



The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER MAY 2011

Next meeting

Venue: The auditorium behind the main building at Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.

Date and time: Wednesday 25 May at 19h15.

Programme:

- **Feedback:** "National Star Party 2011" by Percy Jacobs.
- **What's Up?** by Johan Smit.
- 10 minute break — library will be open.
- **Main talk: "Science at CERN - 3 Trillion Collisions"**
by Claire Lee.
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Hein Stoltsz.

Next observing evening: Friday 20 May at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road. Arrive from sunset onwards.

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Last month's meeting - by Danie Barnardo

The 27 March was a National Holiday, but this had little influence on the attendance and there was a reasonable amount of visitors present, mainly friends of the main speaker, Frikkie le Roux, attending to support him. However, we do hope they found proceedings interesting and will visit again in future.

After the usual introductions and a reminder of the Kambro National Starparty the following weekend, and the annual SCOPEX on 7 May, Johan Smit started with Beginners Corner and presented a very interesting and entertaining talk titled "The Dark Side of Light", focusing on one of his favourite subjects, light pollution. His talk centered on the effects of light pollution and the main problem: wasted energy. If lights are not correctly designed, the light shines into the sky and not on the ground, where it is needed. Therefore, he argued that we should use this as an approach to convince the authorities to install proper lighting. If lights are properly designed, you will need less electricity (energy) with the same (or better) lighting effect and actually assist ESKOM in its campaign to save electricity.

Pat Kuhn followed with "What's Up" and pointed out all the interesting viewing objects that will be visible during the month of May. He pointed out which constellations will be visible and also mentioned the very interesting groupings of the planets Venus, Mars, Jupiter and Mercurius, which will be a highlight in the early mornings, just before sunrise. He also mentioned the interesting deep-sky objects from the ASSA 100 list which will be visible during the month.

A 15-minute leg-break followed, during which the library was open and afterwards the main speaker, Frikkie le Roux was introduced. Frikkie is a long-standing member of ASSA Pretoria-centre and is a professional musician (he actually plays the French Horn). He saw service in the Police Band and also performed in well-known orchestras like the Johannesburg Philharmonic Orchestra, the KZN Philharmonic and the Johannesburg Festival Orchestra. Frikkie specially brought a PC, amplifier and proper speakers to play extracts from pieces of music to illustrate his talk.

Frikkie presented a talk termed "Celestial Music", which had everybody wondering what it was all about! He started off by explaining the fantastic ability of the human ear to detect the slightest changes in atmospheric pressure (which is what sound is). He commented: "*If the note C is played on a recorder fairly loudly, at a distance of 3 meters, the pressure variation between the high and low points of the sound wave, compared with atmospheric pressure, amounts to 1 part in a million! The proverbial pin dropping would correspond to a pressure change of 2-3 parts in 10 000 000 000!*".

He then discussed the legendary discovery of the relationship between mathematics and music after Pythagoras, who was an accomplished lyre player, noticed the different tones of blacksmith's hammers when they beat iron on their anvils with different-sized hammers. Pythagoras is also thought to be the discoverer of the philosophical concept regarding the proportions between the movement of celestial bodies like the sun, moon and planets, known as the "*Musica Universalis*".

He then told of the discovery in 1893 of the first examples of musical notation in a Greek temple in Athens, known as the "*2 Delphic Hymns*". He proceeded to play an extract from the first of these Hymns, performed by the "Empire Brass Quintet". At the end of the first millenium, a new type of music "Polyphonic Music" appeared and Frikkie played "*Te Deum*" as an example of this type of music. Orlande de Lassus, born in 1532, was a leading exponent of this type of music.

However, De Lassus is relevant to the subject because he was admired and referred to by Johannes Kepler. In Kepler's famous work "Harmonices Mundi", which is his famous discovery of the Laws of Planetary Motion, which recognises the difference in orbital speed of the planets at different stages in their orbits. Kepler also found that the angular velocities of all the Planets closely correspond to musical intervals. In 1596 Kepler wrote "Mysterium Cosmographicum", which he also circulated to noted astronomers of his time like Galileo and Tycho Brahe.

Galileo was born in 1564 in Pisa, Italy. Galileo grew up in a musical family – his father and brother was noted composers and lutists and he himself was an accomplished lute player. Gali-

leo's scientific discoveries are well-known, but his greatest battle was with the Roman Catholic church regarding his support of a heliocentric universe and he was placed under house arrest in 1610 until his death and found consonance playing the lute.

In 1783, William Herschel, perhaps the greatest astronomer of the 18th century was born in a very musical family in Hanover, Germany. He himself was a very accomplished musician and played the oboe, cello, harpsichord and organ. He was an organist at various English churches and was also a noted composer and in 1780 he was appointed director of the Bath orchestra. In the meantime, Herschel was also an astronomer and a telescope maker of note. During his life he made over 400 telescopes, including the monster 40ft focal length, 49 inch reflector . Herschel discovered Uranus in March 1781. He was appointed King's Astronomer, awarded the Copley Medal and elected Fellow of the Royal Society.

In 1792, the famous Austrian composer, Joseph Hyden, visited Herschel. It is possible that this visit led to one of Hayden's greatest compositions, the oratorium "*The Creation*". Frikkie played an extract from this oratorio "*Let there be light*", which is probably the first musical representation of the Big Bang. Herschel's son, John, was born in 1792 and John (who was of course also an astronomer), moved to Cape Town in 1834, where his mission was to map and catalogue the Southern skies.

Frikkie then related the story of the great orchestral suite by Gustav Holts "*The Planets*". This work was probably inspired by Holts's interest in astronomy and Frikkie played three extracts from this work, "*Mars*", "*Venus*" and "*Jupiter*". Frikkie himself actually played in this piece and he related a story where, during one of the rehearsals, it was the transit of Venus on 8 June 2000 and he brought his telescope to show his fellow musicians the transit. He showed an image of the transit and told us that he presented a framed print of this photograph (which he took himself) to the conductor.

Frikkie then moved to Carl Sagan and his famous TV series "Cosmos" and its striking theme music, which came from a track on the "*Heaven and Hell*" album of Vangelis. Frikkie's last musician was Mike Oldfield and he told us of his latest album "*Music of the Spheres*", released in 2008. On this album track 11 is "*Harmonica Mund*" and the last track "*Musica Universalis*".

Frikkie ended with the Greeks again. In 1993 Vangelis wrote a track "*Mythodea*", which was released again in 2001 to coincide with NASA's Mars Oddysey that entered an orbit around Mars in October 2001. In Vangelis's own words: "*I made up the name Mythodea from the words myth and ode. And I felt in it a kind of shared or common path with NASA's current exploration of the planet [Mars]. Whatever we use as a key — music, mythology, science, mathematics, astronomy — we are all working to decode the mystery of creation, searching for our deepest roots.*"

This was truly a remarkable talk and we congratulate Frikkie with a very well-made presentation. After questions and answers, the attendees retired to tea, coffee and biscuits and discussions outside the room.

Last month's observing evening - by Michael Poll

No chance with the clouds this time – no clear patches, not even a thin haze we could look through – a ten tenths cloud deck. In fact, not a Good Friday for observing.

There were five of us there – Johan , Rudolph, Pat, Danie and Michael. Apart from staring at the clouds, we admired Johan's newly finished 10 inch telescope. Painted red, a "red giant" in fact, it is nicknamed "The Long Drop" (see photograph number 3 on the second last page), and when one sees the mirror box, the relevance of the name is apparent, although with the fresh paint, the smell was rather more acceptable than that of the namesake!

Johan reports that, on testing, Rigel's companion was easily seen, with clear sky in between the two stars. Sirius' companion, a white dwarf known as "The Pup" will be on the list of doubles for examination. Johan had not tried it on a planet yet. Johan blamed the cloud on the fact that he had brought the telescope along to try it out further.

We hung around and chatted until about 7 o'clock or so, and called it a night. On the way home it started raining.....

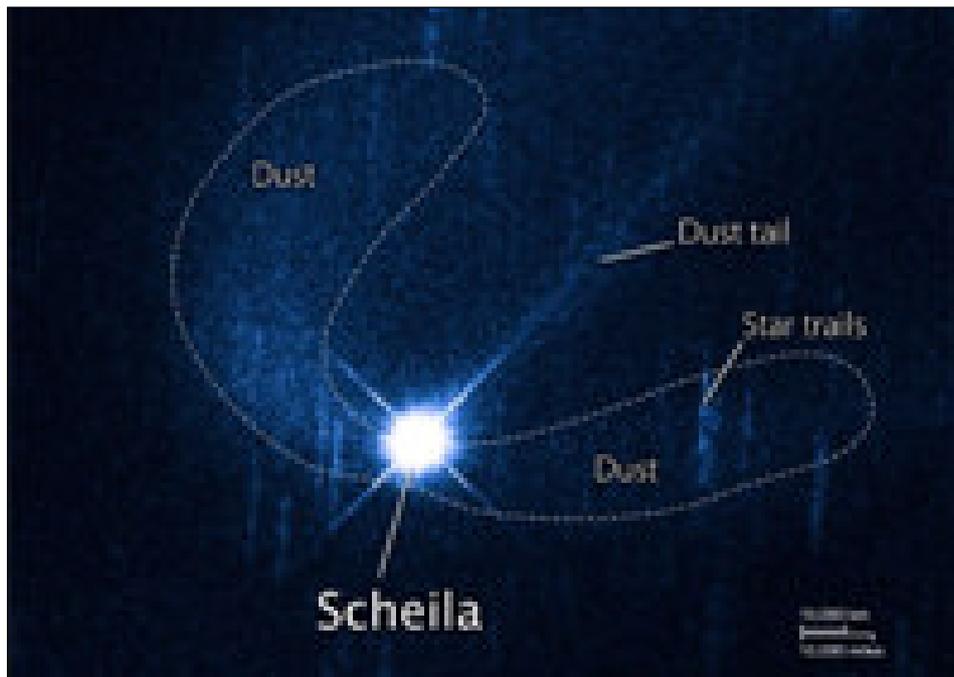
Space telescopes spot asteroid collision debris

Imagine a truck, speeding down the freeway. Flying in the opposite direction is a mosquito. *Smack*. The mosquito collides with the truck's fender, vaporizing. All that's left is the gooey remains of the mosquito's lunch across the chrome and the rest is lost into the howling wind behind the vehicle.

Apologies for the gory analogy, but this is basically what happened in the asteroid belt late last year. A 100 kilometer-wide asteroid collided with an estimated 30 meter-wide asteroid, creating a short-lived comet-like tail of asteroid innards.

The Hubble Space Telescope imaged 596 Scheila on Dec. 27, 2010, when the asteroid was about 350 million kilometers away. The asteroid is surrounded by a C-shaped cloud of particles and displays a linear dust tail in this visible-light picture acquired by Hubble's Wide Field Camera 3. Because Hubble tracked the asteroid during the exposure, star images are trailed.

<http://news.discovery.com/space/space-telescopes-spot-another-asteroid-collision-110428.html>



South African news snippets

- South African National Space Agency (SANSa) has been operational from 1 April 2011. SANSa Space Operations Directorate (was CSIR Satellite Application Centre (SAC)) and SANSa Space Science (was Hermanus Magnetic Observatory (HMO)) are now part of SANSa. See www.sansa.org.za
- MEARIM II, the second **M**iddle **E**ast and **A**frica **R**egional IAU* **M**eeting was held at the Ritz Hotel in Cape Town from 10 -15 April 2011. See <http://mearim2.sao.ac.za/>. You can read the opening address of the Deputy Minister of Science and Technology, Mr Derek Hanekom, by left clicking on "Derek Hanekom" on this website. Dr Adam Viljoen, one of our members, attended the meeting and he could maybe give you some feedback. His e-mail address is adieviljoen@surgeon.co.za and his cell phone number is 082 900 5566.

* IAU is an acronym for **I**nternational **A**stronomical **U**nion

This was sent in by Dr Hubrecht Ribbens, one of our members.

Another news snippet

Comet Hale-Bopp was spotted beyond the orbit of Neptune at a distance of 30.7 AU.

http://www.scientificamerican.com/podcast/episode.cfm?id=comet-bops-past-neptune-cleanly-11-05-02&WT.mc_id=SA_CAT_physics_20110506

Summary of "What's Up?" to be presented on 25 May 2011 - by Johan Smit

What's up will be dedicated to observing lunar eclipses and in particular the one on 15 June 2011. Some details about the eclipse follow. (See also the eclipse map on the next page.)

The Total Lunar Eclipse of 15 June 2011 is a long eclipse passing deeply through the Earth's umbra. The totality phase just on its own will last 100 minutes. The northern limb of the Moon will be 22.3 arc-seconds from Earth's umbra, while the southern limb will be 54.2 arc-seconds from the edge of Earth's umbra. Therefore the northern regions of the Moon may appear brighter than the southern regions of the Moon. The Moon will undergo dramatic colour changes throughout the eclipse. This makes it challenging to make precise predictions for the exact brightness distribution of Earth's umbra on the Moon. Therefore observers are encouraged to estimate the various brightness at different times using the Danjon Scale of Lunar Brightness.

Penumbral Eclipse Begins:	17:24:34 UT/GMT
Partial Eclipse Begins:	18:22:56 UT/GMT
Total Eclipse Begins:	19:22:30 UT/GMT
Total Eclipse Ends:	21:02:37 UT/GMT
Greatest Eclipse:	20:12:37 UT/GMT
Partial Eclipse Ends:	22:02:15 UT/GMT
Penumbral Eclipse Ends	23:00:45 UT/GMT

Add 2 hours to these times to get our local times.

Saros Member 130

Number 34 out of 71

First Eclipse, 10 June 1416, 11:56:50

Last Eclipse, 26 July 2678, 05:42:41

Duration of Saros 130 = 1262.11 years

Special viewing evening

On Wednesday 15 June 2011 at 20h12 there will be a total lunar eclipse. The Pretoria Centre of the ASSA invites everyone who is interested, to a special observing evening on this date to celebrate the first total lunar eclipse of 2011. We urge you to make an effort to observe this eclipse with us, because the next total lunar eclipse, fully visible from our location, will be in September 2015 and then you will have to get up at 02:00 in the morning.

The observing evening will take place at the Pretoria Centre Observatory at CBC. This eclipse happens at a very convenient time, from just after 19:00, so we will gather there from sunset on. Bring along a picnic basket, chairs, binoculars, telescopes and warm clothes and enjoy the evening with us.

And to top it off, the next day (16 June) is a public holiday, so we can sleep late the next morning. We could not have asked for a better timed eclipse. Let's make the best of it.

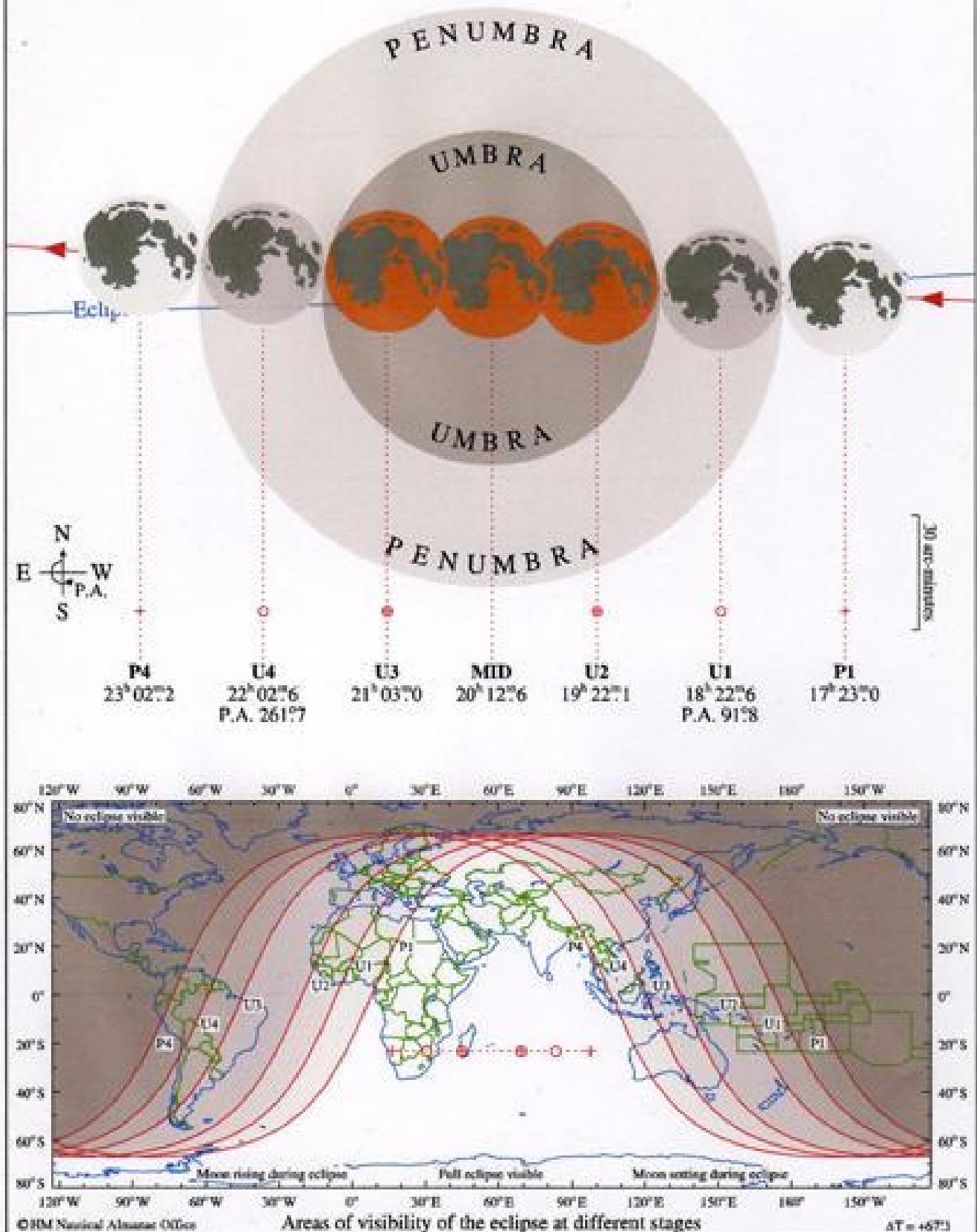
To get to our observatory at CBC (Christian Brothers College): CBC is at Mount Edmund, Pretoria Road, Silverton, Pretoria. Turn left immediately after entering the main gate at CBC and follow the road up to our observatory.

III. - Total Eclipse of the Moon

2011 June 15

UT of geocentric opposition in RA: June 15^d 20^h 13^m 8.224

Umbral magnitude of the eclipse: 1.705



Planet-struck? - by Pierre Lourens

When I look through old newsletters I have compiled, I see that I have put a lot of information about extrasolar planets in them. Some members must have started thinking that I am - well, not moon-struck, but planet-struck. But I have reasons for having done so:

- The life forms we know, evolved here on Earth. It is the only place we know of where life is present. So, naturally, in the search for extraterrestrial life, **the discovery of planets around other stars raises our hopes that extraterrestrial life will be found on one of them.**
- A lot of extrasolar planets have been found so far. (538 on 11 March 2011.) They have been found around just about any kind of star. A further 1235 candidate stars with planets have been found by the Kepler spacecraft and will be studied to find out if they actually have planets orbiting around them. (See the April 2011 newsletter, page 8.) **The picture that is becoming in focus gradually, is that planets are abundant and just a typical byproduct of star formation. This raises our hopes further.**
- The first planets found around other stars than the Sun (planets around pulsars aside) 20 years ago, were very massive, with masses about 10x the mass of Jupiter and even more. As time went by, observing techniques were refined, and less and less massive planets were found. Recently, planets with masses only a few times that of Earth have been found. **The more Earth-like planets are found, the more our hopes are raised.**
- But what is so special about life? **Life is special for two reasons:**
 1. **Complexity.** A living organism is an exceedingly complex, yet smoothly functioning molecular machine, i.e. a machine of which the smallest moving parts are molecules.
 2. **Consciousness.** Above a certain level of complexity, living organisms have consciousness, i.e. they are aware of the Universe around them. (It is debatable where this level is.)

Allow me some speculation. My guess is that life is very common in the Universe and that it is all based on carbon chemistry that takes place in liquid water, like in the case of life on Earth. Microbial life is very common; multicellular life less common; intelligent life rare; and intelligent life that produces a technological civilization like our own, very rare.

If you are not yet "gatvol" of reading about extrasolar planets (I'm not), here are web links:

- <http://www.newscientist.com/article/mg20928005.200-starless-planets-may-be-habitable-after-all.html>
- <http://www.newscientist.com/article/dn20160-two-planets-found-sharing-one-orbit.html>
- <http://news.nationalgeographic.com/news/2011/02/110222-planets-formation-theory-busted-earth-science-space/>
- <http://news.discovery.com/videos/space-star-spits-out-baby-planet.html>

Milky Way stuffed with 50 billion alien worlds (This is probably an underestimate - PL.):

- <http://news.discovery.com/space/milky-way-stuffed-with-50-billion-alien-worlds.html>

Planets around white dwarf stars?

- <http://news.discovery.com/space/could-dead-dwarf-stars-support-life-110324.html>
- <http://www.sciencecentric.com/news/11033105-astrophysicist-white-dwarfs-could-be-fertile-ground-other-earths.html>

Bizarre alien plants imagined in binary star systems - slide show:

- <http://news.discovery.com/space/slide-show-binary-star-purple-plants-110422.html>

Contact with intelligent aliens with a technological civilization:

- <http://science.discovery.com/videos/ten-ways-alien-signal.html>
- <http://news.discovery.com/videos/space-alien-speculation.html> (continued on next page)

- <http://news.discovery.com/videos/space-battle-los-angeles-alien-life.html>

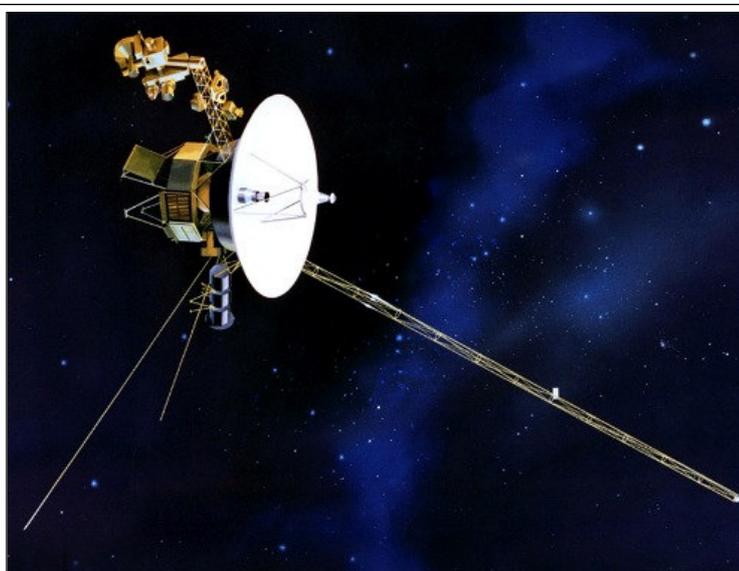
Pluto bulging with CO

It may have been demoted to dwarf planet status, but researchers have found that Pluto's atmosphere is much bigger than previously known. Astronomers first detected an atmosphere around Pluto when it briefly passed in front of a star in 1988. Light from the star passed through the dwarf planet's atmosphere, causing it to dim slightly.

The atmosphere was then known to be over 100 kilometers thick. Now, astronomers have used the James Clerk Maxwell Telescope in Hawaii to study Pluto's atmosphere in more detail. Their observations have pushed it out to more than 3000 kilometers. Pluto's atmosphere has a very low pressure, about a microbar, so it expands very readily. The researchers also detected carbon monoxide (CO) in Pluto's atmosphere. Methane (CH₄) had already been known to exist in its atmosphere. Pluto's thin atmosphere is thought to be the result of ice sublimating from its surface.

NASA's spacecraft New Horizons is scheduled to arrive at Pluto in July 2015. The image is an artist's representation of the surface of Pluto.

<http://www.abc.net.au/science/articles/2011/04/21/3197581.htm?topic=space>



Spacecraft reaches edge of solar system

After a 33-year odyssey, NASA's Voyager 1 has reached a zone where there is no outward-blowing solar wind. It was launched in 1977 for the first close-up studies of Jupiter and Saturn. Voyager 1 is now about 17.4 billion kilometers from the Sun, traveling in a region of space known as the heliosheath, a turbulent area between the sphere of space influenced by the Sun and magnetic forces from interstellar space that lies beyond.

<http://news.discovery.com/space/voyager-solar-system-edge-101214.html>

<http://www.abc.net.au/science/articles/2010/12/15/3092705.htm>

Basics: Evidence that Earth is round and rotates – by Pierre Lourens

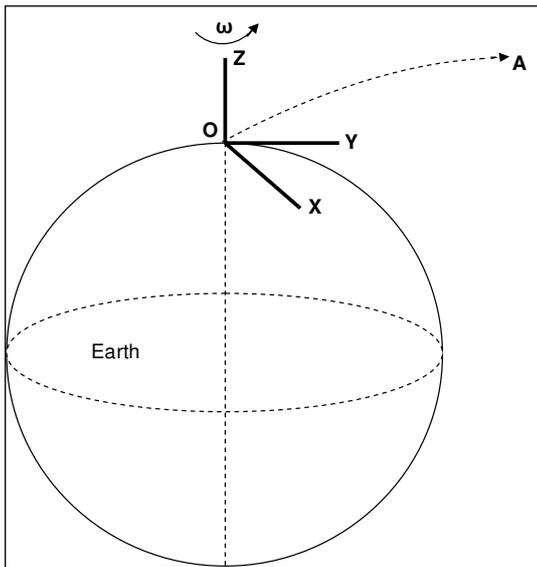
Evidence that Earth is round.

This seems too trivial to discuss. But remember, there was a very long time when people didn't know it, and when everyone thought that the Earth was flat. It was actually comparatively recently in the 200 000-year history of Homo Sapiens that the first evidence was found that the Earth is round. I won't delve into the evidence that gradually accumulated through history. Today we have abundant and convincing evidence for it in the form of photographs of Earth from spacecraft far away from Earth. See, for instance, the accompanying photograph of Earth.



Evidence that Earth rotates.

1. The Coriolis force.



For an observer in a rotating coordinate system, the equations of motion for a moving body contains a term named the "Coriolis force". It is actually a fictitious force. Because of the rotational movement of the observer, there is an apparent additional acceleration of a moving body, apart from that caused by all the other known forces upon it. Hence it appears as if an apparent additional force acts upon it. It can be understood by considering the following simple example.

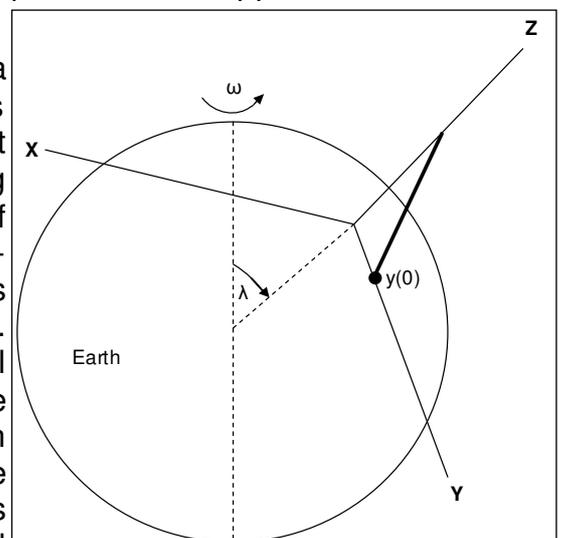
Let XYZ be a coordinate system that is fixed at the north pole (O) on the surface of Earth. Imagine an observer that is standing still at O. As Earth rotates toward the east, the observer and the coordinate system rotate with Earth. Imagine a projectile that is fired from the north pole. Its actual trajectory in space is OA. The observer at O will observe a westward acceleration of the projectile. He will

have to turn his head towards the west to keep the projectile in view, and it will appear to him as if there is a force acting on the projectile that is directed westward. But this is because he himself is rotating with Earth as it rotates towards the east.

The Coriolis force is named after the French mathematician Gustav Coriolis who first set up these equations of motion and used them to do an analysis of the movement of bodies as seen by an observer fixed in a rotating coordinate system. The equation can be applied to two cases:

- **The Foucault pendulum.**

Consider a bob hanging on a cable (i.e., a pendulum) near the Earth's surface and the XYZ axes chosen so that the Z axis points vertically upward at that location, as shown in the figure. These axes are a rotating coordinate system. The rather complicated equations of motion for the bob (one for each of the x-, y- and z-coordinates of the bob) are a set of 3 differential equations and are exactly solvable numerically with a computer. However, for movements of the bob which are small compared to the length of the cable and which are approximately confined to the XY plane, some terms in these equations of motion are small compared to the others, and can be deleted from the equations. Solutions for the resulting approximate equations can then be found



in the form of formulae. These formulae are then fairly accurate approximate solutions of the

original equations These approximate solutions are as follows.

$$x(t) = y(0) \cos[(g/\ell)^{1/2} t] \cdot \sin[(\omega \cos \lambda) t]$$

$$y(t) = y(0) \cos[(g/\ell)^{1/2} t] \cdot \cos[(\omega \cos \lambda) t]$$

$$z(t) = 0$$

The symbols have the following meanings:

x, y, z : Orthogonal Cartesian coordinates of the bob.

g : Gravitational acceleration.

ℓ : Length of cable.

t : Time.

ω : Magnitude of Earth's angular velocity.

λ : Angle measured as shown in figure.

The mathematical expression for the Coriolis force in the equations of motion contain the quantity ω which eventually "precipitates" in the solutions above.

These solutions show that the bob swings to and fro, but the plane in which it does so, slowly rotates with period $P = 2\pi / (\omega \cos \lambda)$, with $\omega = 2\pi / (24 \text{ sidereal hours})$. Therefore $P = (24 \text{ sidereal hours}) / \cos \lambda$.

The angular speed with which the plane oscillates, is $\omega \cos \lambda$. $\omega \cos \lambda$ is positive in the northern hemisphere, which means that the plane rotates clockwise there (as seen from above the swinging pendulum). $\omega \cos \lambda$ is negative in the southern hemisphere, which means that the plane rotates anticlockwise there.

A famous public experiment was performed in 1851 by Jean Foucault in the Panthéon in Paris. He hung a pendulum from the top of the inside of a dome of the building. The plane in which the bob of the pendulum oscillated, did rotate clockwise with period $(24 \text{ sidereal hours}) / \cos \lambda$, as predicted by these solutions. The outcome of the experiment provided evidence that Earth rotates.

Note that if ω is put = 0 in these solutions (this amounts to assuming Earth to be not rotating), they become simply

$$x(t) = 0$$

$$y(t) = y(0) \cos[(g/\ell)^{1/2} t]$$

$$z(t) = 0$$

This means that the equations of motion predict that the movement of the bob will be confined to the YZ plane on a non-rotating Earth. This movement of the bob does not agree with experiment.

- http://en.wikipedia.org/wiki/Foucault_pendulum
- For mathematically minded members: "Theory and problems of theoretical mechanics" by Murray R Spiegel (Schaum's outline series), 1967 edition, chapter 6.

- **Deflection of winds on Earth's surface.**

A cyclone is a pattern on the Earth's surface of closed lines of constant pressure (isobars), which are roughly concentric, and with the air pressure decreasing from the outside to the inside. The air is driven by the pressure gradient to move perpendicular to the isobars. On a non-rotating Earth, the air in a cyclone would simply have moved from the outside to the inside of the cyclone. On a rotating Earth, however, the Coriolis acceleration would be directed perpendicular to this movement - to the right of the movement in the northern hemisphere and to the left of the movement in the southern hemisphere. As a result, on a rotating Earth, the air in a cyclone would spiral inward and circulate counterclockwise in the northern hemisphere and clockwise in the southern hemisphere. This is what is observed. This way air moves in a cyclone therefore also serves as evidence that Earth rotates.

2. Experiment with a gyroscope.

A simple experiment with a gyroscope also provides evidence of Earth's rotation.

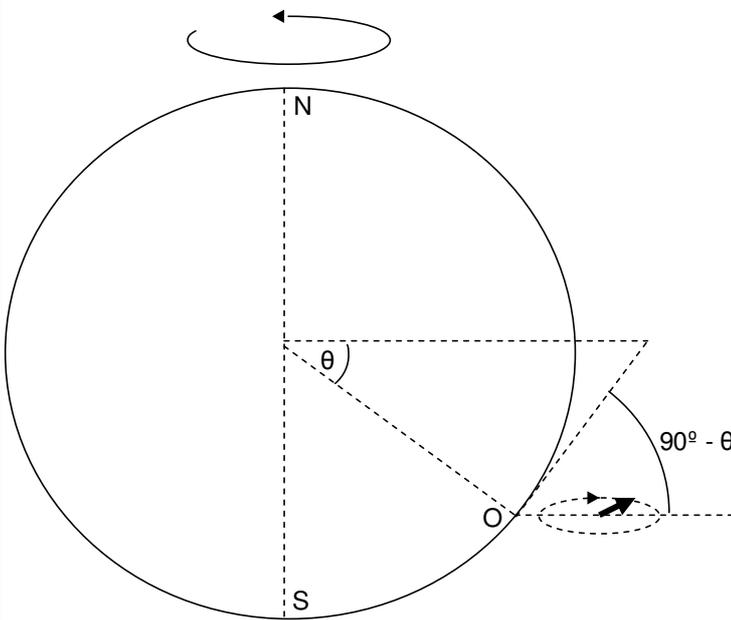
(Remember that a property of a gyroscope is that, once it is set spinning, its axis of rotation remains pointing in the same direction in space.) Set up a gyroscope with its axis pointing horizontally and due east, start it spinning and leave it for some hours. If the Earth were not rotating, an observer on Earth would see the axis of the gyroscope remaining pointing horizontally and due east. If the Earth were rotating toward the east, an observer on Earth would see the axis of the gyroscope slowly moving around in a plane as shown in the figure below. This is what is observed.

3. The oblateness of the Earth.

A rotating body attains an oblate shape – i.e., its equatorial diameter is greater than its pole-to-pole diameter. The fact that Earth has an oblate shape is evidence of its rotation.

4. Actual time-lapse movies..

Time-lapse movies, compiled from images of Earth made by spacecraft, show the rotation of Earth. Give your Google (or other search engine) the keywords “**Rotation of Earth seen from space**”. Seeing is believing!



Θ is the latitude at the observer's location, which is at O. N and S indicate the geographic north and south poles. The thick arrow shows the direction in which the axis of the gyroscope is pointing at a certain moment. The plane in which the axis of the gyroscope is observed to be moving, makes an angle of $90^\circ - \theta$ with a line that is drawn tangent to the Earth's surface at the observer's location and that is pointing north. If the gyroscope remains spinning long enough, its axis rotates back to its original orientation (i.e. pointing due east) after 24 hours.

Bad news

• **New low for NASA's beleaguered space telescope**

A space telescope that could help find life on other planets and insights into the first galaxies won't be finding anything for a while yet. NASA says its over-budget James Webb Space Telescope (JWST) probably won't launch until 2018.

<http://www.newscientist.com/article/dn20368-new-low-for-nasas-beleaguered-space-telescope.html>

• **Budget crunch mothballs telescopes built to search for alien signals**

The hunt for extraterrestrial life just lost one of its best tools. The Allen Telescope Array (ATA), a field of radio dishes built to seek out transmissions from distant alien civilizations, has been shuttered, at least temporarily, as its operators scramble to find a way to continue to fund it. The ATA is a partnership between the SETI Institute, which is responsible for building the telescope array, and the University of California, Berkeley, which is responsible for operating it. The nonprofit SETI Institute was founded in 1984 and has mostly relied on private donations to support its research. NASA had bankrolled a number of early SETI Institute projects, but Congress cancelled NASA's short-lived SETI program in 1993.

<http://www.scientificamerican.com/blog/post.cfm?id=budget-crunch-mothballs-telescopes-2011-04-24>

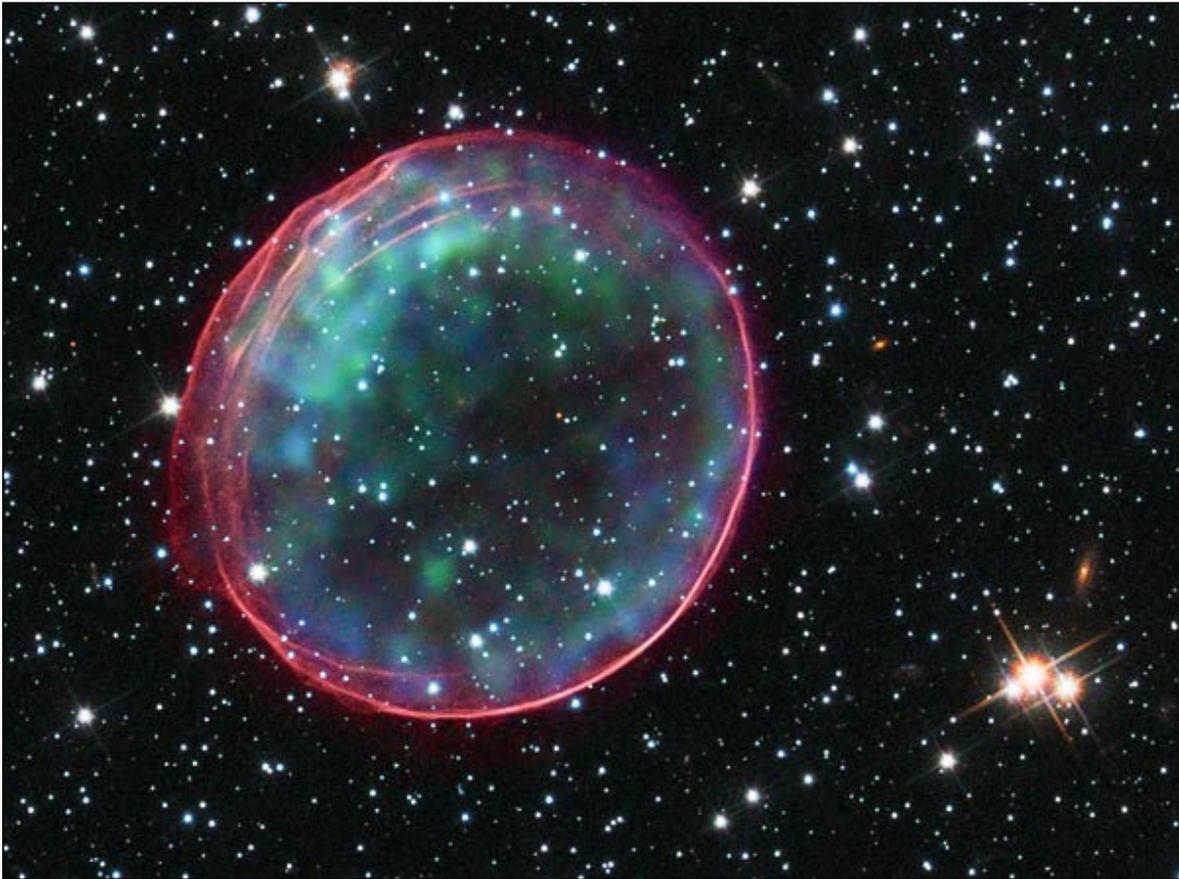


Clockwise, from top right: 1. Johann Swanepoel, a former member of the Pretoria Centre of the ASSA, with two identical 20-inch Dobsonians he built himself. He also ground the two parabolic mirrors of the telescopes himself, with a grinding machine that he designed and built himself. 2. The stall of the Johannesburg Centre of the ASSA. 3. Johan Smit, chairman of the Pretoria Centre of the ASSA, with his self-built telescope, for which he received an award. 4. The stall of the West Rand Astronomy Club. 5. Neville Young (middle), a former chairman of the Pretoria Centre of the ASSA and still a member of it, in front of his stall. 6. A heliochronometer, which is a cleverly designed, accurate sundial. The longitude and latitude can be adjusted for the location where it is used. The rectangular frame in the middle can be rotated to add or subtract the time correction.

FEATURE OF THE MONTH: Cosmic gem

The leftover cloud of hot gas and dust created by a star that ended its life in a violent explosion. This picture of it combines data from NASA's Chandra X-ray Observatory and the Hubble Space Telescope.

Known as SNR 0509-67.5, the supernova remnant sits about 160,000 light-years from Earth in the Large Magellanic Cloud, a companion galaxy of our own Milky Way galaxy. Chandra's X-ray vision shows the soft greens and blues (false colours) from hot material, while Hubble's visual-light data reveals the visible, glowing pink (actual colour to our eyes) shell of gas being superheated by an expanding shock wave.



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Galaxy M101

