and below the Milky Way.

http://www.scientificamerican.com/article.cfm?id=fermi-bubbles

See short presentations at:

http://www.nasa.gov/mission_pages/GLAST/news/new-structure.html

http://www.youtube.com/watch?v=1hIF36ty1Eo

Basics: Kepler's three laws of planetary motion - by Pierre Lourens

1. **The orbit of every planet is an ellipse with the Sun at one of the two foci.**
2. **A line joining a planet and the Sun sweeps out equal areas during equal intervals of time.**
3. **The square of the orbital period P of a planet is directly proportional to the cube of the semi-major axis a of its orbit.**

Mathematically, the third law can be written as $\mathbf{P^2 = k a^3}$, with **k** constant. **k** has the same value for all the planets. If **P** is measured in sidereal years and **a** in astronomical units, then the third law becomes $\mathbf{P^2 = a^3}$ for all the planets.

Johannes Kepler published his first two laws in 1609, having found them by analyzing the astronomical observations of Tycho Brahe. Kepler discovered his third law only years later, and it was published in 1619.

His first law was a correction of the heliocentric Copernican theory of the solar system. In the latter theory, the orbits of the planets around the Sun were circles, with the Sun at the centre.

As science advanced further, it turned out later that these three laws are not basic laws of nature, but can be derived from Newton's three laws of motion and his law of gravity. This sort of thing, to derive laws from more fundamental laws, is termed "reductionism" in physics.

For further reading, see http://en.wikipedia.org/wiki/Kepler's_laws_of_planetary_motion

http://www-istp.gsfc.nasa.gov/stargaze/Skeplaws.htm

Noteworthy items

- **See an impressive image of the Sun, made by an amateur through an Hα filter and watch a video of eruptions on the Sun.** http://news.discovery.com/space/big-pic-sun-hydrogen-alpha-disk-120413.html
- **Mars life search to go into high gear.** http://news.discovery.com/space/mars-life-search-nasa-120416.html
- **First Astrobiology Chair at the NASA Astrobiology Institute selected.** http://www.nasa.gov/home/hqnews/2012/apr/12-113_LOC_Astrobiology_Chair.html
- **Ultra conservatives must not read this:** Playboy magazine is planning an "adult entertainment establishment" in orbit. http://news.discovery.com/space/playboy-plans-club-in-space-120229.html#mkcpgn=emnws1 **Editor's comment:** I can imagine a choir of Playboy bunnies floating in the zero gravity conditions of the space station like a choir of angels, singing: **"Oh, come, all ye faithful!"** And the visitors (and the bunnies) will have to learn how to do things in zero gravity conditions**…..**
- **Saturn's rings, Titan and Enceladus.** See new images from the Cassini spacecraft. http://www.esa.int/esaSC/SEMBGCKWZ0H_index_0.html
- **Far-off cousin of part-time African lake found on Titan.** A region on Saturn's moon Titan has been found to be similar to the Etosha Pan and its climate in Namibia. http://www.esa.int/esaCP/SEME9CKWZ0H_index_0.html
- **ESA's long-term technology plans for space exploration.** ESA's technical experts have prepared long-term roadmaps of technologies required for advanced robotic and human exploration. http://www.esa.int/SPECIALS/Technology/SEM4ZFKWZ0H_0.html
- **Why does our Universe have 3 dimensions?** Read a short popular level article about the TOE's (TOE = **T**heory **O**f **E**verything) that physicists have formulated to try and explain the workings of our mysterious Universe. http://news.discovery.com/space/why-does-our-universe-have-three-dimensions-120119.html#mkcpgn=emnws1
- **Frequently asked questions in cosmology.** http://www.astro.ucla.edu/~wright/cosmology_faq.html
- **NASA'S Chandra sees remarkable outburst from old black hole.*** http://www.nasa.gov/home/hqnews/2012/apr/HQ_12-139_Chandra_Old_Black_Hole.html
  * **Editor's note:** This has nothing to do with an old man with an upset stomach.
- **NASA's Spitzer telescope sees light of alien "Super Earth".** The planet is a water world. It is called 55 Cancri e, and falls into a class of planets termed super Earths. http://www.nasa.gov/home/hqnews/2012/may/HQ_12-138_Spitzer_Super_Earth.html
- **We are the explorers.** See a videoclip. http://www.nasa.gov/multimedia/videogallery/index.html?media_id=134209771
- **Aurora over Raufarhöfn. Something special.** http://apod.nasa.gov/apod/ap120430.html

Asteroids and comets.

- **NASA mission wants amateur astronomers to target asteroids.** http://www.nasa.gov/home/hqnews/2012/apr/HQ12-121_OSIRIS-REx_Outreach_NEOs.html
- **Minivan-sized asteroid explodes over California.** Also watch videos of meteors & asteroids. http://news.discovery.com/space/meteor-the-size-of-a-minivan-exploded-over-california-120423.html#mkcpgn=emnws1.

(Continued on next page.)

- **Spacecraft Dawn / Rosetta at asteroid Vesta / Lutetia: see close-up photographs.** http://news.discovery.com/space/photos-asteroid-vesta-nasa-dawn-120425.html#mkcpgn=emnws1
- **NASA scientists find history of asteroid impacts in Earth rocks.** Evidence for these impacts on Earth comes from thin rock layers that contain debris of nearly spherical, sand-sized droplets. These were formerly molten rock droplets. http://www.nasa.gov/home/hqnews/2012/apr/HQ12-135_Asteroid_Imapcts_Earth_Rocks.html
- **Herschel spots comet massacre around nearby star Fomalhaut.** http://www.esa.int/esaSC/SEM1XBHWP0H_index_0.html
- **NASA announces 16th Undersea Exploration Mission dates and crew.** An international team of aquanauts will travel again to the bottom of the Atlantic Ocean to simulate a visit to an asteroid. http://www.nasa.gov/home/hqnews/2012/apr/HQ_12-116_NEEMO.html

  http://www.esa.int/esaCP/SEMYK2KWZ0H_index_0.html
- **Who owns the asteroids?** One company's plan to mine asteroids may fly in the face of international treaty. http://news.discovery.com/space/asteroid-mining-space-treaty-ownership-120427.html#mkcpgn=emnws1

The Sun's siblings.

- **Sun's siblings could host cousins of Earth life.** Far-fetched, but not impossible. http://www.livescience.com/19575-sun-siblings-asteroids-earth-life.html

  http://news.discovery.com/space/find-suns-sibling-find-lifes-cousin-120409.html#mkcpgn=emnws1
- **But how to find the Sun's siblings?** See the article titled ***Looking for the Sun's siblings using chemical tagging*** in the February 2011 newsletter, page 6 and also the one titled ***FEATURE OF THE MONTH: The Gaia mission*** in that same newsletter on page 7.
- **Sun's twin discovered - the perfect SETI target?** Astronomers have identified a twin of the Sun lying only 200 light-years away. Could it have a twin solar system too? http://news.discovery.com/space/suns-twin-is-an-optimum-seti-target-120426.html#mkcpgn=emnws1
  Editor's note: Don't neglect to click on the links on this website!
- **Related to this topic: Project Icarus - which exoplanet to visit?** This interstellar mission will have to be choosy about its first star system target.

Fleece jackets - by Pat Kühn

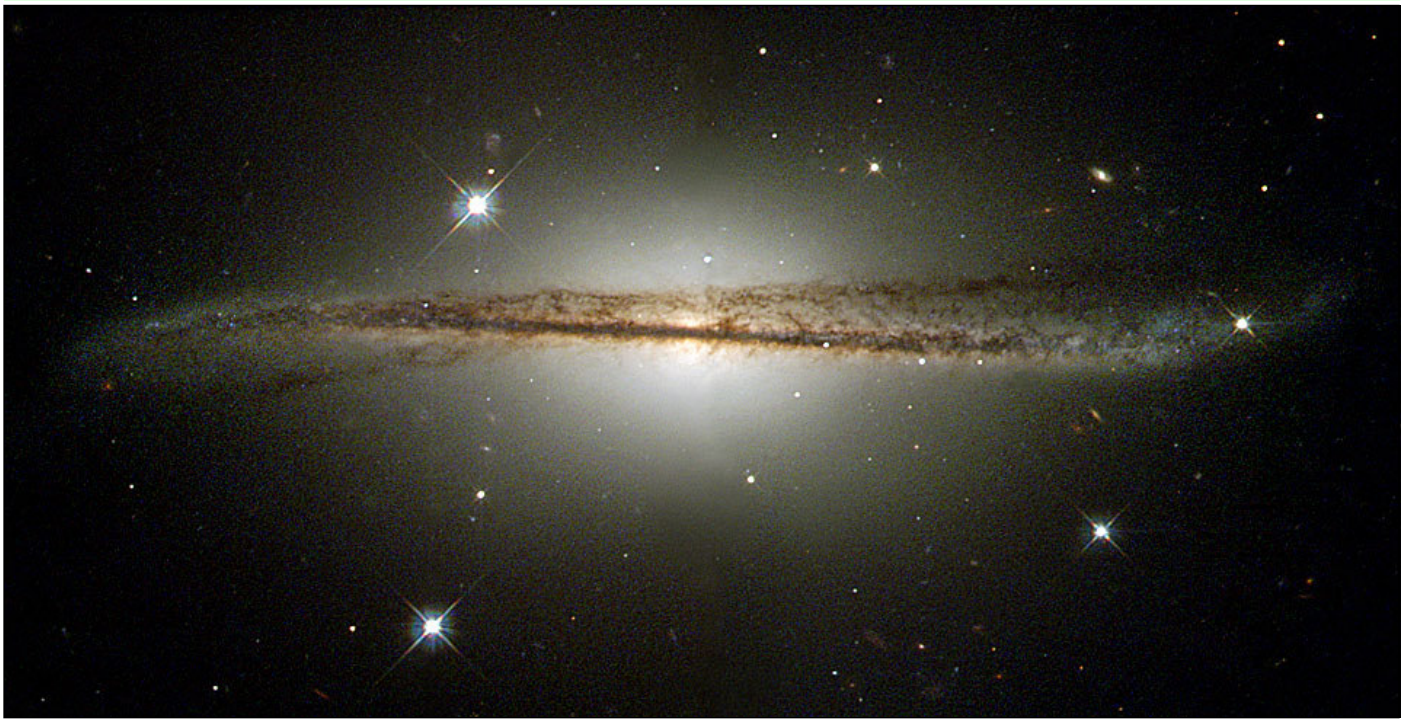
Please be advised that orders for fleece jackets have now closed. No more orders can be accepted from now on, for the foreseeable future. For those who have already ordered jackets, we again apologize for the delay in delivery. We are using our best efforts to resolve the matter. You will, of course, be informed as soon as the goods are ready.

ScopeX 2012

Where: National Military History Museum, Johannesburg (aka War Museum, next to the Zoo).
Date: Saturday 21 July 2012 .
Time: 9 am to 9 pm. (Star Party from 6 pm onward.)
Museum Entrance Fee: R22 adults, R11 senior citizens and children up to 18.
Website: http://www.scopex.co.za/

Warped spiral galaxy ESO 510-13

How did spiral galaxy ESO 510 -13 get bent out of shape? Warped disks are not uncommon, though, and even our own Milky Way Galaxy is thought to have a small warp. The causes of spiral warps are still being investigated, but some warps are thought to result from interactions or even collisions between galaxies. ESO 510-13 was imaged by the HST (below). It is about 100,000 light years across and 150 million light years away in the southern constellation Hydra.



Note re MNASSA

The April 2012 issue of MNASSA has just been published on the MNASSA Download Page at http://www.mnassa.org.za/

Errata

Equation **(4)** on page 6 of the April 2012 newsletter should be: $\Delta\Theta = \Theta\, v_r\, \Delta t \,/\, (r + v_r\, \Delta t)$

Pretoria Centre committee

Chairman	Johan Smit	072 806 2939 [Mobile]	
Vice Chairman	Danie Barnardo	084 588 6668 [Mobile]	
Secretary	Tony Viljoen	072 247 6648 [Mobile]	012 654 5783 [H]
Newsletter Editor	Pierre Lourens	072 207 1403 [Mobile]	012 654 6366 [H]
Treasurer and Membership Secretary	Rynhardt van Rooyen	082 325 8745 [Mobile]	
Member	Michael Poll	074 473 4785 [Mobile]	
Librarian	Danie Barnardo	084 588 6668 [Mobile]	
Curator of Instruments	Johan Smit	072 806 2939 [Mobile]	
Public Relations Officer	Fred Oosthuizen	072 373 2865 [Mobile]	
Observing Director	Percy Jacobs	082 498 4680 [Mobile]	
Member	Bosman Olivier	082 883 1869 [Mobile]	
Member	Pat Kühn	082 895 5686 [Mobile]	
Member	Johan Hartmann	083 276 1323 [Mobile]	
Member	Hubrecht Ribbens	082 448 0633 [Mobile]	