march 2008

canopus

monthly newsletter of the johannesburg centre of assa

Old Republic Observatory, 18a Gill Street, Observatory, Johannesburg
PO Box 412 323, Craighall, 2024

The Moon and Regulus during the Lunar Eclipse on 21 February (Photo by Kobie van Zyl)

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notice of next meeting – assa johannesburg

The next monthly meeting of the Johannesburg Centre of the Astronomical Society of Southern Africa will be held at the Old Republic Observatory, 18a Gill Street, Observatory, Johannesburg on Wednesday, 12 March 2008 at 20h00. . Guest Speakers:

Dr Cecil Churms

"From the Outside Looking In"

How an ancient astronomical computer was taken apart without touching it, how an Uncle discovered the rings of Uranus, and other astronomical anecdotal stories.

Brian Fraser

"Monitoring Solar Flares from your Backyard with a Simple Radio Receiver."

It is possible to monitor solar flares with a small home-made radio receiver using a PC as your recording device. This talk by someone who is "electronically-challenged" explains how easy it is to set up a receiver that produces professional results.

assa johannesburg calendar

Date	Event	Details
05 March	Introduction to Astronomy – Lecture 3	Observatory @ 18:30 – Gil Jacobs
08 March	Committee Meeting	War museum @ 14:00
12 March	Introduction to Astronomy – Lecture 4	Observatory @ 18:30 – Gil Jacobs
12 March	Monthly Meeting	Observatory @ 20:00 – Dr C.L. Churms
19 March	Introduction to Astronomy – Lecture 5	Observatory @ 18:30 – Gil Jacobs
05 April	Committee Meeting	War museum @ 14:00
09 April	Monthly Meeting	Observatory @ 20:00 – Gil Jacobs

assa johannesburg committee members 2007/2008

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www.assajhb.co.za

editorial

by Claire Lee

For a while now, a bunch of physics bloggers have been suggesting that we have a "Talk like a Physicist Day". After all, pirates have theirs (www.talklikeapirate.com) and surely physicists have contributed more to the world than pirates have? Well, it looks like a date has been chosen, the 14th of March (which, happily, is Albert Einstein's birthday) has now been proclaimed "Talk Like a Physicist Day" and has it's own blog too (www.talklikeaphysicist.com).

March 14 (3.14 in American date format), at 1:59:26 pm also marks another special annual event in the science world. Anybody recognise that string of numbers from anywhere? That's right… they give the value of **π** (pi) to 7 decimal places: 3.1415926. That makes March 14 International **π** Day.

So what can you do to celebrate **π** Day? Well, there's the obvious – just eat lots and lots of pie, or for the more creative, shape your food into the **π** symbol before you eat it. For the geekier ones among us there are a number of activities utilising **π**: for example, convert the hours on the clock into radians… Instead of it being 3 o'clock, now it's ½ **π** o'clock. Apparently there's even a movie called "Pi" that you can watch, about a mathematician who goes crazy. And last but certainly not least, you can calculate the value of **π** by throwing frozen hot dogs around! (Check out www.wikihow.com/Calculate-Pi-by-Throwing-Frozen-Hot-Dogs)

So, we've got a lot to do on the 14th in between talking like a physicist, eating pie and lighting a birthday candle for Einstein. The good news is that the kiddies don't have to be left out either, with some cute & cuddly elementary particles from the folks at Particle Zoo (www.particlezoo.net). You can choose from quarks, force-mediating bosons such as the graviton and our astronomical favourite, the photon, and even theoretical particles like the Higgs and Dark matter!

So get yours today, and have a great **π**-2008!

■

chairman's chat

by Robert Groess

Another exciting month under the belt. I am watching Space Shuttle Atlantis undock from the Intentional Space Station live on streaming NASA TV after a very successful STS-122 mission. The European module, Columbus, has been delivered and integrated with the rest of the space station and the Shuttle astronauts are looking forward to returning home.
Closer to home, the annual SAASTA SA Science Lens competition was held on the Observatory grounds on Friday, 8 February, and boasted some fine photographs taken with a distinctive science undercurrent. One of the runners up was our very own Alicia Toumilovitch who took a stunning photograph of ice-crystals which formed on the outer window pane of a commercial airliner while travelling at altitude from Russia to Egypt. Alicia's photograph was called "I C View" displaying the "icy view" from her vantage point in the passenger seat. After the award ceremony, Dr. Mattie Hoffmann from UOFS in Bloemfontein presented a lucid cosmic zoom, using the humble cellphone SMS as an example of interstellar communication distances. The evening was rounded off with a trip to the 26.5" Innes Refractor where guests were given a chance to enjoy the historic instrument's capabilities.

Speaking of which, these past two months have seen a dramatic resurgence of activity at the observatory, in particularly, with the 26.5" Refractor. A number of evening events have turned out to be great attractors such as the Mars Viewing evening, a visit by the "Voortrekkers", the SA Science Lens event, to mention but a few. Viewing is also done on clear nights after monthly meetings, and the 3rd Wednesday night of every month has been set aside for public viewing. As the winter months approach, so we should see an increased use of the giant telescope, and possibly others on the top of the hill.

By now you may have heard that our "International" keynote speaker at ScopeX will be Professor David L. Block, who still has the title of his talk shrouded in mystery. Preparations for ScopeX are well under way and this year promises to be as great an event as ever. Telescope makers at the ATM class at Parktown Boys' High are feverishly working on their instruments to make the grade at this year's telescope exhibition, and I have been privy to see some of these labours of love, which have elicited the question from onlookers "where did you buy that?".

By popular demand, the society plans to hold a Mega-Star party on a private farm near the Suikerbosrand towards the end of March. Confirmation and details of the event will be on our website and announced at the March monthly meeting. The idea is to convene a record number of operational telescopes at one location, on the African continent. So if you have a working telescope, and would like to assist with this "record" attempt, this would be a great opportunity to bring it along. We just need to get hold of those weather officials…
Until next month, Robert. ■

club news

by ASSA-jhb

ASSA-jhb would like to send our congratulations to Chris Middleton, who receives a well earned award from the AAVSO:

Chris Middleton, the ASSA Director of Variable Star section has received an award from the AAVSO for making over 100 000 CCD/PEP variable star observations during the period 2004 to 2006 –a massive 140 929 observations!

In the period 2006 – 2007 his total recorded by the AAVSO was the highest across the world, namely 172 727. Together with Berto Monard (153 919 observations) they pushed South Africa to the top of the list for the period with 393 319 observations, beating USA and New Zealand who also scored higher than 300 000.

Outreach activities during February 2008:

On 8 Feb Oleg Toumilovitch and Rodney Hyman operated the Innes telescope for viewing to the guests and winners attending the SAASTA's Science Lens Award event at the Observatory. Oleg's daughter Alicia also walked away with a 2nd prize in one of the categories - well done Alicia!

On 15 Feb Johan Smit of ASSA Pretoria gave a presentation on "Hoe 'n Teleskoop Sien" to the youngsters of the Voortrekker Kommando for their Astronomy badge. After the presentation they were treated to viewing through the 26" telescope and a couple of commercial scopes set-up outside the dome with the help of Chris Curry, Chris Stewart and Francois Nortje. The Voortrekkers were delighted that it was a clear sky evening and felt very honoured to be the very first group to see the newly cleaned telescope dome and scope, thank you to SAASTA for funding this clean-up operation!

Then, on the 20th of February Gil Jacobs held the first of his four-session introductory astronomy course entitled "Theoretical Astronomy – the ideas behind the observations" at the Observatory.

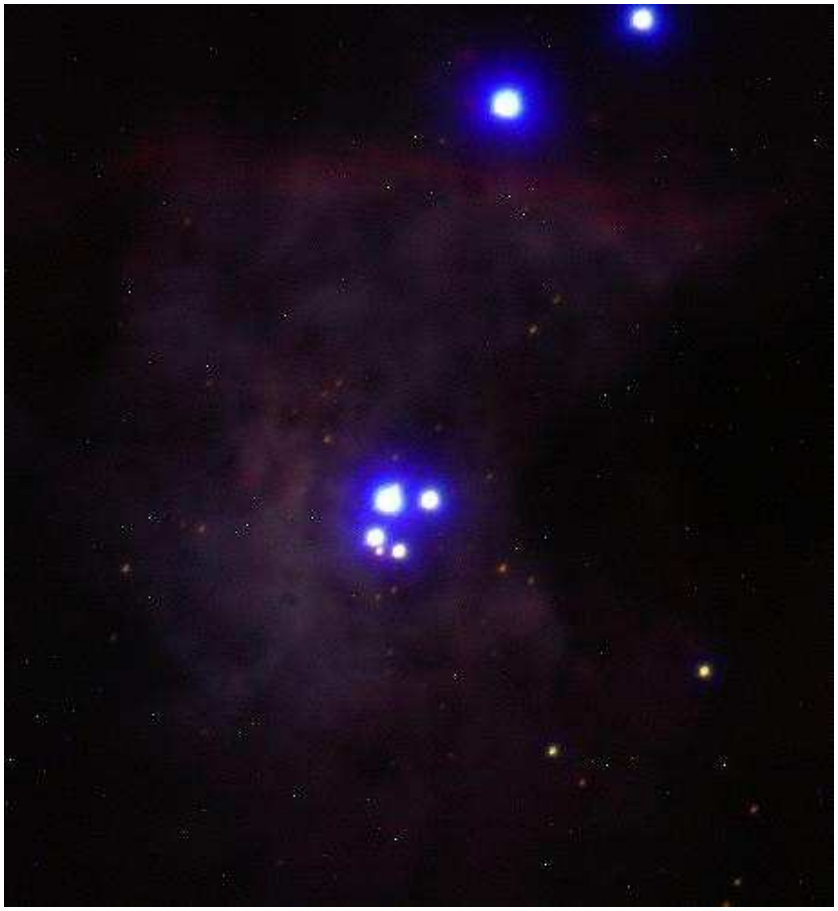
After the lecture the attendees continued on to the Public Viewing session at the Innes scope, manned by Chris Curry. Chris took these photos through the eyepiece during the viewing session. ■

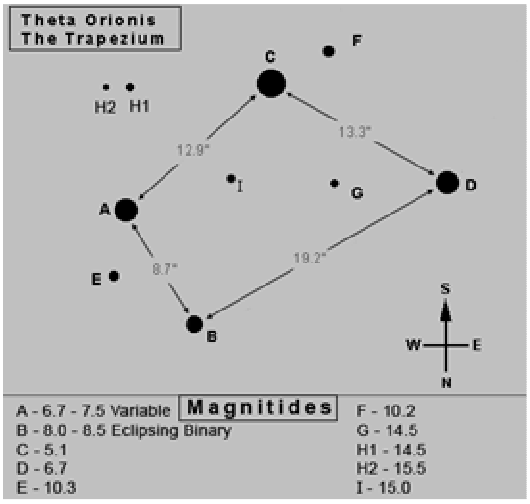
Photos (previous page) by Lerika Cross:

right: Inside the newly-cleaned dome
bottomt: Johan Smit during his presentation

Photos (this page) by Chris Curry:

above right: a beautiful picture of Saturn and the Cassini division
below: The Trapezium in the Orion Nebula, one can even make out stars E and F.





happy birthday Einstein

from http://www.visionlearning.com/

Albert Einstein (left, with sister Maja), the first child of the Jewish couple Hermann and Pauline Einstein, was born on March 14, 1879 in Ulm, Germany. Einstein learned to speak at a late age, he was considered a slow learner as a child, and he showed no particular aptitude for formal schooling. In June 1880, his family moved to Munich where Hermann Einstein and his brother Jakob founded an electrical engineering company. After the failure of his father's business in 1894 the Einsteins moved to Pavia, Italy. Young Albert remained in Munich to finish school, but moved to Pavia to join his family after completing only one term. Upon reaching Italy, he renounced his German citizenship, possibly to avoid obligatory military service, and became stateless. At about the same time, Einstein “renounced his legal adherence to the Jewish religious community."

In 1895, Einstein took an exam for the Federal Swiss Polytechnic University, but failed the liberal arts portion of the test. Einstein wrote his first scientific paper in 1895 on electro-magnetism and the propagation of light and heat. He was sent by his family to Aarau, Switzerland to finish secondary school and in 1896, received his diploma. Though he did not have enough credit to enroll in a traditional university, Einstein did qualify for the Federal Swiss Polytechnic University, in Zurich. Einstein was pleasantly surprised at the liberal education at the Polytechnic and began to discuss his scientific interests with a group of close friends. In 1900, Einstein was granted a teaching diploma by the Polytechnic and was accepted as a Swiss citizen in 1901. Upon graduation, Einstein wrote to many prominent European scientists to ask whether they needed an assistant, but received no replies. He finally accepted a position as technical assistant in the Swiss Patent Office, which he held for seven years.

In 1898, Albert met Mileva Maric, a Serbian classmate, and fell in love with her. He and Mileva (right) had an illegitimate daughter, Liserl, in January 1902 and they married on January 6, 1903. Einstein's marriage to Mileva, who was a mathematician, was both a personal and intellectual partnership; Einstein referred lovingly to Mileva as "a creature who is my equal and who is as strong and independent as I am". On May 14, 1904, Einstein's first son Hans Albert Einstein was born. Einstein's second son, Eduard, was born on July 28, 1910. However he and Mileva divorced on February 14, 1919.

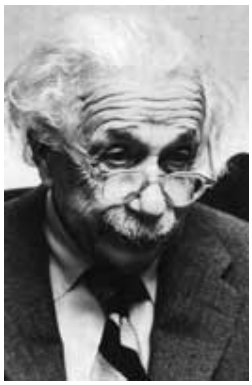
Einstein married his cousin Elsa Loewenthal on June 2, 1919. Elsa was Albert's first cousin (maternally) and his second cousin (paternally) and she was 3 years older than Albert. There were no children from this marriage.

In 1905 while still employed as a patents officer, Einstein earned a doctorate degree from the University of Zurich after submitting his thesis "On a new determination of molecular dimensions". That same year he completed an astonishing range of theoretical physics publications, written in his spare time without the benefit of close contact with scientific literature or colleagues. The first of the papers was on the quantum theory of light including an explanation of the photoelectric effect for which he was awarded the Nobel Prize in 1921. The second paper was on a statistical paper on Brownian motion, a proof for the existence of atoms. Other papers documented his reasoning on special relativity, which led to the famous equation $E = mc^2$. Further work on generalizing the special relativity theory led to the general relativity paper published in 1916. In this work on general relativity, Einstein concluded that gravity was not a physical force acting through space, but a characteristic of the geometry of space. The theory of general relativity revolutionized modern thinking on gravity, and Einstein himself once wrote "Newton, forgive me."

During World War I, Einstein lived in Germany and publicly expressed dissatisfaction with German militarism. He suggested that warfare be abolished and an international organization be set up to mediate between nations. From 1914 to 1933 he served as director of the Kaiser Wilhelm Institute for Physics in Berlin. After Adolf Hitler came to power in 1933, Einstein was accused by the National Socialist regime of creating "Jewish physics". Nazi physicists attempted to discredit his theories and Einstein fled to the United States. In 1935, Einstein was given permanent residency in the United States, he accepted a position at the Institute for Advanced Study in Princeton, New Jersey and became an American citizen in 1940.

After World War II, Einstein was a leading figure in the World Government Movement. He was offered the Presidency of the State of Israel, which he declined, and he collaborated with Dr. Chaim Weizmann in establishing the Hebrew University of Jerusalem. His work at Princeton focused on the unification of the laws of physics. Einstein undertook the quest for the unification of the fundamental forces and spent his time at Princeton investigating a grand unifying theory. He attempted to construct a model, under the appropriate conditions, which described all fundamental forces as different manifestations of a single force. His attempt was in a way doomed to failure because the strong and weak nuclear forces were not understood independently until

around 1970, 15 years after Einstein's death. Einstein's goal survives in the current drive for unification of the forces, embodied most notably by string theory.



Einstein died on April 18, 1955 in Princeton, New Jersey. After a long illness, he died peacefully in his sleep; the listed cause of death was a ruptured artery in his heart. By request in his will, there was no funeral, no grave, and no marker. His brain was donated to science and his body was cremated, the ashes spread over a nearby river. ■

name a telescope!

call from NASA

NASA is inviting members of the general public from around the world to suggest a new name for the Gamma-ray Large Area Space Telescope, otherwise known as GLAST, before it launches in mid-2008. GLAST is designed to probe the most violent events and exotic objects in the cosmos from gamma-ray bursts to black holes and beyond.

"We're looking for suggestions that will capture the excitement of GLAST's mission and call attention to gamma-ray and high-energy astronomy," says Alan Stern, associate administrator for Science at NASA Headquarters in Washington DC. "We hope someone will come up with a name that is catchy, easy to say and will help make the satellite and its mission a topic of dinner table and classroom discussion."

The telescope's key scientific objectives include:

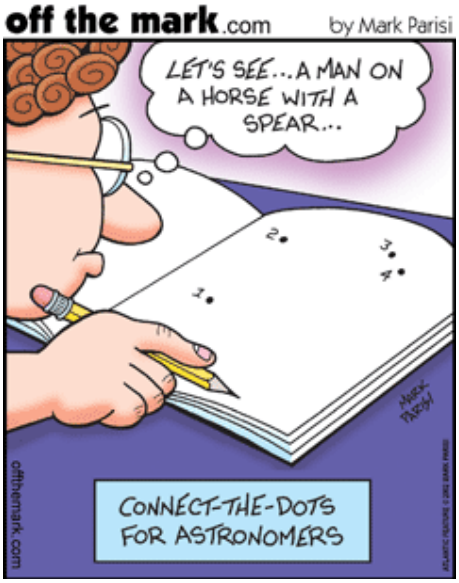
- Exploring the most extreme environments in the Universe, where nature harnesses energies far beyond anything possible on Earth
- Searching for signs of new laws of physics and what composes the mysterious dark matter

- Understanding how black holes accelerate immense jets of material to nearly light speed
- Cracking the mysteries of stupendously powerful explosions known as gamma-ray bursts
- Answering long-standing questions about solar flares, pulsars and the origin of cosmic rays

Suggestions for the mission's new name may be an acronym, but that is not a requirement. Any suggestions for naming the telescope after a scientist may only include names of deceased scientists whose names are not already used for other NASA missions. All suggestions will be considered. The period for accepting names closes on March 31, 2008. Participants must include a statement of 25 words or less about why their suggestion would be a strong name for the mission. Multiple suggestions are encouraged.

To submit a suggestion for the mission name, visit: http://glast.sonoma.edu/glastname

Anyone who drops a name into the "Name That Satellite!" suggestion box on the Web page can choose to receive a "Certificate of Participation" via return e-mail. Participants also may choose to receive the NASA press release announcing the new mission name. The announcement is expected approximately 60 days after launch of the telescope. ■



astro news: US missile hits spy satellite

NewScientist.com – 21 February 2008. *Image: US Navy*

A missile fired by a US Navy warship has hit the defunct US spy satellite that was slowly falling to Earth, the Pentagon says. USS Lake Erie fired the missile from the Pacific at about 0326 GMT Thursday (10:26 p.m. EST Wednesday). It had been feared that rough seas would thwart the mission.

The modified SM-3 ballistic missile was fired in an attempt to destroy the satellite's fuel tank. The Pentagon feared that toxic hydrazine inside could be hazardous to human health if the out-of-control satellite, USA 193, fell to Earth.

The Pentagon said it was "very confident that [they] hit the satellite", putting the chances that the tank had been breached at around 90%.

International concern

Russia and China have expressed concern, with Moscow suggesting the operation could be used as cover to test a new space weapon.

A Chinese state newspaper on Thursday accused Washington of hypocrisy for criticising other countries' space ambitions while rejecting a treaty proposed by China and Russia to ban weapons in space and firing the missile at the satellite.

"The Chinese side is continuing to closely follow the US action, which may influence the security of outer space and may harm other countries," Foreign Ministry spokesman Liu Jianchao told a news conference.

Space junk

The missile hit the 2270 kg (5000 lb), bus-sized satellite as it traveled through space at more than 27,400 kph (17,000 mph), the Pentagon said. "Due to the relatively low altitude of the satellite at the time of the engagement, debris will begin to re-enter the earth's atmosphere immediately," it added. "Nearly all of the debris will burn up on reentry within 24-48 hours and the remaining debris should re-enter within 40 days."

Some space experts have questioned the Pentagon's justification for the mission, saying the chances of any part of the satellite causing harm were extremely remote. But

Pentagon officials denied suggestions they wanted to destroy the satellite to prevent part of the classified spacecraft from falling into non-US hands.

They also reject accusations from security and space experts that the satellite problem was used as an excuse to test the Pentagon's ability to hit targets in space after an anti-satellite test by China in January 2007 that destroyed an obsolete weather satellite.

US defense officials say their case is different because Washington, unlike Beijing, informed the public and world leaders before shooting the missile. They insisted their only motivation was that the 450 kg (1000 lb) fuel tank could survive largely intact and release toxic gas.

The Pentagon operation used elements of its controversial missile defense system. But officials said that the mission is not a test for the system, adding that hitting a satellite is different from trying to shoot down a missile.

USA 193 was in a decaying orbit 247 km above the Earth. Launched in December 2006 for the National Reconnaissance Office, it stopped communicating within a few hours of reaching orbit. ■

astro news: Titan surpasses Earth's oil reserves

astronomy.com – 14 February 2008. *Artist's conception: Steven Hobbs*

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

"Titan is just covered in carbon-bearing material, it's a giant factory of organic chemicals," says Ralph Lorenz, Cassini radar team member from the Johns Hopkins University Applied Physics Laboratory. "This vast carbon inventory is an important window into the geology and climate history of Titan."

At a balmy 179° C, Titan is a far cry from Earth. Instead of water, liquid hydrocarbons in the form of methane and ethane are present on the moon's surface, and tholins probably make up its dunes. The term "tholins"was coined by Carl Sagan in 1979 to describe the complex organic molecules at the heart of prebiotic chemistry.

Cassini has mapped about 20 percent of Titan's surface with radar. Several hundred lakes and seas have been observed, with each of several dozen estimated to contain more

hydrocarbon liquid than Earth's oil and gas reserves. The dark dunes that run along the equator contain a volume of organics several hundred times larger than Earth's coal reserves.

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

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

Scientists estimated Titan's lake depth by making some general assumptions based on lakes on Earth. They took the average area and depth of lakes on Earth, taking into account the nearby surroundings, like mountains. On Earth, the lake depth is often 10 times less than the height of nearby terrain. "We also know that some lakes are more than 10 meters or so deep because they appear literally pitch-black to the radar. If they were shallow we'd see the bottom, and we don't," says Lorenz.

The question of how much liquid is on the surface is an important one because methane is a strong greenhouse gas on Titan as well as on Earth, but there is much more of it on Titan. If all the observed liquid on Titan is methane, it would only last a few million years, because as methane escapes into Titan's atmosphere, it breaks down and escapes into space. If the methane were to run out, Titan could become much colder. Scientists believe that methane might be supplied to the atmosphere by venting from the interior in cryovolcanic eruptions. If so, the amount of methane, and the temperature on Titan, may have fluctuated dramatically in Titan's past.

"We are carbon-based life, and understanding how far along the chain of complexity towards life that chemistry can go in an environment like Titan will be important in understanding the origins of life throughout the universe," adds Lorenz.

Cassini's next radar flyby of Titan is on February 22, when the radar instrument will observe the Huygens probe landing site. ■

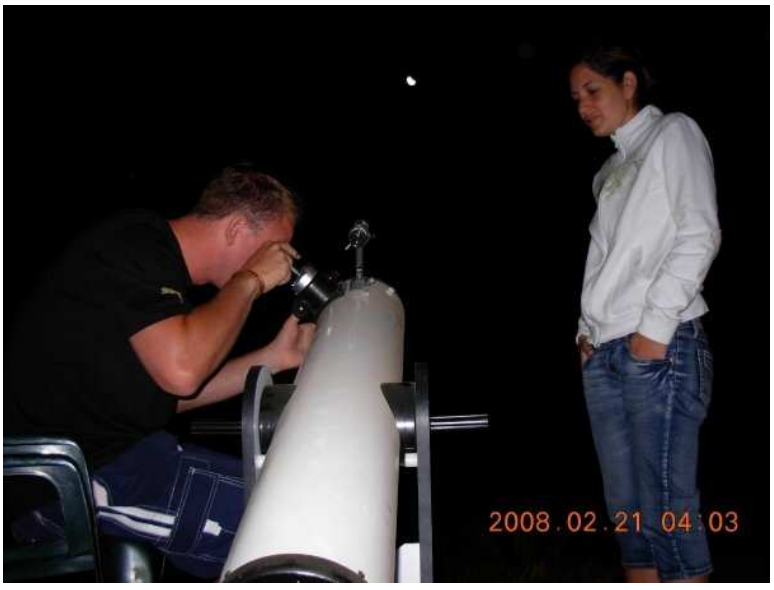
reader's pics

by Dale Finch

On Wednesday 20 February we had dinner and went to bed early, to catch some sleep before the eclipse. At 2:40am the alarm sounded and we got out of our warm beds to satisfy our curiosity… Could we see the first shadow over the moon? The answer was no and we could have slept another hour. Oh well, we live and learn.

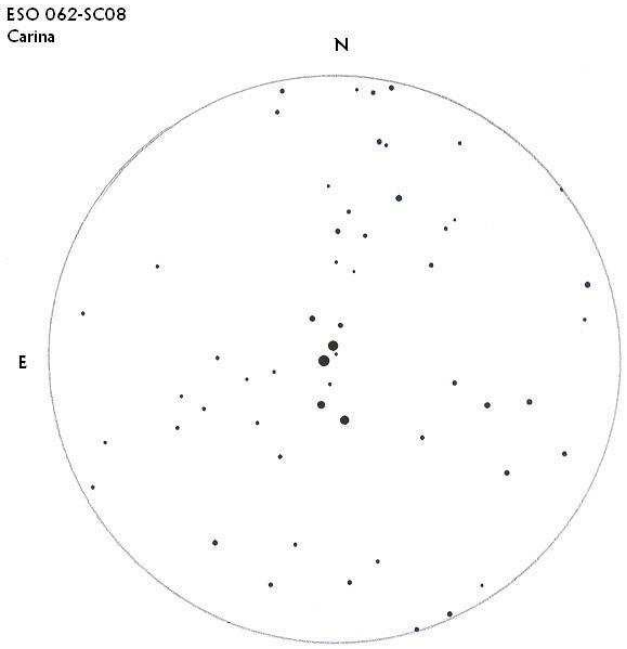
While we waited for the eclipse to start we turned to Saturn, we counted 5 of its satellites. A few minutes before 3:50 we started to see the beginning of the eclipse. We noticed the red tinge on the eclipse side of the moon at around 4:00. The challenge of taking photos was to let the camera focus on either the bright or dark half of the moon as the camera could not handle the vast contrast between the two shades.

Unfortunately the clouds started to set in around 4h45 and that was the end of the lunar viewing. Equipment used was a 6" Dobsonian reflector, a 1.25" 25mm eye piece, and a Nikon 7.2 mega pixel digital camera (no camera bracket). ■



focus on: the European Southern Observatory (ESO)

by Magda Streicher



The establishment of the European Southern Observatory (ESO) became a reality with the signing of an agreement on 5th October 1962. Only in 1963 was it decided to build the observatory in the Cerro Chincado mountains, high up on the slopes of Cerro La Silla. The location guaranteed a stable, dry climate, which would bring with it unbelievably clear night skies. The first ESO big eye telescope to observe the night skies in 1968 was the 1 m photometric telescope, followed shortly afterwards by the 1.5 m spectroscopic telescope. From South Africa a Double Astrograph was shipped to La Silla. By 1976 six countries had already invested in the project and the 3.6 m telescope, the largest, saw first light. The ESO is now recognised as one of the world's largest giants keeping a watch on the universe (Laustsen, Madsen and West).

Tackling different projects is a challenge, and the ESO clusters are a challenge I have been taking on over the past three years. They are in a class of their own which could most aptly be described as obscure. I am privileged to be able to share these observations with you on a monthly basis, and since I am Afrikaans speaking I am pleased to have translator and copy-editor Nicky Grieshaber as my ally, without whose assistance this would be a lot more difficult.

ESO 062-SC08 - CARINA
RA: 10h21m.7 - DEC: -69^{o}20'00" - Magnitude: 9 - Size: 5'
Telescope: 12" – 218x – FOV - 23.1'

The particular grouping in the Carina constellation remains something quite special to me, as it is one of the first ESO clusters I ever observed, hence my addiction to the slavish seeking out of these tiny, peerless, mystical clusters.

Seven outstanding stars in an N-S direction with various stars between magnitudes 8 and 9. The group consists mainly of yellow stars, with the brightest being the orange-coloured 8th-magnitude HD 9012 1 star situated more or less in the centre of the group.

This stringy little group is by far one of the more fascinating groupings in the ESO open clusters list. Viewed in a special way, the grouping has the shape of the letter Z.

Great Observatories hold a special charm for me, and so do these little star groupings with the sense of mystique that surrounds them.■

Object	Bright Star	Type	RA	Dec	Mag	Size
ESO 062-SC08	HD 9012 1	Open Cluster	10.21.7	+69◦ 20’	9	5’

Evening view of the La Silla Observatory. Credit: ESO www.eso.org

canopus classifieds

For Sale:
Geoptic Formula 20
Syn Scan
HEQ5/Mount
R10 000 (onco)

Contact Sakkie van de Merwe on 082 442 8686

the sky this month

site location: lat. **26.0 deg S** long. **28.0 deg E** local time = UT **+2.0 hrs**.

march 2008

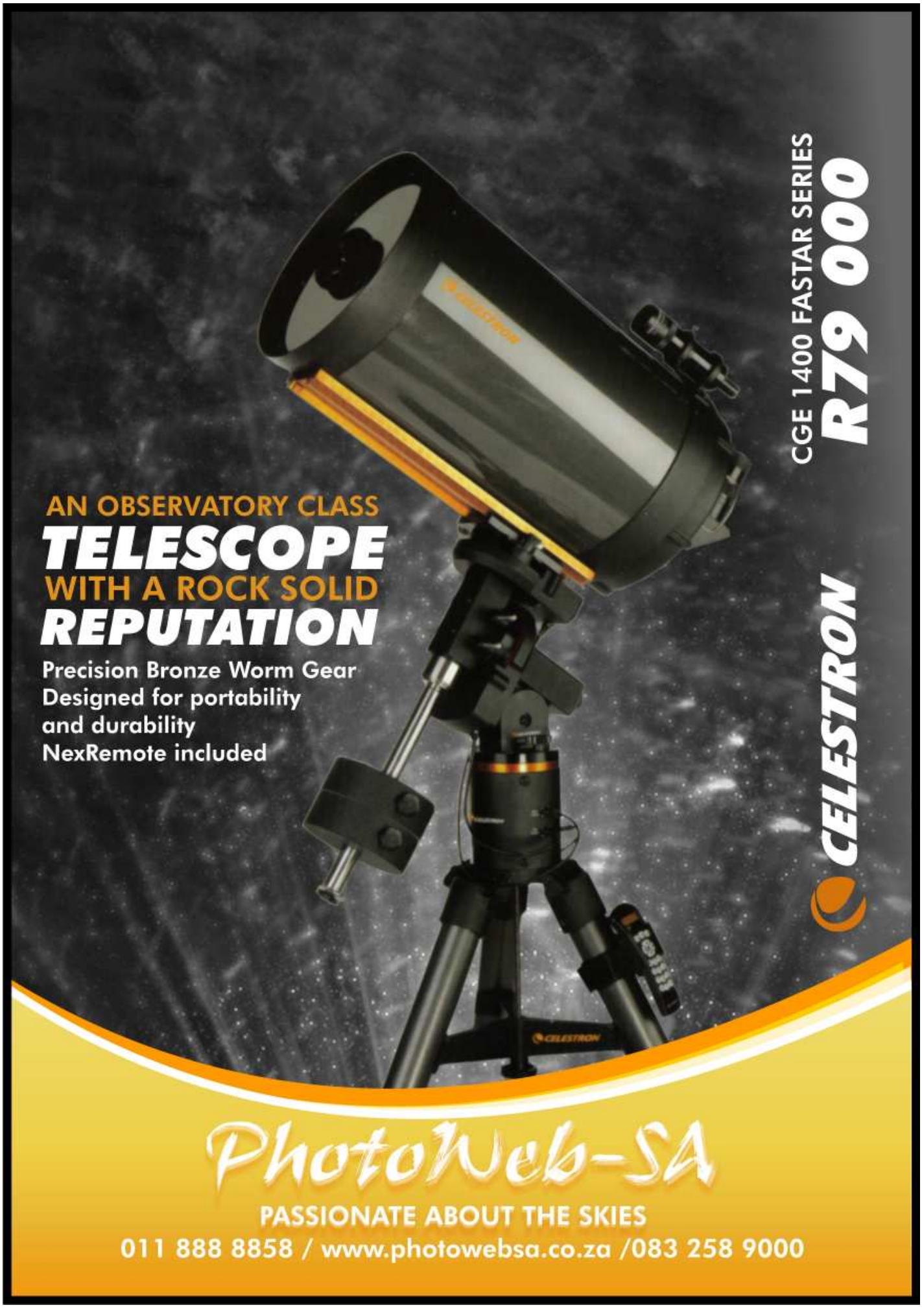
dd	hh			dd	hh		
3	02	Jupiter 3.6N of Moon		16	14	Pollux 3.8N of Moon	
3	14	Mercury greatest elong	W(27)	19	08	Regulus 0.7N of Moon	Occn
5	15	Mercury 0.1N of Moon	Occn	19	14	Saturn 2.4N of Moon	
5	20	Venus 0.3S of Moon	Occn	20	06	Equinox	
5	22	Neptune 0.1N of Moon	Occn	21	19	FULL MOON	
7	01	Venus 0.6S of Neptune		23	15	Spica 2.2N of Moon	
7	18	NEW MOON		24	13	Mercury 1.0S of Venus	
7	20	Uranus 2.6S of Moon		26	19	Moon at apogee	
8	21	Uranus at conjunction		27	11	Antares 0.5N of Moon	Occn
9	09	Mercury 0.9S of Neptune		27	20	Mercury 1.6S of Uranus	
10	21	Moon at perigee		28	24	Venus 0.7S of Uranus	
14	11	FIRST QUARTER		29	22	LAST QUARTER	
15	04	Mars 1.6S of Moon		30	18	Jupiter 3.1N of Moon	

april 2008

dd	hh			dd	hh		
2	09	Neptune 0.1S of Moon	Occn	15	17	Saturn 2.4N of Moon	
2	09	Pluto stationary		16	07	Mercury superior conjunction	
4	08	Uranus 2.8S of Moon		19	22	Spica 2.2N of Moon	
4	22	Venus 4.2S of Moon		20	11	FULL MOON	
5	09	Mercury 5.2S of Moon		23	07	Moon at apogee	
6	04	NEW MOON		23	18	Antares 0.3N of Moon	Occn
7	20	Moon at perigee		27	04	Mars 4.8S of Pollux	
12	06	Mars 1.2S of Moon	Occn	27	06	Jupiter 2.7N of Moon	
12	19	FIRST QUARTER		28	15	LAST QUARTER	
12	19	Pollux 3.9N of Moon		29	20	Neptune 0.3S of Moon	Occn
15	14	Regulus 0.9N of Moon	Occn				

local times of rise and set for the sun & major planets

Date	Sun	Mercury	Venus	Mars	Jupiter	Saturn
	Rise Set	Rise Set	Rise Set	Rise Set	Rise Set	Rise Set
Mar 1	05.49 18.43	03.39 17.25	03.44 17.32	14.42 0.06	01.26 15.51	18.28 5.29
Mar 11	05.58 18.29	03.51 17.24	04.05 17.31	14.16 23.41	00.54 15.18	17.46 4.45
Mar 21	06.07 18.15	04.19 17.27	04.26 17.26	13.52 23.20	00.21 14.44	17.05 4.02
Mar 31	06.15 18.01	04.59 17.30	04.46 17.19	13.30 23.01	23.48 14.09	16.23 3.20
Apr 10	06.23 17.47	05.50 17.35	05.06 17.11	13.08 22.43	23.13 13.34	15.42 2.38
Apr 20	06.31 17.34	06.53 17.45	05.26 17.03	12.47 22.28	22.37 12.57	15.02 1.57
Apr 30	06.39 17.23	07.57 18.01	05.46 16.56	12.26 22.14	22.00 12.19	14.22 1.17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