april 2009

canopus

monthly newsletter of the johannesburg centre of assa

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

Comet Lulin moving against a stationary background of stars, 25 February '09. Photograph by Lucas Ferreira

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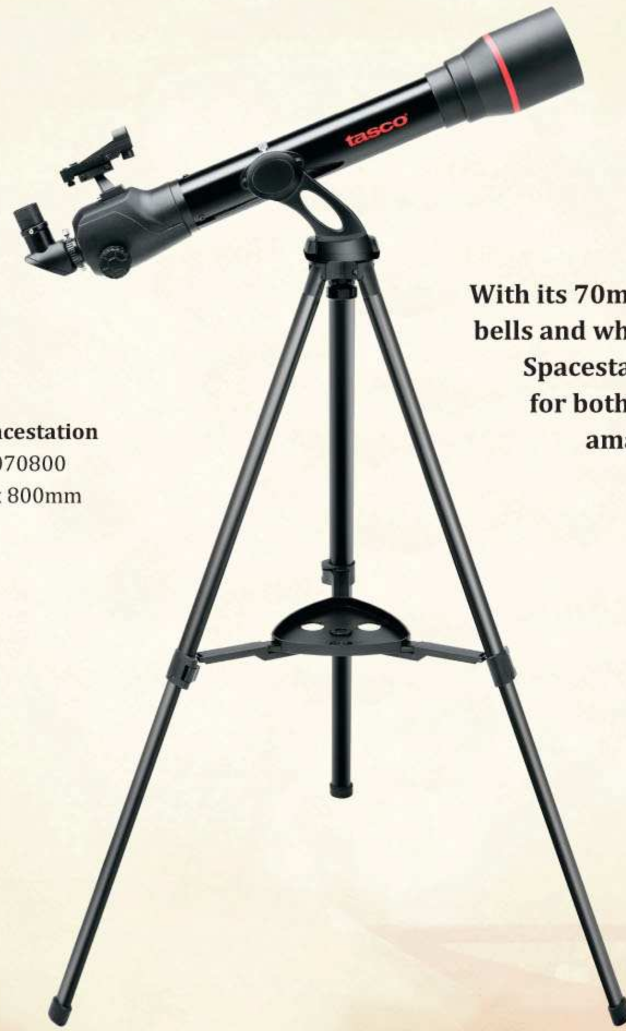

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notice of next meeting – assa johannesburg

The next 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, 8 April 2009 at 20h00:

Guest Speaker: Gil Jacobs on

"Visual Binary Star Orbits –
Homage to the Johannesburg Observatory"

assa johannesburg calendar

Date	Event	Details
1 April	LECTURE SERIES	**Observatory @ 18:30 – The Life Cycle of Stars, Lecture 4: Late Stages of Stellar Evolution I**
2-5 April	100 Hours of Astronomy	**Observatory all weekend**
4 April	Committee Meeting	**Observatory @ 14:00**
8 April	LECTURE SERIES	**Observatory @ 18:30 – The Life Cycle of Stars, Lecture 5: Late Stages of Stellar Evolution II**
8 April	MONTHLY MEETING	**Observatory @ 20:00 – GIL JACOBS**
15 April	LECTURE SERIES	**Observatory @ 18:30 – The Life Cycle of Stars, Lecture 6: Black Holes & Revelations**
1 May	Stargazing Evening	**Witwatersrand Botanical Gardens @ 18:00**

assa johannesburg committee members 2008/2009

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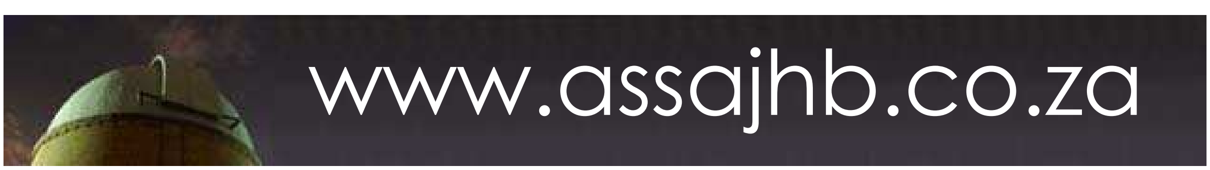
The Committee welcomes the following new members who joined the Centre over the past two months:

James Matthews (1134)
Joseph Viljoen (1135)
Shawn Belluigi (1136



editorial

by Claire Lee (photo by Emil von Maltitz, www.limephoto.co.za)

The 20th of March marked the autumnal equinox, and one can definitely feel the change in season in the mornings and evenings. Autumn brings with it a nip in the air, a red-and-orange hued blanket over our metropolitan forest, and, hopefully, a break from the interminable rain that has seen us through the summer.

I was doing some reminiscing with a friend of mine the other day about the "good old days" back in undergraduate physics, and the fun we had together as a class. The ensuing chaos and disorder culminated in our Honours year, and provided us with memories and stories that we will dine out on for the rest of our lives. The April edition of these was a hike in the Drakensberg with our Electromagnetism and General Relativity lecturer, who is an astrophysicist. The planning started a few weeks before the excursion, with a handout entitled "The Galaxy's Guide to Hitchhiking" which you may (ought to!) recognise as a pun on the Douglas Adams series.

We left at the crack of dawn one brisk April morning and headed down to the 'berg in a couple of cars. I think we got to the starting point around noon, kitted up, signed in, filled our water bottles, and had a debate as to whether or not we should take the telescope with us. There was a comet that was observable at the time (I think it was comet NEAT, C/2001 Q4, but correct me if I am wrong) but it was eventually decided that the disadvantages of lugging a 4-inch scope up and down a mountain outweighed the observational experiences it would provide. At any rate, we had binoculars.

That afternoon we made it through a section aptly named "the Mud Slide", because that's what it was, and camped on a gently sloping hill with a fantastic view of the sky. We pitched our tents, made a fire and cooked dinner, and bundled ourselves up in as many layers as we had brought with us because it was freezing! The skies were fantastic – more stars than the planetarium could produce – and we had some lovely cometary viewing before heading off to bed.

The next morning we awoke in a sea of fog, and after breakfast made the long and gruelling hike up to the chain ladders. The amphitheatre (photo) was our ultimate destination, and to get there we needed to climb up two ladders of 40m and 20m each, made of chain links and nailed to a cliff face. By the time my two friends and I (who were trailing the pack of enthusiastic guys) got there it was dark, so we camped in the crevice at the foot of the ladders for a particularly blustery night. The next morning we made it to the top, and spent the day relaxing and exploring the top of the amphitheatre, and in the evening, sitting around the fire, we watched a spectacular sun set on our final night in the mountains. ■

chairman's chat

by Robert Groess

By 1930, the global village was already a real (if comparatively quaint) construction. These are the words of Alan Stern and Jacqueline Mitton, in their book about Clyde Tombaugh and the Lowell Observatory in Flagstaff Arizona. My story today however, is not about them. My story **is** about the global village, which today is more a village than most people may realise. What was once isolated by vast distances is now a short flight by jet aeroplane. What once took months and months to communicate across the miles is today transmitted at the speed of light. These were the thoughts going through my mind as I took the Southern service (train) from Chichester back to London Victoria station after visiting Sir Patrick Moore at his home in Selsey, Sussex.

I was privileged to enjoy sandwiches and orange juice, later to be replaced by a particularly fine glass of red wine, all in the good company of Sir Patrick, in the very office where most of his books have been wordsmithed into existence on his trusty old typewriter – now replaced by a computer with a banner above reading, "If you can read this… you are not partying enough." It was likewise a treat to meet John Mason, editor of the legendary yearbooks of astronomy, along with the trusty team which are always at Sir Patrick's aid. Oh and not to forget, his two cats, Ptolemy and Jeanie! On the day of my visit, the team were feverishly preparing for a St. Patrick's Day party which was being thrown that evening. And if the words of that big banner are anything to go by, we can only but guess that the party was a howling success. Just before being whisked away by his good driver, I was assured that our editions of Canopus, which get sent as far afield as Selsey, are making their way across the miles.

Much closer to home, Claire Lee had the first of her lecture series on the Life Cycle of Stars, on the evening of the March monthly meeting. Interest in this attracted enough people to fill the front half of the lecture auditorium. Juicy topics include the various stages that stars go through during their life cycle. And if you don't know what the ZAMS is, then you've just got to attend! To really sweeten the pot, the lecture series will be wrapped up with a tantalising treatise on Black Holes with a spin on General Relativity. The lectures are weekly, every Wednesday at the Observatory, starting at 18:30, and last about an hour. There is something for everyone, beginners and advanced alike.

And so, as I prepare for the London launch of David Block's book, Shrouds of the Night, I would like to remind you all that it's the International Year of Astronomy. If you are having any astronomically related events, and of particular interest, star parties or viewing sessions, please take a register of who has attended and pass it on to me, Centre Rep of IYA2009 South Africa. I will compile a list of statistics and let you know how we are doing!

And so until next month, Robert. ■

stargazing evening at the observatory

by Lerika Cross & Alec Jamieson

This is the 3rd year that members of the Johannesburg and Pretoria Centres of ASSA assisted young Voortrekkers to obtain their astronomy badges. On 20 February Johan Smit (of ASSA Pretoria) gave an explanation of how lenses and light work together in a telescope. His demonstration of a telescope made out of his glasses, a magnifying glass and a cardboard box summed up his lecture very well. There was a lively atmosphere and Johan had many questions to answer.

After the lecture, Chris Curry, Rodney Hyman and Alec Jamieson assisted Johan in showing the night sky to the 80-odd youngsters using the Innes and other telescopes at the Johannesburg Observatory. Alec enjoyed the comment made by a girl upon seeing the crescent Venus for the first time through a telescope: "dit lyk nes 'n piesang!". All in all, a very successful outreach evening. ■

list of books donated to the ASSA-Jhb library

by Alec Jamieson, ASSA-Jhb Librarian

The committee wishes to thank John Barsby for his generous donation of books to the library. John Barsby's donation is greatly appreciated, and the books have been added to the ASSA Jhb Centre library catalogue, where they can be easily located by library users. ■

Dewey No.	Dewey Category & Title	Author (first)	Print Date	Library Shelf No.
520	**Astronomy - Comprehensive Works**			
	Stars and Planets	Abetti, Giorgio	1945	2
	Outlines of Astronomy, 11th Edition	Herschel, Sir John F. W.	1871	Old Books
	History of Astronomy, A	Pannekoek, A.	1961	3
	Astronomy	Russell, H. N.	1938	3
	Foundations of Astronomy	Smart, W. M.	1953	3
522	**Practical Astronomy Techniques, procedures, apparatus, equipment, materials**			
	Observation in Modern Astronomy	Evans, David S.	1968	5
	Positional Astronomy	McNally, D.	1974	5
	Practical Astronomy	Schroeder, W.	1956	5
522.2	**Astronomical instruments – Telescopes**			
	Men, Mirrors and Stars	Pendray, G. Edward	1935	6
522.62	**Photometry**			
	Photoelectric Astronomy for Amateurs	Wood, Frank B.	1963	7
522.7	**Spherical Astronomy**			
	Textbook on Spherical Astronomy	Smart, W. M.	1965	7
523	**Specific celestial bodies and phenomena**			
	Atlas Australis 1950.0	Becvar, Antonin	1964	7.17
523.1	**The universe, galaxies, quasars**			
	Messier's Nebulae and Star Clusters	Jones, Kenneth Glyn	1968	9
523.3	**Moon**			
	Guide for Observers of the Moon	Various	1974	10
523.7	**Sun**			
	Sun and the Amateur Astronomer, The	Baxter, W. M.	1963	11
523.844	**Variable stars**			
	Variable Stars	Glasby, John S.	1968	12
	Manual for Observing Variable Stars	Mayall, Margaret W.	1970	12

HMO radar research at SANAE soon back on track

from www.eepublishers.co.za

The Hermanus Magnetic Observatory (HMO) operates a high frequency radar system at the South African Antarctic base as part of the SuperDARN network of auroral region radars. In June 2008 a massive storm with winds of up to 180 kph destroyed the antennas. Currently a team from the HMO is at the base to reconstruct the antennas but it looks as if the weather, even if it is the Antarctic summer, is not helping the team members achieve their goals.

The super dual auroral radar network (SuperDARN) is an international collaborative network of HF radars that monitor ionospheric plasma convection over the majority of the northern and southern polar regions. SuperDARN comprises fourteen radars in the northern hemisphere and seven radars in the southern hemisphere. South Africa's involvement in SuperDARN is through the southern hemisphere auroral radar experiment (SHARE) which is a collaboration involving the University of KwaZulu-Natal, the North-West University, the British Antarctic Survey in Cambridge (UK), the John Hopkins University Applied Physics Laboratory in Baltimore (USA) and the HMO.

The main objective of SuperDARN is to measure ionospheric plasma convection with relatively high spatial and temporal resolution on a global scale. The overlapping fields of view of the radar pairs provide independent plasma drift measurements in two directions. Each of the radars in the SuperDARN pair has a 16-beam field of view so the radar pair has in principle 256 beam intersection cells, Each beam measures the protection of the full velocity vector onto the beam and from the two overlapping velocity measurements the full vector can be reconstructed or "merged"

Lindsay Magnus and his HMO team left for the SANAE base in December on board the research ship SA Agulhas for a three-month stay to effect the repairs and get the radar back into operation.

Speaking on satellite phone, Magnus gave a laymen's explanation of the purpose of the radars and why they are so important in propagation research.

"The radars transmit HF pulses into the ionosphere at an oblique propagation path, not straight up like an ionosonde. The radar pulses are reflected off patches in the ionosphere which are tied to the earth's magnetic field. As the earth's magnetic field is disturbed these patches move through the ionosphere and we are then able to pick up that movement with the radar.

"As changes happen in the earth's magnetic field these patches move around in the polar ionosphere. What the radar does is to use these patches as targets to see how they move, in what direction and at what velocity which then gives us a good picture of what is going on in the magnetic field, and that tells us what is going on in space.

"The reason we are doing this kind of research in the polar region is because the magnetic field lines from the polar regions are the ones that travel furthest out into space. It is at the boundary where the earth's magnetic field starts interacting directly with the interplanetary space environment that the field lines converge in the polar region. It gives us direct access to the deepest regions into space we can see."

One of the remarkable results of the velocity data was the radar's ability to measure and characterise Pc5 field-line resonant pulsations. Although the structure and characterisation of these events is well-known, the cause and propagation mechanism is still a topic of much debate.

A co-ordinated investigation involving HF –radar, magnetometer and satellite data is being carried out in order to better understand these dynamics.

The question is always: why do we want to do this? Why are researchers so interested in space weather to the point that last year the HMO was appointed as the space weather centre for Africa? Understanding and predicting conditions in space is important for manned space missions, the management and planning of satellite systems and HF radio propagation. The SuperDARN project is an important element in this process and bringing the radars at the SANAE base back into operation is welcomed by the collaborating institutions world-wide.

Acknowledgement: *P Cilliers, African Skies October 2006* ■

NASA planet hunter to search out other earths

by Anna Bogdanowicz

The Kepler satellite, scheduled to launch this month, will spend more than three years hunting for planets that might support life.

For centuries, humans have looked up at the sky and wondered if they were alone in the universe. Now we're one step closer to finding an answer. On 6 March, NASA's first planet-hunting spacecraft, Kepler, will embark on a three-and-a-half-year journey in search of Earth-like planets outside our solar system. Kepler is the first space telescope capable of discovering such planets orbiting in a distant solar system's habitable zone—the area in which liquid water, and possibly life, can exist.

PHOTO: KIM SHIFLETT/NASA

"We're at the threshold of answering questions that date back to the ancient Greeks," says James Fanson, Kepler project manager at NASA's Jet Propulsion Laboratory, in Pasadena, Calif. Although astronomers have found more than 330 planets in other solar systems, none of these planets have the size and location believed necessary to support life.

Named for the 17th-century astronomer who discovered the laws of planetary motion, Kepler will orbit the sun instead of the Earth. The craft will focus on about 100 000 stars between the Cygnus and Lyra constellations. (To find this area, in the Northern Hemisphere, look for a triangle of the three brightest stars in the summer sky, which make up the Cygnus constellation. If you make a square with your hands and hold them at arm's length in the direction of the constellation, you'll see the area Kepler will explore.) Kepler will find planets using the "transit method," looking for periodic slight dips in the brightness of stars that can signal a planet orbiting a star.

"Kepler was a technically difficult challenge," Fanson says. It took nearly 25 years to go from a far-off dream to reality. The mission is the brainchild of Bill Borucki, Kepler's principal science investigator at NASA Ames Research Center, at Moffett Field, Calif. "Bill proposed the mission several times, but the reviewers were skeptical," Fanson says. "When an Earth-size planet passes a star, brightness only dims by 84 parts per million. Many thought the technology wasn't available to measure that, and it took years for scientists to prove it was possible."

"We didn't have the detector technology 25 years ago to make those kinds of measurements," says Riley Duren, chief engineer for Kepler. But in the past decade, charge-coupled devices (CCDs) with the parameters needed for finding other Earths have been demonstrated in the laboratory. Kepler uses the latest detectors but didn't require inventing new technologies. "We didn't have to reinvent the wheel," says Duren. "We just took the best CCDs and made custom versions, and then we built custom electronics and software to get the most out of our system." The result? A telescope that's the equivalent of a 95-megapixel camera—the largest ever flown in space—made up of 42 CCDs, each with a bit more than 2 megapixels.

Ball Aerospace & Technologies Corp., in Boulder, Colo., the contractor responsible for building Kepler, began work on the US $500 million mission in 2002. The engineers had to face many challenges: keeping the camera pointed accurately enough so that the stars remained motionless in the images, creating a large field of view to increase the chances of finding stars with orbiting planets, and implementing low-noise electronics to make it possible to read data from the CCDs, according to John Troeltzsch, Ball Aerospace program manager for civil space systems.

“The specification for our pointing accuracy is 9 milliarc seconds of drift over 15 minutes,” Troeltzsch says. That drift is only about 1/56th of the angle resolved by a good ground-based telescope. There aren’t many disturbances in space, except for the solar wind pushing up against Kepler’s photovoltaic panels. To make sure the telescope doesn’t move, four CCDs in the camera monitor the position of 24 stars continuously. If those stars move in the field of view, a control system repositions the telescope.

Building a 1-meter-diameter telescope with a field of view 33 000 times as great as that of the Hubble Space Telescope was no easy undertaking, but that large field of view was absolutely necessary. Planetary orbits are randomly oriented in the sky. In order to see a transit, your line of sight must precisely match up with the plane of the orbit. The more stars you see, the more likely you are to find one with the right orbital plane. The array of CCDs in Kepler’s camera form a focal plane of 900 square centimeters.

Behind that focal plane is a 0.5-meter box containing more than 20 000 electronic components. “The difficulty was designing all those parts to be low noise and maintain performance in a radiation environment,” Troeltzsch says. “It was eight years of putting designs together and seeing if they’d work.” Part of the solution was to operate the camera at –85 °C, which helped reduce the noise.

Once a month, Kepler will turn toward Earth to align a fixed high-gain antenna and transmit its data to NASA’s Deep Space Network (DSN). The DSN is an international network of antennas that supports the agency’s interplanetary spacecraft missions and radio and radar astronomy observations. Scientists at the Ames Research Center will then analyze the results to verify any possible planets. Kepler will also rotate once every 90 days to keep its solar panels directed at the sun.

Planet hunting has been around for more than a decade, but it’s been done mostly from the ground. Kepler isn’t even the first spacecraft to search for planets. In 2006, the French space agency, CNES, launched the Convection Rotation and Planetary Transits (COROT) mission, but it was never expected to find Earth-like planets. Unlike Kepler, COROT orbits Earth, which partly obscures the view of the sky from the craft. This means that COROT can observe a patch of sky for only weeks at a time, not years. “In order to have a firm detection of a planet, we need to see at least three orbits so we can verify that we see a body moving in a fixed orbital period,” Fanson says. “To find planets like Earth, which take a year to go around a star, you need to observe the same stars for three to four years.” Also, compared with Kepler, COROT is much smaller, less sensitive, and has a smaller field of view.

Fanson, Duren, and Troeltzsch say that even if Kepler finds no Earth-like planets, that itself will be a monumental discovery—the fact that planets like ours are rare. But the researchers don't think that will be the case.

"I'm an optimist, and I hope the galaxy is filled with many Earth-like planets," Fanson says, adding that the Kepler mission is the highlight of his long career at the agency.

"I've been working for NASA for 25 years and have been involved in many exciting missions, including being on the team that fixed the Hubble Space Telescope," Fanson says. "But this is the most exciting one, because we have the chance to answer a question that has been in the minds of people for as long as we have records." ■

newfound moon may be source of outer Saturn ring

by Carolina Martinez & Joe Mason, NASA News Release, 3 March 2009

NASA's Cassini spacecraft has found within Saturn's G ring an embedded moonlet that appears as a faint, moving pinprick of light. Scientists believe it is a main source of the G ring and its single ring arc.

Cassini imaging scientists analyzing images acquired over the course of about 600 days found the tiny moonlet, half a kilometer (about a third of a mile) across, embedded within a partial ring, or ring arc, previously found by Cassini in Saturn's tenuous G ring.

"Before Cassini, the G ring was the only dusty ring that was not clearly associated with a known moon, which made it odd," said Matthew Hedman, a Cassini imaging team associate at Cornell University in Ithaca, N.Y. "The discovery of this moonlet, together with other Cassini data, should help us make sense of this previously mysterious ring."

Saturn's rings were named in the order they were discovered. Working outward they are: D, C, B, A, F, G and E. The G ring is one of the outer diffuse rings. Within the faint G ring there is a relatively bright and narrow, 250-kilometer-wide (150-miles) arc of ring material, which extends 150,000 kilometers (90,000 miles), or one-sixth of the way around the ring's circumference. The moonlet moves within this ring arc. Previous Cassini plasma and dust measurements indicated that this partial ring may be produced from relatively large, icy particles embedded within the arc, such as this moonlet.

Scientists imaged the moonlet on Aug. 15, 2008, and then they confirmed its presence by finding it in two earlier images. They have since seen the moonlet on multiple occasions, most recently on Feb. 20, 2009. The moonlet is too small to be resolved by Cassini's cameras, so its size cannot be measured directly. However, Cassini scientists estimated the moonlet's size by comparing its brightness to another small Saturnian moon, Pallene.

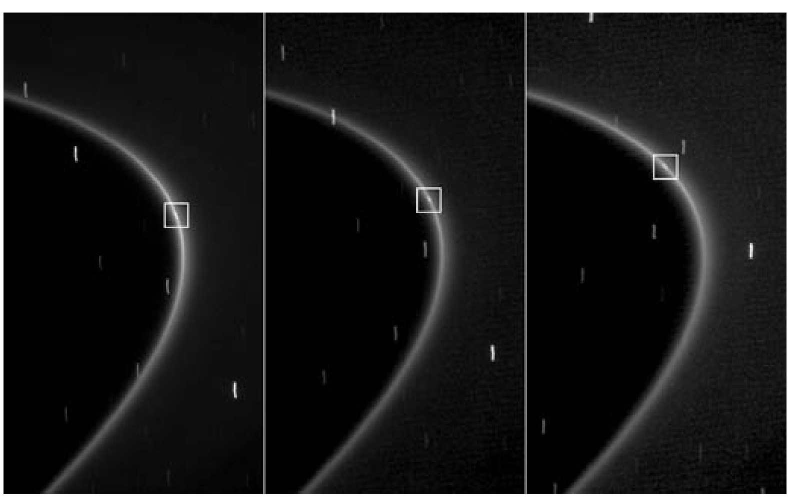
Hedman and his collaborators also have found that the moonlet's orbit is being disturbed by the larger, nearby moon Mimas, which is responsible for keeping the ring arc together.

This brings the number of Saturnian ring arcs with embedded moonlets found by Cassini to three. The new moonlet may not be alone in the G ring arc. Previous measurements with other Cassini instruments implied the existence of a population of particles, possibly ranging in size from 1 to 100 meters (about three to several hundred feet) across. "Meteoroid impacts into, and collisions among, these bodies and the moonlet could liberate dust to form the arc," said Hedman.

Carl Murray, a Cassini imaging team member and professor at Queen Mary, University of London, said, "The moon's discovery and the disturbance of its trajectory by the neighboring moon Mimas highlight the close association between moons and rings that we see throughout the Saturn system. Hopefully, we will learn in the future more about how such arcs form and interact with their parent bodies."

Early next year, Cassini's camera will take a closer look at the arc and the moonlet. The Cassini Equinox mission, an extension of the original four-year mission, is expected to continue until fall of 2010.

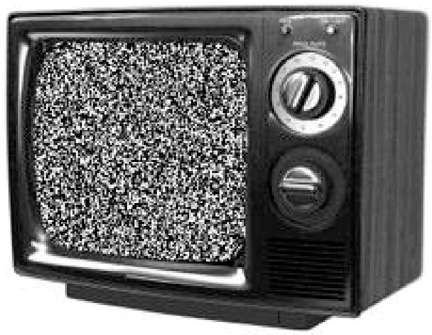
The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute, Boulder, Colorado. ■



This sequence of three images, obtained by NASA's Cassini spacecraft over the course of about 10 minutes, shows the path of a newly found moonlet in a bright arc of Saturn's faint G ring. In each image, a small streak of light within the ring is visible. Unlike the streaks in the background, which are distant stars smeared by the camera's long exposure time of 46 seconds, this streak is aligned with the G ring and moves along the ring as expected for an object embedded in the ring.

the switch to digital switches off big bang TV signal

by Nicholos Wethington



The switch from analog to digital television broadcasting signals in the United States , which was originally scheduled for February 17th, has been postponed until June 12th, 2009. To those anticipating the higher-quality picture and more reliable signal that this switch will afford, the delay is surely a downer, though some stations may begin broadcasting digital signals before this date. You may be surprised, though, that the change in signal may no longer allow you to see leftover radiation from the Big Bang in the static on your television screen.

That's right - when you are between channels on an analog television, the snow that you see on the screen is made up of interference from background signals that the antenna on your TV is picking up. Some of the "snow" is from other transmissions here on Earth, and some is from other radio emissions from space. Part of that interference - about 1% or less - comes from background radiation leftover from the Big Bang, called the Cosmic Microwave Background (CMB). The same is true for FM radios - when the radio is tuned to a frequency that is between stations, part of the hiss that you hear, called "white noise", is leftover radiation from the Big Bang some 13.7 billion years ago.

In other words, your TV and radio are telescopes, good for receiving transmissions here on Earth, but really, really bad telescopes for viewing the Universe (a 1:100 signal-to-noise ratio is pretty poor). Why does your TV or radio allow you to tune into the Big Bang, however poorly? Analog television signals are basically radio waves that your television picks up, decodes, and turns into an image on your television using what's called a cathode ray tube (CRT) in older televisions, and in newer TVs, plasma displays.

These analog signals are broadcast between 7-1002 Mhz, and TV tuners are designed to receive in this range. The CMB peaks in the microwave, at around 160 Ghz, but the frequency of CMB photons can be lower than 100 Mhz (.1 Ghz). Your television antenna is constantly being bombarded by these signals, but when it's tuned to a specific station the overwhelming intensity of the signal at that frequency makes a crisp picture on your screen, and drowns out everything else. When your TV or radio isn't tuned into a channel that is broadcasting clearly, it picks up whatever radio transmissions are available and displays those transmissions as the black and white static that is oh-so annoying when you are trying to acrobatically align your TV antenna and stand in just the right place to clearly show your favorite program.

Arno Penzias and Robert Wilson in front of the Horn Antenna. Image Credit: AIP Niels Bohr Library

Digital signals eliminate the interference while watching a program because instead of broadcasting the picture as a radio wave which communicates to the CRT or plasma screen what to "paint" on the screen by the frequency of the signal, all a digital signal communicates is a 1 or 0, and the digital converter takes care of decoding and sending information as to what the picture and sound on your screen should look like.

In fact, it was annoying "noise" that led to the discovery of the Cosmic Microwave Background in the first place. In 1965, Arno Penzias and Robert Wilson had built a Dicke radiometer for Bell Telephone Laboratories to use in radio astronomy and satellite communication experiments. Their instrument kept receiving a background signal that they could not account for. After trying everything imaginable to eliminate the noise (including removing the pigeon droppings from the telescope), they finally realized that the signal wasn't "noise", but photons from the Big Bang. Penzias and Wilson share the 1978 Nobel Prize in physics for this discovery, and the CMB has since been studied as a way to learn more about the beginnings of the Universe.

Televisions manufactured after March 1, 2007 for the U.S. are required to have Digital Television (DTV) tuners or be DTV ready. Some broadcasters are already transmitting TV programs in both analog and digital formats, but they will all be required to broadcast only in digital format after June 12, 2009. If you have an older television that doesn't contain a built-in DTV tuner, you will have to buy a digital converter box. So, if you want to see static created by the CMB, unplugging the converter after June 12th will suffice. If you have a newer TV that only has a digital tuner, you will sadly be unable to experience that small percentage of influence the ancient event of the Big Bang has on something quotidian as the television in your living room. ■

canopus classifieds

Telescope for Sale: Orion SkyView Deluxe 8" EQ, as new. I used it about 8 times. Complete with a wooden box, which I built for its protection Can be viewed at my home in Fairland (JHB).

Asking price R 5 100.

Contact Paul Námer: 011 476 6666, 083 308 3860, or pnamer@iburst.co.za ■

the elusive Herbig-Haro objects

by Magda Streicher. Photo credit: NOAO/AURA/NSF

Faint nebulosity is something that is always a challenge to search out, but it takes a lot of willpower and determination to detect faint objects. No effort can be spared – from averted vision, the highest power possible for your telescope, available filters and the darkest skies possible. Depending on the type of nebula, filters can sometimes be the clinching factor with a positive observation. According to Professor Derck Smits of Unisa, Herbig-Haro objects are shock-excited nebulae associated with stars in the stage of evolution, with masses less than about 4 solar masses. Jets of material, ejected at velocities up to 400 km/s, from the young stellar object (YSO) impact the interstellar medium (ISM), creating a shock front that ionises the gas and produces optically visible nebulae.

The subject of this essay is the very elusive and faint Herbig-Haro objects close to and around NGC 1999, inspired by a challenge from my friend Derck, which I took up without hesitation. It has turned out to be by no means an easy task, but fortunately for me it has had a positive result. These may be some of the most difficult objects to observe through amateur telescopes.

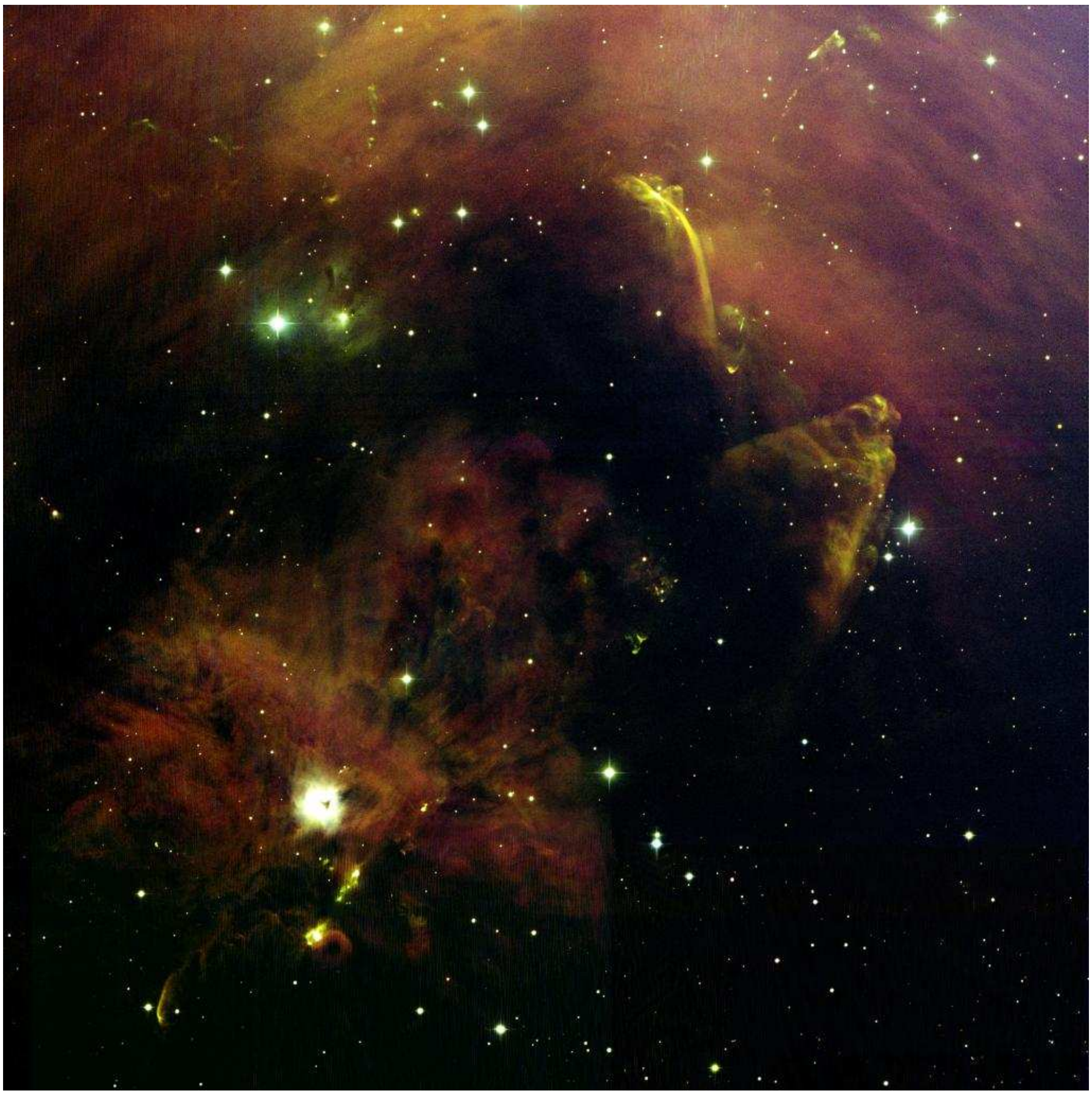
NGC 1999 pointed the way to the first of these HH objects. With a detailed star map I identified the indicated position of HH 1 at RA: 05h 36m 20.34 & DEC: -06^{o} 45’ 08.4, barely 2.5’ south-southwest of NGC 1999. Filters can be a handy tool, but I found little gained with various deepsky filters and almost nothing through a 0III filter. However, exercising great care I detected a very faint object that looked like an extremely faint out-of-focus star, visible only for mere moments. The best strategy is to place NGC 1999 out of the visible frame and use the old reliable technique of averted vision. I made a careful sketch of all the stars and nebulosity seen at the indicated position. Paperwork afterwards showed that I was at the right spot with a suspected positive catch. Only worth a try with bigger telescopes.

"These are pretty tough objects," I muttered to myself at the time when I approached HH 2, which is 4.3' south of NGC 1999 at RA: 05h 36m 25.30 & DEC: -06^{o} 47’ 15.8. With averted vision I glimpsed HH 2, surprisingly, with direct vision and concentration, as a very faint, small hazy spot containing a magnitude 14 stellar knot. This is one of the brighter HH objects. I am afraid I could not see any small detail in the sense of bow shocks and stellar jets showing off the delicate nebulosity.

In the attached picture, HH 34 situated at the top with gas of material being ejected by the young star. HH 222, more popular known as The Waterfall, is the structure further down in the picture; the origin remains mysterious. Another Herbig-Haro object is HH 47, associated with the dark globule known as “Bok's Valentine” in Vela.

To have a professor of astronomy as a friend is one thing; to discuss Herbig-Haro objects with him quite another! At least with this observation it has been proved that given the right amount of commitment and effort, every challenge can produce a positive effect. ■

Object	RA	DEC	Magnitude	Size
Herbig-Haro 1	05h36m20.3	-06°45’08.4	14.7	6”
Herbig-Haro 2	05h36m25.3	-06°47’15.8	14.2	8”



the sky this month

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

april 2009

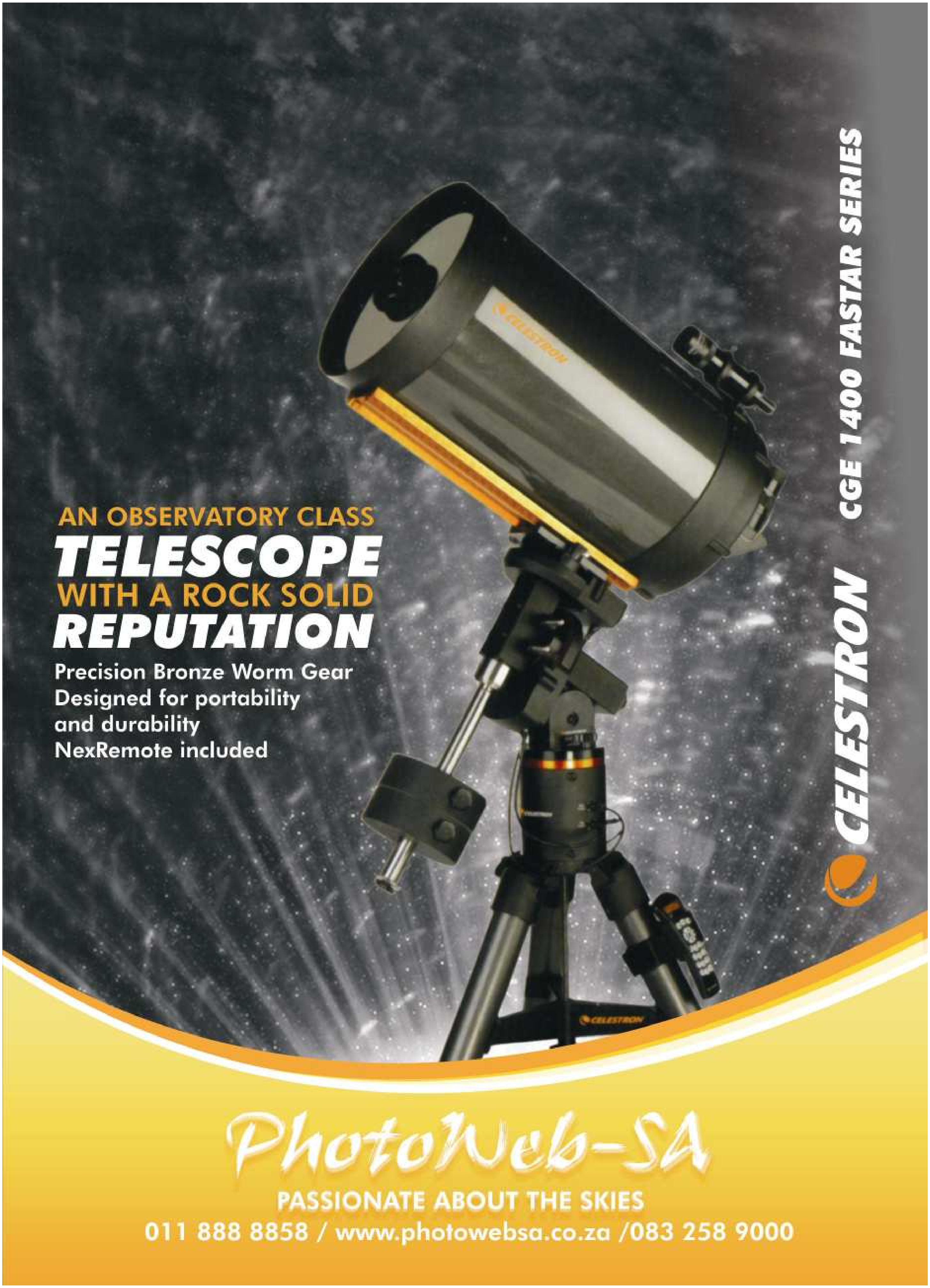
dd hh		dd hh	
2 03	Moon at perigee	19 00	Venus 5.6 N of Mars
2 15	FIRST QUARTER	19 18	Jupiter 2.3 S of Moon
4 18	Pluto stationary	20 02	Neptune 2.3 S of Moon
7 09	Saturn 6.2 N of Moon	22 10	Uranus 5.0 S of Moon
9 17	FULL MOON	22 16	Venus 0.0 S of Moon Occn.
12 04	Mercury greatest brilliancy	22 20	Mars 5.8 S of Moon
13 15	Antares 0.7 S of Moon Occn.	25 05	NEW MOON
15 06	Mars 0.5 S of Uranus	26 08	Mercury greatest elong. E(19)
15 11	Venus stationary	26 18	Mercury 1.8 S of Moon
16 11	Moon at apogee	28 07	Moon at perigee
17 16	LAST QUARTER		

may 2009

dd hh		dd hh	
1 23	FIRST QUARTER	19 22	Uranus 5.4 S of Moon
2 19	Venus greatest brilliancy	21 10	Venus 6.6 S of Moon
4 13	Saturn 6.2 N of Moon	21 21	Mars 6.4 S of Moon
7 23	Mercury stationary	24 03	Mercury 7.2 S of Moon
9 06	FULL MOON	24 14	NEW MOON
10 23	Antares 0.8 S of Moon Occn.	25 21	Jupiter 0.5 S of Neptune
14 03	Moon at apogee	26 06	Moon at perigee
17 10	LAST QUARTER	29 08	Neptune stationary
17 10	Jupiter 3.1 S of Moon	30 16	Mercury stationary
17 11	Neptune 2.8 S of Moon	31 05	FIRST QUARTER
17 19	Saturn stationary	31 19	Saturn 6.3 N of Moon
18 12	Mercury in inferior conjunction		

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
Apr 10	06.21	17.57	07.09	18.25	04.54	16.37	04.07	16.31	01.53	15.00	16.18	03.53
Apr 20	06.26	17.47	07.54	18.39	04.09	16.02	04.02	16.14	01.21	14.26	15.37	03.11
Apr 30	06.31	17.39	08.05	18.36	03.41	15.37	03.57	15.57	00.48	13.51	14.56	02.30
May 10	06.36	17.32	07.34	18.08	03.25	15.18	03.52	15.40	00.15	13.16	14.16	01.49
May 20	06.42	17.27	06.29	17.20	03.17	15.04	03.47	15.23	23.39	12.39	13.36	01.10
May 30	06.47	17.24	05.30	16.34	03.16	14.53	03.41	15.06	23.03	12.02	12.57	00.31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