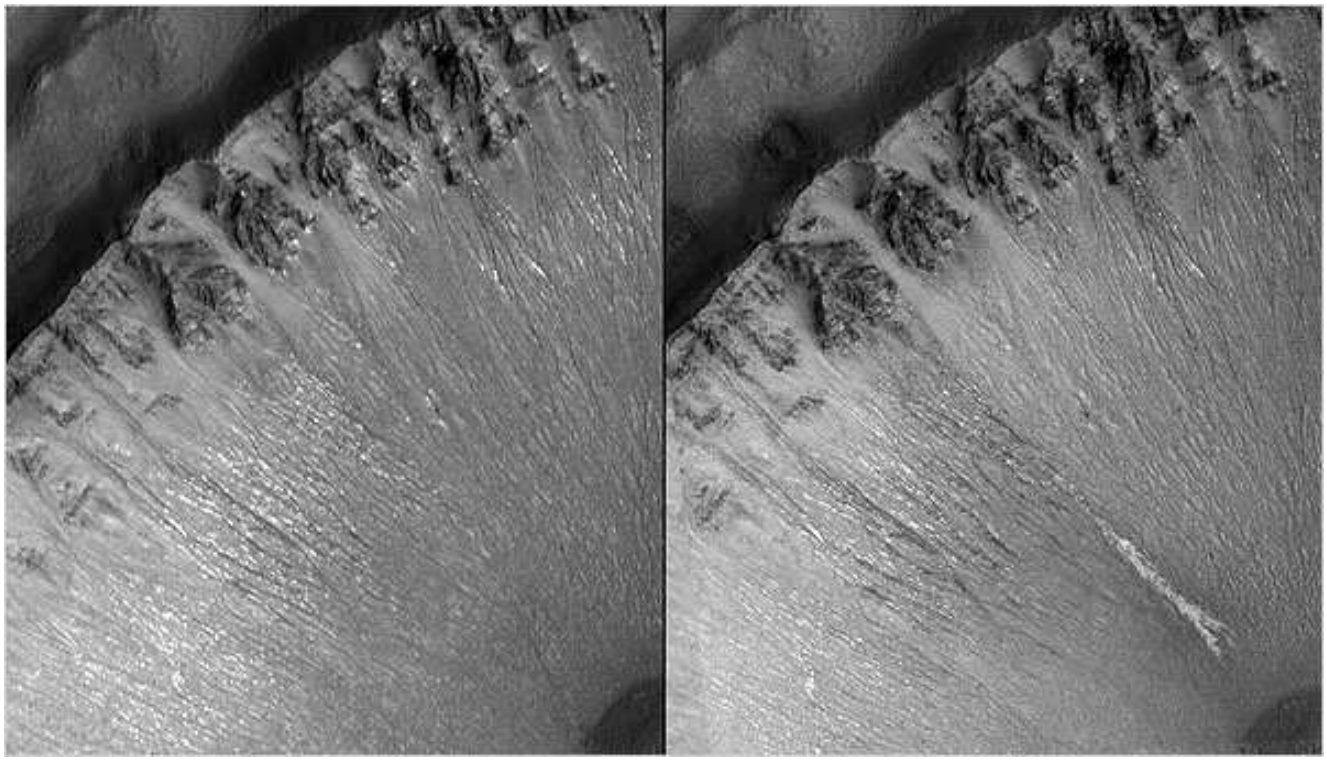
january 2007

canopus

monthly newsletter of the johannesburg centre of assa

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



Evidence for flowing Water on Mars – Image: JPL/NASA

contents

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, 10 January 2007 at 20h00
Guest speaker:

Dr. Percy Amoils
"Astrophotography"

assa johannesburg committee members 2006/2007

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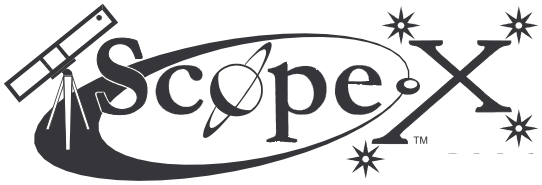
ATM: Amateur Telescope Making classes are held on the premises of Parktown Boys' High School on most Saturday afternoons.

Article submissions to Canopus:
You are invited to submit short articles and/or letters to the Editor. All formats are welcome (stone tablets included!). Please note that the **deadline for a submission is the 15th of the month**, for printing in the following month's edition. Successful articles will appear in both the printed copy (booklet) as well as the full colour electronic PDF version. Please contact the Canopus Editor (contact details above) for further information.

ASSA Johannesburg Centre's electronic mailing-lists & subscriptions:
A suite of mailing lists exist; you are encouraged to visit the assajhb website for detailed information.

www.assajhb.co.za



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Annual Telescope & Astronomy Expo

21 April 2007 : 10am to 9pm

Military History Museum - Johannesburg

Special Guest Speakers will be announced when confirmed.

Astrophotgraphy and "home built" telescopes will be judged according to various criteria
– please see astrophotography rules listed below

- **Activities:** Science shows, telescope mirror making demonstrations
- **Exhibits:** Self-made telescopes by amateurs, telescopes, cameras, books by commercial companies
- **Awards:** Amateur telescopes – **BRING YOUR OWN** self-made telescopes
- **Star Party:** In the evening

Rules:

Bring your Photographic submissions to ScopeX and enter them on arrival. All submissions are to be in by 11h00. Please refer to the Events Schedule for the time when awards will be announced. The photographs must be related to Astronomy; both conventional and digital photographs will be accepted. Entries should be printed and mounted on lightweight white board. (Prints only: Slides and electronic submissions will not be accepted) The following details should be supplied as a caption:
Title/subject, aperture, shutter speed, film and speed, type of camera, lens, filters, mounting (prime focus, piggy-back, barndoor), any other details you feel are appropriate. **Do not put your name on the caption**: For purposes of judging, entries will be assigned just a number. Your name and contact details will be held separately by the convenor of the event. The judge's decision will be final.

chairman's editorial

Robert Groess

It is when I sit in front of my computer like this, that I realise how indispensably important all your contributions to Canopus are. Over the past few weeks I have heard various comments about how the favourite articles in your monthly newsletter are definitely those written specifically for Canopus – and you have quite a number of people to be thankful for, for pouring their talent into articles you can enjoy. Perhaps I could suggest that instead of mentioning your delight and appreciation of these articles to me, pluck up the courage to thank the amazingly gifted contributors yourself. I know they will appreciate it. As I've said before, they – ***you*** – write Canopus, I only stitch the articles together.

We are extremely fortunate to be involved with an endeavour which essentially sells itself. Astronomy already has a captive audience. But what makes a good (astronomical) society, a great one? What brings about the mysterious element which attracts people to a place and brings out the best in them? Passion certainly ranks high on the list, but is it all? Stability? Prestige? Recognition? There have been some great names in the past that have made the Johannesburg Centre an institution capable of withstanding the test of time. Weathering changes in meeting locations, general trends in astronomy (i.e.: very technically oriented to providing an accessible interface for the lay-public.), financial health and political systems. And 2007 promises to provide more of the same.

Guest speakers at forthcoming meetings will provide insight into such subjects as amateur astrophotography as well as the history behind the old Republic Observatory. Further ideas that may come to fruition would be a thought-provoking presentation on the vexing topic of 'time'. Not to mention a positively spellbinding line up of ScopeX speakers from around the country and beyond.

But that lies in the future…

Let me end off by thanking Dave Hughes for hosting a fantastic committee year-end party at his house in Boskruin. Dave is very well prepared and despite some inclement weather, nothing could dampen the wonderful evening to which we were treated. Thanks also go to Brian Fraser for hosting another wonderful year-end star party as his house at Henley on Kilp. While the only star that was observed was the Sun, just before some think clouds rolled in and decided to settle in for the night, it was a very enjoyable social event none-the-less, and provided a great opportunity for discussions and a generally relaxed 'atmosphere'.

With that, allow me to extend my compliments of the season and wish you and your respective families a prosperous and fantastic 2007.

Robert.

encarni's reflections

Encarni Romero Colmenero – erc@saao.ac.za

Hello all,

Apologies for a long absence from Canopus – this has been due to a variety of reasons, including a lot of travelling on my part since I wrote to you last! But more on that later.

Firstly, as it has been ages since you've heard a peep about SALT (at least from me!), let me give you an update. The best news so far is again how much the telescope has improved in terms of reliability and how much our efficiency has also improved as a result. This is excellent news and we can only continue to improve. We have also now tested all the modes of operation of the Robert Stobie Spectrograph (RSS), namely its long- and multi-slit spectroscopy, the Fabry-Perot imaging spectroscopy, and the linear and circular polarimetric capabilities in combination with all of the above, and it was all proven to work successfully. And a lot of progress has also been made by all the investigators with the analysis of their SALT data and we are expecting more papers based on these data to appear in the scientific literature soon.

But there are also still some issues to be resolved. After several tests were performed on the instrumentation, we found that RSS was not as sensitive in the blue/UV it should be. As you might imagine, this is a serious problem, especially for a telescope that's actually optimized for the blue! So we did many more tests to find out the culprit(s), and it turns out that the coatings on many of the lenses in the instrument were damaged. As a result, RSS was taken off the telescope in November, dismantled, and at the time of writing, the lenses are on their way back to the States to be repaired. This is not a minor task, and the current estimate is that RSS will be back on the telescope around May or June 2007.

With RSS off the telescope, we currently only have SALTICAM as a science instrument. SALTICAM is also scheduled for several upgrades and maintenance sometime in February 2007, when it will also be taken off the telescope, and it is expected to be back on in April. In the meantime, we have opened a new call for SALTICAM proposals, and this is one of the things that we have all been extremely busy with for the last few weeks. We have also released a new Proposal Preparation and Submission Tool (PIPT), which is now required in order to submit proposals to SALT – please visit the SALT website (http://www.salt.ac.za) for more information. We also have released a new issue of SALTeNEWS, which you can download from the news web pages.

A lot of progress has been made on the investigation about the image quality of the telescope, and at the time of writing we are all keeping our fingers crossed that the plan of action in mid-December will significantly improve the image quality, if not fix it completely.

Unfortunately I cannot explain more at the moment, so I have to leave you with only that tantalising bit of information until the next issue, when I'll unveil whether it was successful or whether we are still hunting for the solution! ☺

I also wanted to tell you about my recent conference trip to China, which was absolutely fantastic – but I'm running out of space so I think I'll also leave that for the next issue.

So until next time,

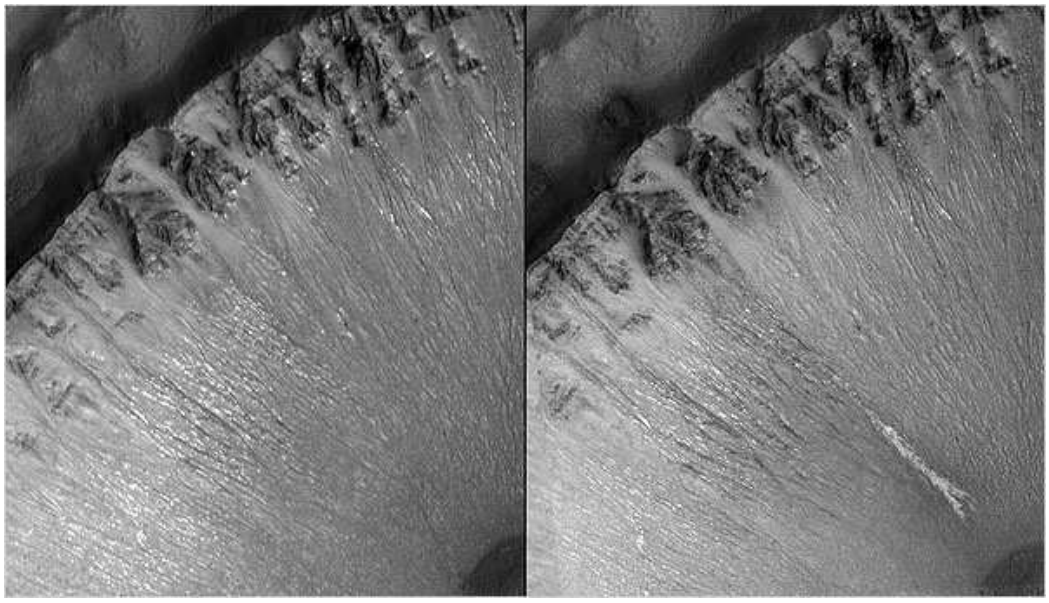
Encarni

stronger evidence for flowing water on mars

edited article by Warren E. Leary

Pictures of Martian gullies taken several years apart strongly suggest that water still flows at least occasionally on the surface of the planet. While water ice and water vapour have long been known to exist below the surface of Mars in the relatively recent past, and water ice has been seen at the poles, this is "the strongest evidence to date that water ***still flows*** occasionally on the surface of Mars," said Michael Meyer, the lead scientist for NASA's Mars exploration program.

If water is present, that would raise the possibility of microbial life: with water and some form of steady heat, bacteria can grow even in hostile environments. The new images were taken by NASA's Mars Global Surveyor spacecraft, which fell silent last month after almost 10 years of observing the planet from orbit. They show light-coloured deposits in two gullies within crater walls that were not there in pictures taken in 1999.



The before-and-after images show what appear to be deposits of material left by bursts of water flowing down the sides of the gullies. “The shapes of these deposits are what you would expect to see if the material were carried by flowing water,” Michael Malin said in a televised news conference held at NASA headquarters. The deposits appeared to have been left by a liquid mixed with dirt or other material that flowed down a slope for hundreds of yards before dispersing, he said, with water being the more likely fluidizing material.

Though the evidence is circumstantial, the possibility of liquid water on Mars is exciting. It raises the questions of where the water comes from and whether it could be used as a resource for future explorers. Water could be broken down into hydrogen and oxygen, which could be used as rocket fuel, and oxygen to breathe.

Kenneth Edgett, also of Malin Space Science Systems in San Diego, said whenever the surface of Mars was disturbed by spacecraft on the ground or by strikes from “meteorites”, it appeared as a dark colour. The light tone of the material in the flow patterns suggests that it came from minerals or other chemicals that were in the water.

The bright features persist for several years, which means it’s not likely to be frost and is more likely to be sediment from water flow. The researchers said they believed that underground water slowly made its way to the surface, perhaps accumulating under a crust of ice until being released in a sudden burst by a quake or a meteorite strike.

When released, the water shoots out as if from a squirt gun and immediately begins evaporating or boiling away as it flows downhill. The flow appears to be from a thick, sediment-laden material that moves like a mudslide that occasionally courses around obstacles and diverts into finger-shaped marks as it disperses at the bottom.

Water in the flow would evaporate or turn into ice crystals within hours or days, leaving sediment along its path. The photographed flow patterns travelled down slopes for 500 to 600 yards and each probably carried the equivalent of “5 to 10 swimming pools of water.”

In a paper to be published in the journal *Science*, the researchers said pictures of the same areas taken in 2004 and 2005 clearly showed changes that occurred since initial images taken in 1999. While some scientists have suggested that past flow evidence seen in craters might be from landslides or rocks falling down slopes, geological properties of the crater areas strongly suggest that the changes were caused by a fluid, and most probably water.

Philip R. Christensen, a professor of geological science at Arizona State University who was not involved with the research, said he had been sceptical of previous claims about signs of flowing water on present-day Mars but found the new evidence “reasonable and plausible.” We’re now realizing Mars is more active than we previously thought.

the grimaldi robotic lunar observatory idea

edited article by Paul D. Lowman Jr. (NASA GSFC)

Astronomy is today in a golden age, one that began approximately in the early 1990s with the launch of the Hubble Space Telescope. The HST and its counterparts, such as the Spitzer Space Telescope, have produced stunning images. Earth-based astronomy at optical, IR, and sub millimeter wavelengths has achieved comparable progress. The most striking advance has occurred in interferometry - especially optical interferometry, which produces spatial resolutions previously unimaginable in single-aperture telescopes. The twin Keck telescopes on Hawaii's Mauna Kea, for example, are now referred to as the Keck Interferometer. Other Earthbased instruments and techniques have likewise made enormous progress with, for example, the discovery of dozens of extra solar planets.

Given those achievements, Dan Lester and others have reasonably asked if there is any reason to reopen the once popular topic of observatories on the Moon. My answer is yes. To organize my reasons, I suggest here a hypothetical lunar-astronomy program, termed the Grimaldi Robotic Observatory (GRO) - an acronym recycled from the now defunct Compton Gamma Ray Observatory.

The program would be the emplacement of a family of small (one-meter-diameter) robotic telescopes in the Grimaldi Basin, perhaps accompanied by submillimeter dishes, mission constraints permitting. The Grimaldi Basin ("Grimaldi" henceforth) is a lava-filled, multi-ring impact crater located at 5° S latitude and easily visible with binoculars during a full to last-quarter moon.

What does Grimaldi offer as an observatory site? First, its near-equatorial location would give access to almost the entire celestial sphere over a 28-day period. The Earth hangs low over the eastern horizon, in continuous line of sight for uninterrupted data transmission, but blocks almost none of the sky. Grimaldi's location would also make centimeter wavelength radio astronomy possible. The popular view that radio astronomy is possible only from the lunar far side applies only to low frequencies, at which auroral interference is demonstrably a problem.

The advantages of the GRO site are shared with those of some other lunar limb locations, so let's now widen the discussion: 'What does the Moon offer that is not already achieved with Earth- or spacebased telescopes?

The most obvious advantage of a lunar observatory site is one shared with many space-based instruments, a continuously visible sky with an unlimited spectral window. But what the Moon offers uniquely is a surface- or more precisely, a solid surface.

For decades astronomers have recognized the Moon as an ideal site for optical and submillimeter interferometry. Recently, however, some have proposed plausible concepts for space-borne interferometry, such as the free-flying Terrestrial Planet Finder and the rigid-beam Space Interferometry Mission. These concepts face formidable technological challenges, such as keeping the distance between telescopes constant to within a fraction of a wavelength of visible light. Earth-based interferometry has overcome that problem through fiberoptic links. Seven of the Mauna Kea telescopes, for example, are now joined by fiber optics in the OHANA (Optical Hawaiian Array for Nanoradian Astronomy) network. Baselines of up to 500 meters separate those telescopes. Lunar telescopes could similarly be linked to form kilometer-length interferometric networks.

The second advantage of a Moon-based observatory is that it would offer far more observing time than any Earthbased one not located at the poles. Any Earth-based telescope with access to most of the sky, such as the Keck or the paired Gemini North and Gemini South instruments, can provide at most 12 hours observing time per day. Typically, it is much less. A Moon-based telescope located in Grimaldi, however, could provide up to 14 days of continuous observing time. Furthermore, the observation time would be subject only to instrumental malfunctions; other observational constraints, such as cloud cover, humidity, and air mass, would be nonexistent.

The question of observing time, or telescope time, is more complex, though, as space-based instruments at Lagrange points can also provide almost unlimited access to any point in the sky for as long as desired. Even the HST, in low Earth orbit, provides spectacular deep-sky images by combining those from many orbits of observation. But telescopes on the Moon can provide more observing time than any Earth-based ones, other factors being equal, and almost as much as those provided by Lagrange-point telescopes.

To illustrate the issue of observing time, here's a bit of over-simplified arithmetic. A telescope on Mauna Kea can operate for no more than 12 hours a night. That adds up to 336 hours of observing time for a 28-day month, given perfect observing conditions. A similar telescope at the GRO would provide 672 hours of total observing time for the entire sky. The 14-day lunar rotation period would cut that down to 336 hours for any particular celestial object. But the total observing time from the GRO would be much more than twice as great as that from Mauna Kea because of weather and other observing-condition constraints. The great increase in potential observing time would enormously expand opportunities not only for professional astronomers, but also for students and amateurs. Small amounts of time for such nonprofessionals have occasionally been provided on the HST, but the GRO would make much more time available.

The surface environment of the proposed GRO is a familiar and technologically benign one. The problems of operating on the lunar surface - the presence of lunar dust in particular - during the Apollo missions are well known. The 14-day lunar night of the GRO site is another problem. However, I can also cite the record of American and Soviet lunar landing

missions, robotic and manned, of which there were dozens. Of the US's seven Surveyor missions in the 1960s, five were successful; the two failures were caused by in-flight problems, not landing ones. (The Surveyor television systems, incidentally, carried out many rudimentary astronomical observations, producing images of the solar corona, the zodiacal light, and Earth-based lasers.) For many months in the 1970s the USSR operated two robotic rovers, the Lunokhods, and even had successful robotic sample return missions - two achievements the US has yet to match for the Moon.

The lunar regolith is composed largely of angular agglutinate fragments formed by billions of years of meteoritic impact. This regolith can only form from particles in the absence of an atmosphere; it is significantly different from volcanic ash. As the Apollo astronauts found out, lunar dust quickly saturates space-suit fabrics and abrades surfaces.

However, robotic missions did not encounter those problems. Moreover, the lunar dust has not obscured the lunar retroreflectors - unprotected optical surfaces - even after three decades. More informative is the experience from the Apollo 12 mission, in which astronauts Charles "Pete" Conrad Jr and Alan Bean retrieved components from the Surveyor 3 spacecraft that had been on the Moon for 31 months. On exhaustive study back on Earth, components such as the Surveyor TV camera were found to be essentially functional. Some dust had been deposited from the Surveyor 3 and Apollo 12 descents, but lunar transport was found to be relatively insignificant. (See NASA Special Publication 284, Analysis of Surveyor 3 Material and Photographs Returned by Apollo 12, 1972, page 28.)

For manned missions the lunar-dust problem should not be minimized. But for robotic programs such as the GRO, it is demonstrably one that can be planned for and overcome. The GRO would be located on the mare material, basaltic regolith, that fills the Grimaldi Basin. The late Eugene Shoemaker and his colleagues, found that the population of small craters and the size distribution of particles are essentially identical on all mare surfaces. This means that the lunar regolith was formed by a steady-state process that reflects billions of years of meteoritic bombardment. To put it simplistically, when you've seen one mare site, you've seen them all.

Moon-based astronomy has been dismissed in recent years because of the perceived cost. This misconception, I have found, comes from the assumption that astronomy from the Moon requires astronomers on the Moon. It could operate much like the Mauna Kea instruments, which are manned by a few hardy astronomers while most of the staff sits comfortably in Hilo or Waimea with no need for supplemental oxygen. With 21st-century robotic technology, even the few hardy astronomers would stay on Earth.

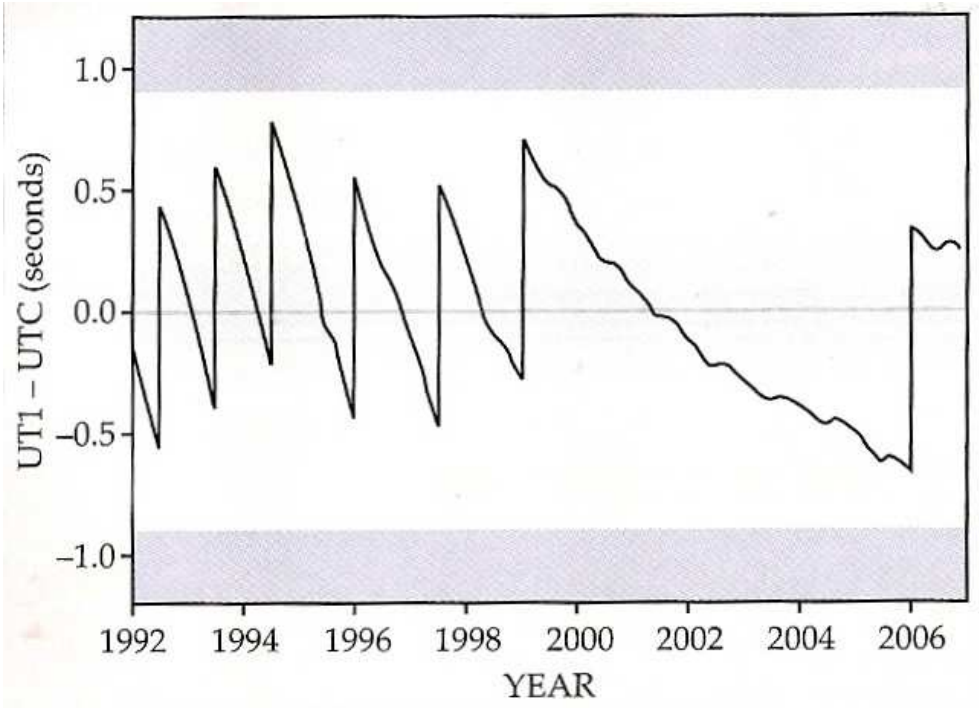
In summary, astronomy from the Moon appears to be a concept whose time has come again, and one that deserves a careful second look.

the leap-second

edited article by Brian Luzum (astronomer at the US Naval Observatory)

Children learn that a day is 24 hours long and the Sun is at its highest point at noon. Unfortunately, that lesson is not strictly true. The desire to make it true, at least on average, is at the heart of the leap second.

The leap second concerns two different ways to measure time. Earth rotation time (UTI) is, as it sounds, based on the variable rotation of Earth on its axis. The second time, coordinated universal time (UTC), is based on steady atomic clocks. A recommendation proposed by the International Telecommunication Union (ITU) Radio communication Sector in 1970, and subsequently incorporated into radio regulations states that a leap second be added to or subtracted from UTC so that the absolute difference between UTC and UTI is never more than 0.9 seconds.



A new proposal before the ITU would keep UTI and UTC synchronized only to within an hour. Users of UTI and UTC are currently debating whether the proposal should be accepted. Where people stand on the issue has a lot to do with how they use their time.

Background

Earth was the first clock humans used. By watching the locations and motions of the Sun, Moon, and stars, our ancestors could tell time. Eventually artisans built devices that allowed people to measure time without needing to look to the heavens. As scientific and engineering skills advanced, the ability to make clocks improved; by the 1930s, high-precision clocks were more stable than Earth's rotation.

Earth's nonconstant rotation period can differ from its average by as much as a few milliseconds per day. The causes of those fluctuations include tidal variations, large-scale weather phenomena such as El Nino, geophysical phenomena, and tidal deceleration modified by deglaciation. The effect of tidal deceleration is predictable, but the others are not, which makes synchronizing Earth rotation time and atomic clock time more challenging.

The details of Earth's rotation were less fully understood in the 1950s, when the second was defined in terms of atomic frequency. The atomic second was set equal to a second of ephemeris time - that is, to a fraction of a day in the 1820s, the epoch of the observations used to define ephemeris time. It didn't take long for scientists to realize that keeping rotation-based and clock-based times close was going to take significant effort. Even into the 1960s, the length of the standard second was allowed to vary, and occasional "jumps" in UTC were used to keep standard time in accord with Earth's rotation. Eventually, the scientific community adopted the ITU leap-second recommendation; the first leap second occurred in 1972.

Dilemmas

Leap seconds have been applied once every year and a half on average since 1972. As Earth's rotation continues to slow down, they will occur, in general, with greater frequency. For many people, the insertion of a leap second is, at worst, a minor inconvenience. But for those who design and work with computer and satellite systems, it causes problems.

Continuing the use of leap seconds is not a zero-cost option. Before each leap second is applied, software and technical equipment undergo testing to ensure that systems will behave as expected before, during, and after the leap second. The cost of that testing is often hidden, but it cannot be ignored.

In many cases, leap seconds are so problematic that designers use independent time scales that have no leap seconds. The global positioning system, for example, uses its own internal time and presumably so will the European Union's Galileo global navigation satellite system. As the time scales developed to address particular problems are appropriated by other applications, new time scales are born.

The proliferation of nonstandard time scales can make system interoperability a challenge. To ensure that information is handled properly, system operators must know the relationships among time scales. A single standard time scale without leap seconds would be much more convenient. Neglecting the difficulties created by leap seconds now will only make the implementation of future changes more difficult.

Why bother to keep atomic clock time and Earth rotation time in sync? The desire for synchrony is not just about history. Celestial navigation and the pointing of antennas at satellites or other distant sources, for example, require the routine observation of UTI. For

applications requiring an accuracy of no better than 1 second, one can approximate UTI with UTC. This approximation is convenient because it is considerably easier to read time from a clock than to read time from Earth. Indeed, that assumption that UTC and UTI are nearly the same has been built into so many systems for so long that any change to that assumption would be a significant undertaking. Even determining the magnitude of the problem is fraught with difficulty.

Legal issues may also come into play. In some countries mean solar time is the legal time. As a practical matter, UTC, as currently defined, is often used as the basis for legal time in those countries. Legal ramifications may ensue, however, if the leap second is abandoned and UTC is no longer closely tied to mean solar time.

One argument in favour of keeping the leap second is misleading: If the leap second is abolished, the Sun will not cross the local meridian at noon. Because of the considerable size of time zones, the sporadic application of daylight savings time, and the variation in Earth's orbital velocity vector during the year, the Sun can cross the meridian hours before, on or after, noon. The effects of the proposed leap-second change would be well within that variation for centuries to come.

The Debate

The debate surrounding the proposal to change the definition of UTC by removing the leap second has narrowed down to two options, and both sides have supportable positions. No matter what is decided, complications will arise, and no compromise will make everyone happy. The real questions are who is impacted more and who can more easily accommodate those impacts.

If any good has come of the leap-second debate, it is that more people are aware of the complexity of time. Hopefully, the increased awareness can be put to use as new systems are developed. A few ideas should probably be considered no matter how the leap-second issue is resolved. Computer- and satellite-system designers should avoid creating new, independent time scales. People who write or rewrite software should make an effort to be as flexible as possible when dealing with time so that as timing interface and development standards are created, implementation of necessary changes to applications is as easy as possible.

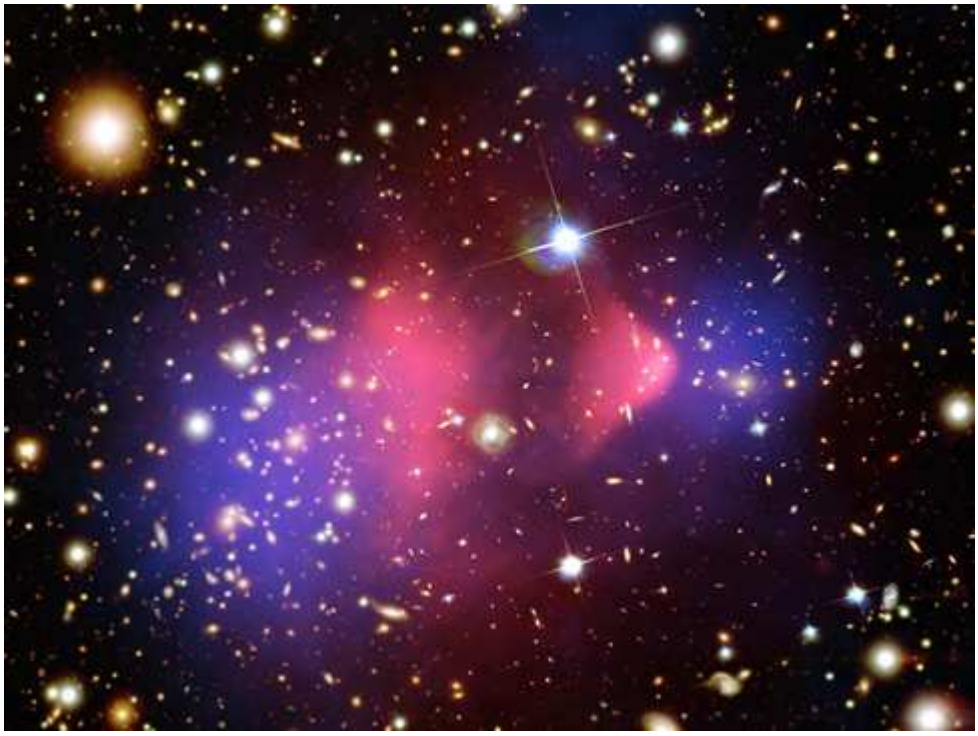
The ITU is currently accumulating information to help it make an informed decision, including input from professional organizations that are evaluating how the maintenance or elimination of leap seconds would affect their members. If you have information that you would like to share with the ITU, you may contact Ronald Beard (ronald.beard@nrl.navy.mil), who is the chairman of the ITU working party addressing the leap-second issue. Comments bolstered with detailed descriptions and documentable facts would help the ITU to decide on the best course of action.

lensing galaxies lend more `proof' of dark matter

edited article by Michael Carroll

The laws of gravity dictate how large-scale bodies, such as galaxies and galactic clusters, should interact. But for several decades, astrophysicists have realized a hidden agent is acting upon the cosmos. The universe must contain up to 5 times more "dark matter" than the ordinary matter seen in planets, stars, galaxies, and clusters. Now, Douglas Clowe of the University of Arizona and his colleagues, report further corroborating evidence of dark matter.

The cosmic smoking gun was found in the constellation Carina, at the site of two colliding galaxy clusters known as the Bullet cluster (galaxy cluster 1E 0657-56). Observers imaged the aftermath of the massive collision, which occurred 100 million years ago, in both visible and X-ray wavelengths. Galaxies in the system are passing through each other at 10 million mph (16 million kilometres per hour), leaving behind a wake of glowing gases.



Galaxy clusters typically contain 10 times as much mass in gas as in stars. As galaxy clusters pass through each other — stars are far enough apart that any actual collision seldom occurs — each cluster drags gas from the other, slowing the gas and leaving a wake. In the case of the Bullet cluster, the wake is rounded, or bullet-shaped. Detailed analysis revealed the system's gravity is warping space and causing light from distant objects to bend around it in a phenomenon called gravitational lensing.

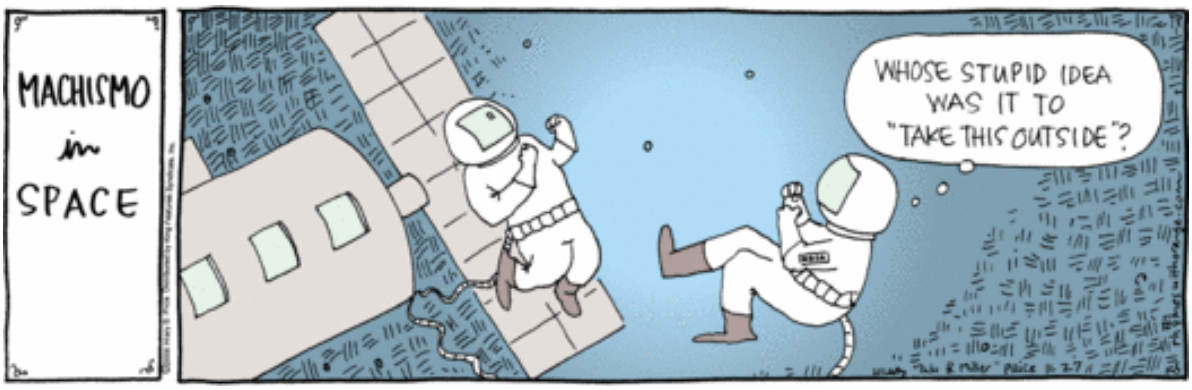
But the gravitational lensing is most pronounced outside of the gas, in regions on either side of the collision. It is very plausible to consider that dark matter is responsible. Gravity pulls the normal matter making up the clusters' gases toward the system's centre. Any dark matter, however, would pass directly through the system, much as stars do. "We see that the mass, which is dominated by dark matter, is centred on the galaxies," says team member Dennis Zaritsky of the University of Arizona. "Therefore, we infer that the dark matter has passed through the collision unaffected as well."

If the team is right, Carina's colliding galaxies have provided a key piece in our understanding of the fundamental workings of the universe. Says Zaritsky: "The significance to me is that it eliminates a nagging worry that we were ignoring a potentially very interesting alternative." That alternative, namely, is that we don't understand the fundamental laws of gravity. The next step is to sort out what the mystery matter is. The team's results will appear in a forthcoming issue of Astrophysical Journal Letters.

ATMer's 12 days of Christmas

On the twelfth day of Christmas my true love sent to me…

Twelve sets of star charts
Eleven eight inch mirrors
Ten great new spiders
Nine red dot finders
Eight drive assemblies
Seven alt-az mountings
Six sturdy tripods
Five different tubes
Four mirror cells
Three pitch laps
Two eyepiece lenses
And a book on how to build 'scopes.



the antikythera mechanism

courtesy: Wikipedia

It was found at the bottom of the sea aboard an ancient Greek ship. Its seeming complexity has prompted decades of study, although many of its functions remained unknown. Recent X-rays of the device have now confirmed the nature of the Antikythera mechanism, and discovered several surprising functions.

The Antikythera mechanism has been discovered to be a mechanical computer of an accuracy thought impossible in 80 BC, when the ship that carried it sunk. Such sophisticated technology was not thought to be developed by humanity for another 1,000 years. Its wheels and gears create a portable orrery of the sky that predicted star and planet locations as well as lunar and solar eclipses. It is 33 centimeters high and similar in size to a large book.

canopus classifieds

To the Highest Bidder:

Partially assembled Cook Book Astronomical CCD Camera, based on the Texas Instruments TC245 CCD chip, donated to the ASSA Jhb. Centre from the estate of the late Dr G. E. B. Tremeer. Highest written offer received up to the time when this item is dealt with at the January monthly meeting on the evening of Wed 10th January 2007 secures.

For sale as a single lot, without reserve, voetstoots.

Note: This is not a "plug & play" kit. It will require the talents of a knowledgeable amateur and the sourcing of some components given in the parts list. The Cook Book Astronomical CCD Camera came on to the market in 1994. Today, this kit might only be good for parts.

A current Internet price for a low end CCD deep sky imager is US$299-00 plus shipping.

The kit and instruction manual can be inspected at the ASSA Jhb. Centre library after 6 PM on Wed. 10th Jan 07, or sooner by arrangement with the librarian, Alec Jamieson, who can also provide more technical details by e-mail.

Up to the 9th January 2007, offers may be sent by e-mail to the librarian who will not be making an offer for this lot. Bids will be kept confidential until the monthly meeting on 10th January 2007.

Alec Jamieson,
Librarian,
ASSA Jhb. Centre.
arjam@iafrica.com
082 654 5336

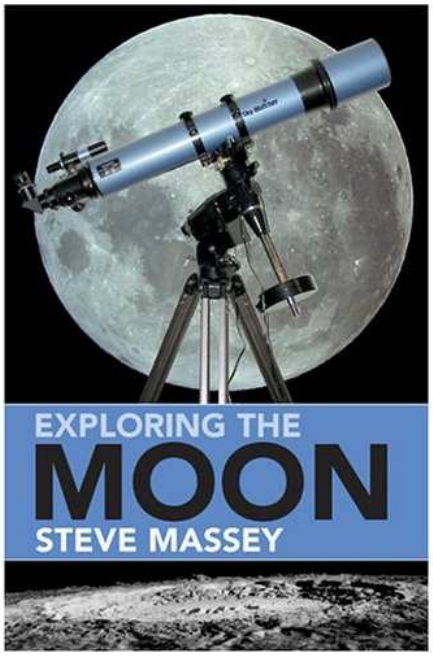
cano-puzzle

K.G. Stewart

FIND 70 LUNAR CRATERS IN THE FOLLOWING WORDSEARCH AND WIN: "Exploring the Moon" by Steve Massey

Rules:

- Persons in possession of the solution booklet are not eligible for receipt of the prize. (We appeal to your honesty and integrity in this matter.)
- First person to email/fax the FULLY correct solution before 10 Feb. 2007 to the Editor (see contact details on page 2) will be eligible – pending the final discretion of the judges (Gill Stewart and the Canopus Editor)
- The judges' decision will be final and no correspondence will be entered into.



For email solutions, please list the Crater names alphabetically with the grid location of the starting block (e.g. Grimaldi L5). (There are 70 more…)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	V	O	N	K	A	R	M	A	N	M	J	D	R	A	C	I	P	E	E	K
B	O	A	A	B	E	E	R	A	E	U	E	N	I	A	M	Y	L	I	A	B
C	L	N	N	I	N	Z	N	Z	P	S	S	E	I	S	T	R	A	B	O	A
D	T	E	N	D	Y	S	O	N	E	S	L	L	I	H	E	K	N	N	K	R
E	A	E	E	V	E	H	C	O	R	E	V	A	A	M	U	N	D	S	E	N
F	R	L	A	N	S	G	H	S	S	U	A	G	O	G	A	R	A	V	N	A
G	C	D	R	A	P	E	R	E	S	S	O	R	A	U	Z	O	U	T	B	R
H	H	A	R	D	I	N	G	A	T	R	E	B	E	G	N	I	W	R	A	D
I	I	W	E	B	B	U	S	O	A	O	H	C	Y	T	A	C	I	T	U	S
J	M	E	T	O	N	N	N	S	T	F	E	R	M	I	S	R	E	T	E	P
K	E	S	Y	R	I	A	Y	R	B	A	F	R	E	U	D	E	I	K	S	T
L	D	U	M	L	G	R	I	M	A	L	D	I	A	B	B	E	V	N	O	T
M	E	O	L	E	A	L	L	E	X	E	L	S	I	L	E	D	A	L	B	O
N	S	O	V	E	X	E	N	O	P	H	A	N	E	S	O	U	T	H	Y	C
O	C	O	P	E	R	N	I	C	U	S	A	N	U	S	T	A	D	I	U	S

one splendid Christmas tree in the sky – ngc 2264

Magda Streicher

Is the fact that our days pass us by so quickly contributed to our getting older or is it our busy lives? Whatever the cause, 2006 is on its back! When I observe Orion in the East, I know unconditionally that a new year is knocking at the door. The end of the year also brings reflection, rest and festivities. I normally enjoy the wonderful bright objects and warm summer evenings behind my telescope. To the east of Orion is the constellation Monoceros, first charted by Bartschius as Unicornu, commonly known as the other horse south of Gemini and Cancer. The constellation Monoceros holds only three stars brighter than 4th Magnitude but aptly houses NGC 2264 the well-known "Christmas Tree Cluster".

Locate 15-Monocerotis in the far northern part of the constellation and you are in the midst of the triangle shaped Christmas Tree Cluster. 15-Monocerotis, a 5-magnitude variable towards the north of the cluster and its double star companion 8.5-magnitude south west, indicate the base of this cluster tree. This bright, large cluster, which spans more or less half a degree in a north to south direction, is easily seen through binoculars. Careful observation reveals around 20 stars imbedded in flimsy nebulosity, which tapers down with brighter stars to the south ending with the famous "Cone Nebula", an obscuring dust cloud which is extremely difficult to see. The southern end indicates a white 6.5-magnitude star, which shines brightly as the star on top of the Christmas tree. Higher power through a telescope and nebular filter reveals a mist of Christmas decorations shining as faint stars that cover the tree in frosted nebulosity. This heavenly Christmas tree is slightly brighter than the ordinary decorated pine tree found in people's homes during Christmas time. NGC 2264 is more or less 20 light years in diameter and approximately 3,000 years away.

It was a privilege to me to share deep sky objects in 2006 with you with inspiration. Spend quality time under the starry sky at the end of this year and enter the New Year with new starry motivation that will carry us through yet another year.

Picture: Marin Germano (45min exp with 8" f5 Newtonian Reflector)

Object	Other names	Type	RA	Dec	Mag	Size
NGC 2264	Cone Nebula	Diff. Neb/Open Cl.	06.41.6	+9°53	3.9	60'

the sky this month

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

january 2007

dd hh		dd hh	
3 14	FULL MOON	17 03	Mars 4.5N of Moon
3 20	Earth at perihelion	19 03	Venus 1.3S of Neptune
4 09	Pollux 2.6N of Moon	19 05	NEW MOON
6 19	Saturn 0.9S of Moon Occn	19 20	Mercury 1.2N of Moon Occn
7 06	Mercury superior conjunction	20 15	Neptune 2.2N of Moon
7 07	Regulus 1.1S of Moon Occn	20 18	Venus 0.7N of Moon Occn
9 07	Jupiter 5.3N of Antares	22 06	Uranus 0.3S of Moon Occn
10 16	Moon at apogee	22 12	Moon at perigee
11 13	LAST QUARTER	25 24	FIRST QUARTER
11 19	Spica 0.9N of Moon Occn	26 14	Mercury 1.3S of Neptune
15 14	Antares 0.5N of Moon Occn	31 17	Pollux 2.6N of Moon
15 16	Jupiter 5.7N of Moon		

february 2007

dd hh		dd hh	
2 6	FULL MOON	13 15	Mercury stationary
2 24	Saturn 0.8S of Moon Occn	15 3	Mars 3.4N of Moon
3 15	Regulus 1.0S of Moon Occn	17 2	Neptune 2.1N of Moon
7 13	Moon at apogee	17 17	NEW MOON
7 14	Mercury greatest elong E(18)	18 9	Mercury 3.9N of Moon
7 19	Venus 0.7S of Uranus	18 17	Uranus 0.5S of Moon Occn
8 3	Spica 1.1N of Moon Occn	19 10	Moon at perigee
8 16	Neptune at conjunction	19 16	Venus 2.1S of Moon
10 10	LAST QUARTER	23 5	Mercury inferior conjunction
10 19	Saturn at opposition	24 9	FIRST QUARTER
11 23	Antares 0.6N of Moon Occn	27 24	Pollux 2.5N of Moon
12 10	Jupiter 5.9N of Moon		

local times of rise and set for the major planets

Date	Sun		Mercury		Venus		Mars		Jupiter		Saturn	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
Jan 1	4.51	19.23	4.30	19.12	6.04	20.28	3.17	17.47	2.45	17.00	21.53	8.36
Jan 11	4.59	19.24	5.06	19.39	6.26	20.32	3.07	17.42	2.13	16.30	21.12	7.53
Jan 21	5.09	19.21	5.51	19.58	6.49	20.31	2.59	17.35	1.40	16.00	20.30	7.11
Jan 31	5.20	19.15	6.36	20.04	7.11	20.26	2.53	17.27	1.08	15.28	19.49	6.27
Feb 10	5.30	19.06	7.00	19.49	7.32	20.19	2.48	17.17	0.34	14.56	19.07	5.44
Feb 20	5.40	18.55	6.17	18.56	7.53	20.10	2.49	17.10	0.00	14.23	18.25	5.00