



The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER FEBRUARY 2013

Next meeting

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

Date and time: Wednesday 27 February at 19h15.

Programme:

- **Beginner's Corner:** "Observing" by Percy Jacobs
- **What's Up?** by Percy Jacobs
- **10 minute break — library will be open**
- **Main talk:** "A few comets to observe, and how to observe them" by Tim Cooper
- Socializing over tea/coffee and biscuits

The chairperson at the meeting will be Pierre Lourens.



Next observing evening

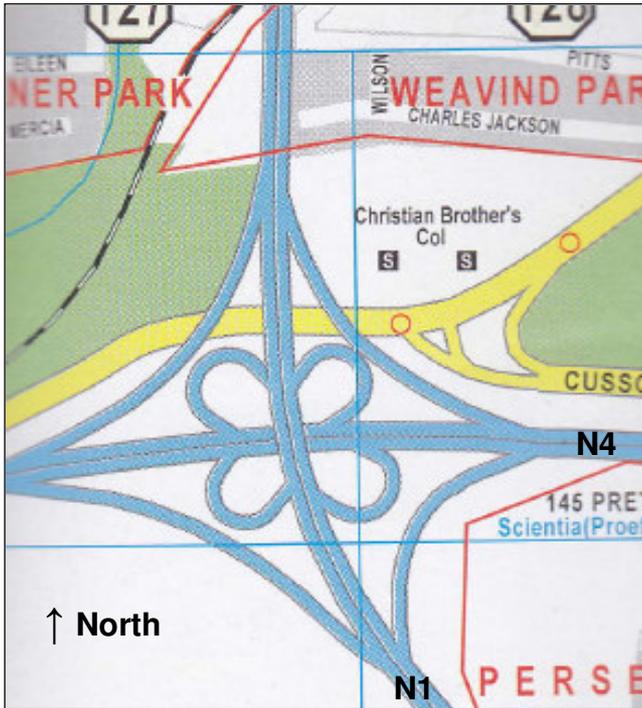
★ Friday 22 February at the Pretoria Centre Observatory, which is also situated at ★ CBC. Turn left immediately after entering the main gate and follow the road. Arrive ★ from sunset onwards. ★



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Report of observing evening on Friday 18 January 2012
by Michael Poll



Our Friday observing evening turned out to be the middle of a wet weekend, the first proper rain since December 26th. It had rained all day, but at least it stopped for the time spent at CBC, but it was still cloudy, so no observations.

Danie Barnardo, Johan Smit and Michael Poll were in attendance, and for the most part of the evening we could only stand in shock and horror while staring at the light pollution now dispensed by the tower lights on the N1 / N4 interchange – the mass of lights looked like a UFO invasion from Star Wars. I counted 25 lights, and those were just the ones in the near distance.

One cannot imagine that there is any light left to be dispensed downwards from these lights when one sees the amount of light dispensed sideways. I guess CBC will not need to install floodlights on its lower playing fields any

time soon – one could play nighttime cricket there, courtesy of Sanral or whoever organises these inappropriate fixtures.

Oh dear! The three of us scouted around to see if there was any escape for our observing, and the only likely place is the “avenue” outside the dome, and next to the pavilion. Ω

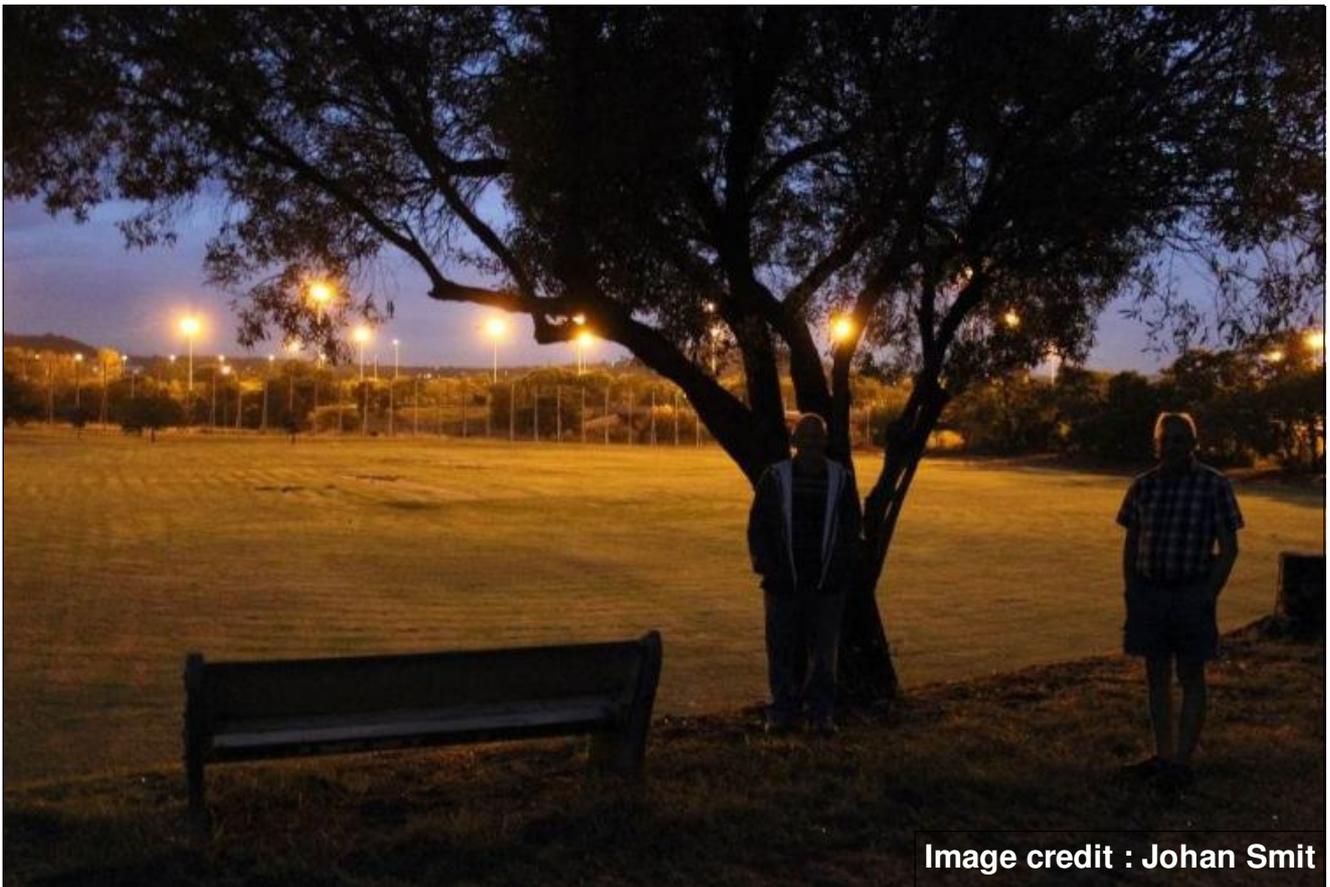


Image credit : Johan Smit

COSMOLOGY MARCHES ON



Chairman's report of meeting held on 23 January 2013 by Bosman Olivier

A record (for me anyway) number of people attended the first meeting of the year. The room was quite full, with quite a number of new visitors and many of our members who we do not see regularly who attended the meeting.

The evening was started off by Pat Kühn, who explained in "**Beginner's Corner**" his efforts of how (not to) build a Foucault pendulum for Scopex 2012. He spent some time on the history of this instrument designed to illustrate the fact the earth rotates around its own axis. Bearing in mind that one of the first instruments was a massive 67 metre long, with a 28 kg bob at the bottom and was suspended from the dome of the Panthéon in Paris, France, Pat's much smaller version (about three metres) posed many challenges. Despite this, the instrument performed well and visitors could see clearly see the movement of the bob around the circle during the course of the day.

"**What's Up?**" was presented by Danie Barnardo, who highlighted the various objects to be on the lookout for during the month of February. He also pointed out the comets and asteroids that would be visible, such as Comet Lemmon. This comet is visible in binoculars and could provide hours of pleasure, even though it does not sport a tail.

The main talk of the evening was presented by Sarah Wild, the science and technology editor of the Business Day newspaper. She is also the author of a new book, "**Searching African skies: the SKA and SA's quest to hear the songs of the stars**", which focuses on the establishment of the SKA and the history of the bid to host the project.

Sarah is an energetic young lady, who held the audience attention with her enthusiasm for the subject. Without using and visual aids, we all listened attentively to all the stories, and some of the politics, surrounding the whole project. True to her profession, Sarah merely presents the facts regarding the project objectively, without any judgemental comments surrounding them.

She is well qualified to talk about the subject, having obtained a Bachelor of Science in Physics and English Literature as well as a B. Sc. (Honours) in English Literature.

The evening ended with an enjoyable cup of coffee and biscuits as well as lively discussions of astronomical matters. The logistics of this was arranged by Michael Poll, to whom we owe many thanks.



Sarah Wild, a science journalist, who was the main speaker at the meeting on Wednesday 23 January.

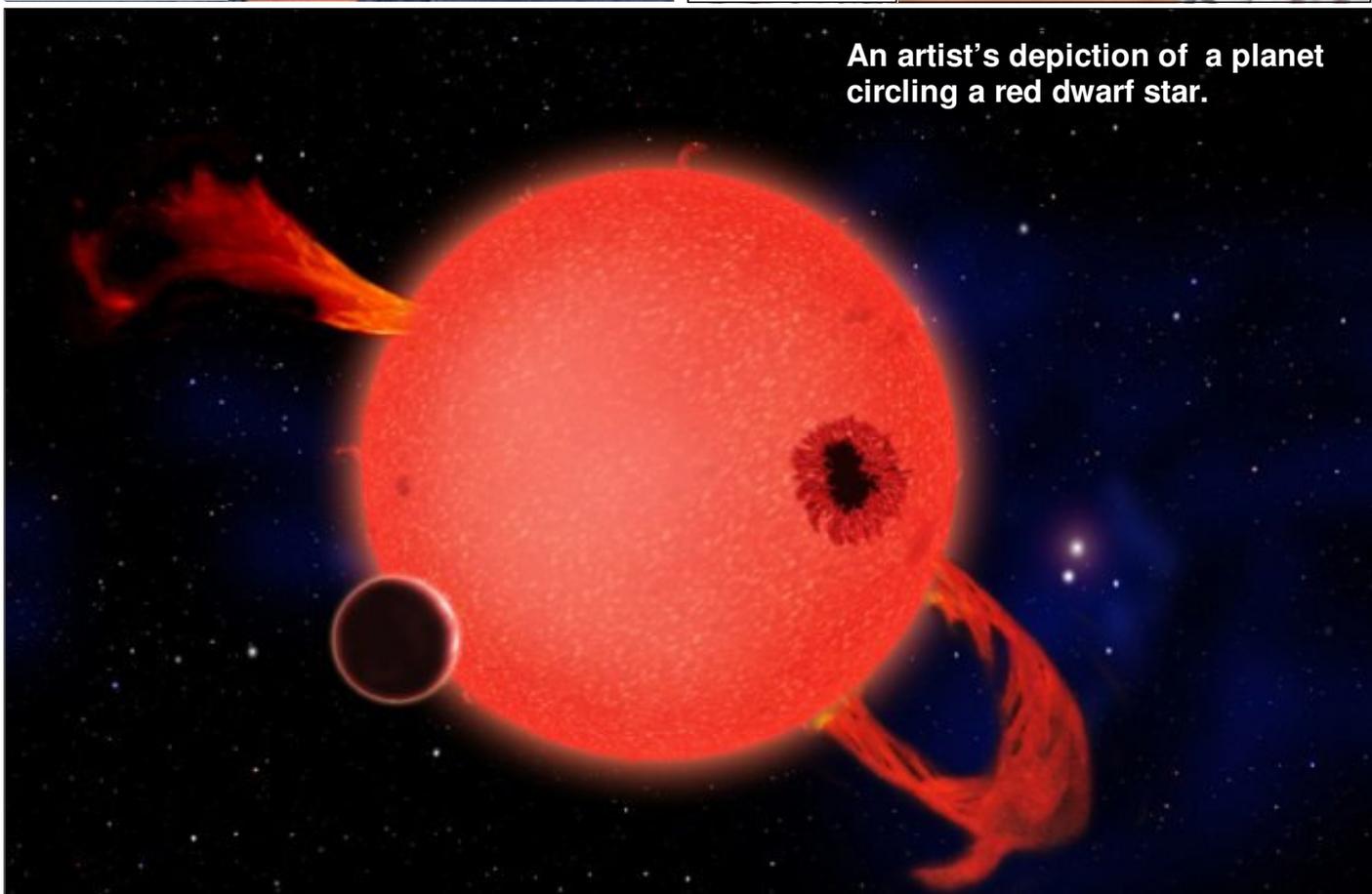


Louis Kloke



Craig Kloke,
son of Louis

An artist's depiction of a planet
circling a red dwarf star.



Summary of "What's Up?" to be presented on 27 February by Percy Jacobs

Dark Sky 1st 2 weeks of March

Phases of the Moon

Full Moon	27 th March
Last Quarter	4 th March & 3 rd April
New Moon	11 th March (dark sky)
First Quarter	19 th March

Planets

Neptune, Uranus, Mars, Mercury, Venus

All setting in the west at sunset – all in the same proximity as the sun

Venus

Early March (1st week), can be seen early hrs of the morning, low on horizon in the east at sunrise

Late March. can be seen setting alongside the Sun

Saturn

Seen rising in the east early March at around 21:00

Good-bye to Jupiter & say hello to Saturn

Jupiter

Seen setting in the west – visible for about 2 - 3 hours before setting

Events

Comet - C/2011 L4 Panstarrs- A Naked Eye Comet On March 12th 13th (west sunset)

Comet - C/2012 F6 (Lemmon) – 21st March peak

March Equinox 20th March (Sun rises "due east" and sets "due west")

Moon shines close to Pleiades and Jupiter in the low west

Constellations – shall be discussed in more detail at meeting

Crux	- south	- "southern cross"
Vela	- south	- "the sails" – gamma Velorum
Carina	- south	- "the keel" – False Cross and Canopus
Centaurus	- south	- "the centaur" – pointer stars – alpha & beta Centauri
Leo	- east	- "the lion" – Regulus
Virgo	- east	- "virgin" – Spica
Gemini	- north/west	- "the twins" – Castor & Pollux
Taurus	- north/west	- "the bull" – Aldebaran
Orion	- upper north west	- "the hunter"
Canis Major	- upper north west	- "the greater dog" - Sirius

"ASSA Top 100" Observers

1 George Dehlen	93 observations
2 Louis Kloke	67 "
3 Percy Jacobs	39 "
4 Michael Poll	24 "
5 Craig Kloke	20 "
6 Grant Thompson	20 "
7 Pat Kühn	15 "
8 Andre de la Ponte	6 "
Total	284 "

Ω

Last month's "What's Up?" - by Pierre Lourens

Last month, Danie Barnardo gave us a very good presentation under the heading "What's Up?". Inter alia, he briefly described the following objects. They will still be visible in March. For further reading, see the cited references/web links. The more you know about the heavenly bodies you observe through your amateur telescope, the better you can appreciate them.

- **Gamma Velorum**, aka "the spectral gem of the southern skies". It is a massive star system dominated by a massive Wolf-Rayet star. See the newsletter for September 2008, page 10, and <http://www.answers.com/topic/gamma-velorum> and <http://www.sydneyobservatory.com.au/2012/harry-has-another-look-at-the-extraordinary-southern-multiple-star-gamma-velorum/>
- **VY Canis Majoris**, the largest known star. See the newsletter for May 2010, page 6 and "Feature of the month" below.
- **Tau Ceti**, a star with 5 planets circling it, one of them in the "Goldilocks Zone". <http://www.universetoday.com/99091/five-planets-around-nearby-star-tau-ceti-one-in-habitable-zone/>
- **Comet C2012 F6 (Lemmon)**. http://www.psychohistorian.org/display_article.php?id=201301231248_comet_lemmon Ω

Feature of the month: The largest known stars - by Danie Barnardo

During my recent "What's Up?" presented at the Pretoria Centre meeting on 23 January 2013, I referred to Canis Major as one of the prominent constellations currently visible and that it contains the largest known star, VY Canis Majoris.

I started doing some research on this statement and came up with very interesting results. The first of these is that there is no clear consent about the "Largest Star". I also came under the impression that these are very special stars indeed.

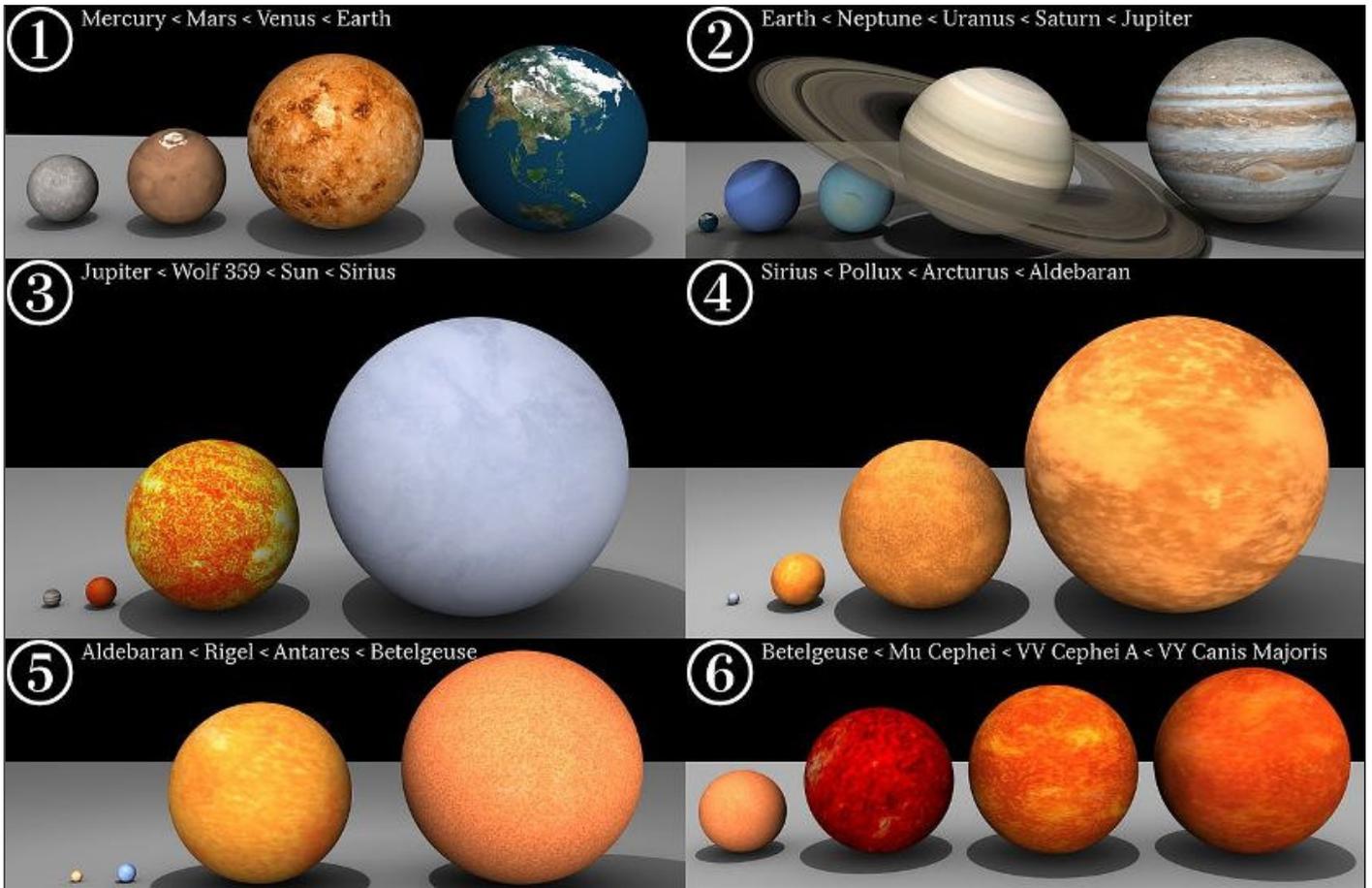
In 1924 Sir Arthur Eddington introduced the *mass-luminosity relation*, which states that outward radiational force is balanced by the inward gravity field of a star. This led to the formulation of the "Eddington limit", which predicts that no star can be larger than about 150 solar masses (150 times the mass of our Sun). Stars larger than this will be extremely short-lived, since it would shed its mass explosively and end up as a black hole or a massive supernova.

VY Canis Majoris falls well within the upper limit of the Eddington Limit, weighing in at approximately 30 solar masses. Its fame comes mostly from its size, which is estimated to be between 1 200 and 1 500 times the diameter of the Sun, which makes it the largest star known by diameter, yet its average density is only 5 -10 mg/m³. If we were to place VY Canis Majoris at the position of our Sun in the Solar System, its outer reaches would envelop the orbit of Jupiter. VY Canis Majoris is about 300 000 times more luminous than the Sun and can be observed as a 7.5 magnitude star and is about 3 900 light years from our Solar System. It is a highly evolved red supergiant and it is expected to explode as a supernova within the next 1 million years.

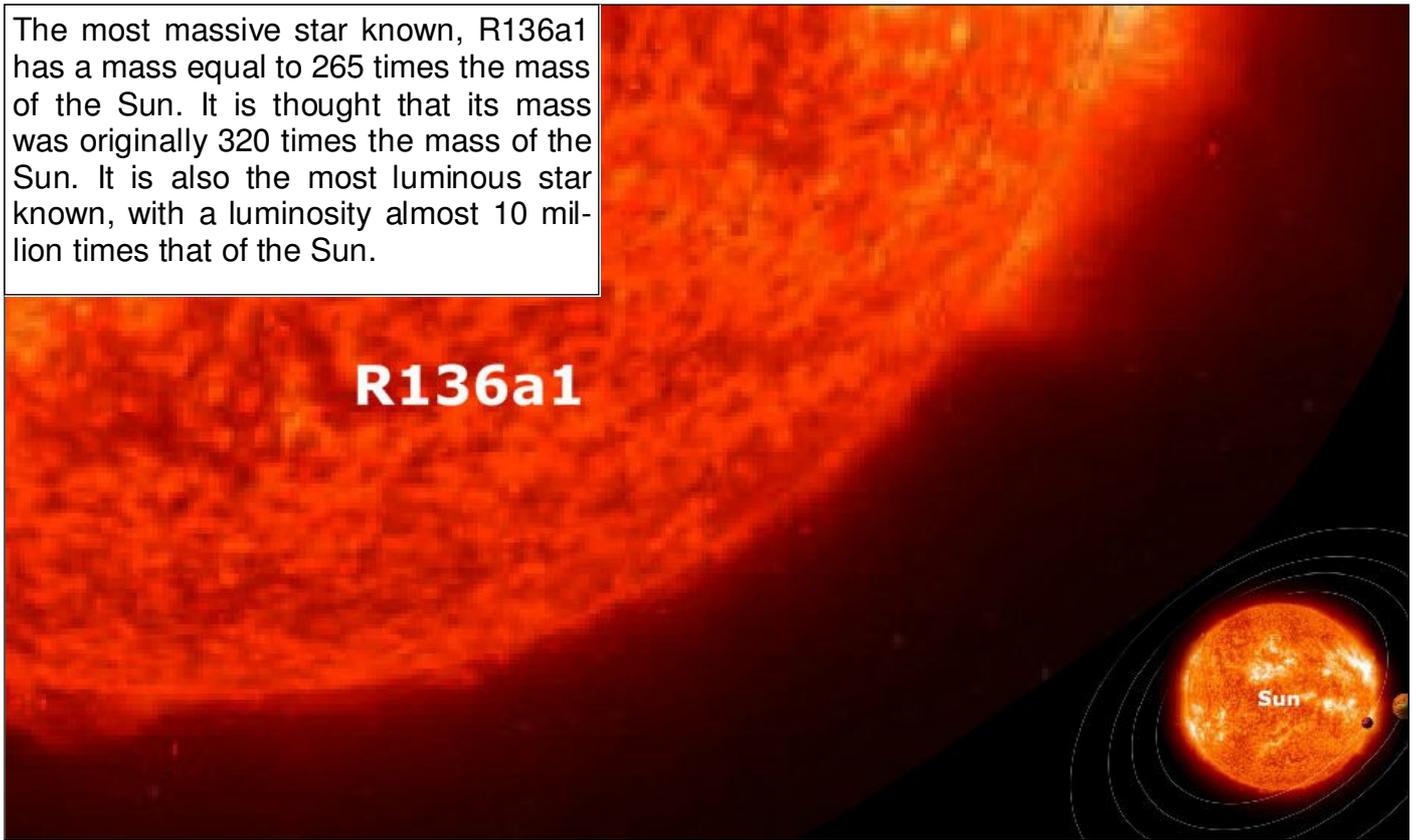
However, there are more amazing stars yet. In the Tarantula Nebula, in the Large Magellanic cloud, which is a satellite galaxy of the Milky Way, located at a distance of about 165 000 light years from the Solar System, there is a star known as R135a1. This star has the incredible mass of 265 solar masses, nearly double the maximum theoretical mass according to the Eddington limit. This star is also the most luminous star known. It has a luminosity 8 700 000 times that of the Sun, with a surface temperature of an incredible 50 000 K. The star is part of a supercluster R136, located near the centre of the Tarantula Nebula. In this supercluster are located a further two nearly equally massive stars, R136a2 and R136a3. In fact, this supercluster contains at least 12 of these hypergiant stars. It is a very young cluster and is estimated to be between 1 and 2 million years old. These very luminous stars are known as Wolf-Rayet stars, which means that they are highly energetic, losing mass rapidly via star winds of up to 2 000 km/s. Ω

See images on next page.

Diagram illustrating the incredible size of the largest stars compared to solar system objects



The most massive star known, R136a1 has a mass equal to 265 times the mass of the Sun. It is thought that its mass was originally 320 times the mass of the Sun. It is also the most luminous star known, with a luminosity almost 10 million times that of the Sun.



Noteworthy items

Stars

- **NASA Astrobiology Institute shows how wide binary stars form.** Using computer simulations, scientists from the NASA Astrobiology Institute are shedding light on a question that has challenged astronomers for years: What causes wide binary stars?
http://www.nasa.gov/home/hqnews/2012/dec/HQ_12-425_Wide_Binary_Stars.html
- **Life and death in a star-forming region.** A new view of W44 which is 10 000 light-years away in the constellation of Aquila, the Eagle. It is a supernova remnant interacting with its parent molecular cloud, situated within dense star-forming clouds. http://www.esa.int/Our_Activities/Space_Science/Herschel/Life_and_death_in_a_star-forming_cloud
- **Vela pulsar jet: new Chandra movie features neutron star action.**
<http://chandra.si.edu/photo/2013/vela/>
- **SOFIA spots recent starbursts in the Galaxy's centre.** Researchers using SOFIA have captured new images of a ring of gas and dust seven light-years in diameter surrounding the super massive black hole at the centre of the Milky Way, and of a neighbouring cluster of extremely luminous young stars embedded in dust cocoons.
http://www.nasa.gov/mission_pages/SOFIA/13-010HQ.html
- **Betelgeuse braces for a collision.** A new far-infrared view from the Herschel space telescope shows how the star's winds are crashing against the surrounding interstellar medium, creating a bow shock as the star moves through space.
http://www.esa.int/Our_Activities/Space_Science/Betelgeuse_braces_for_a_collision
- **Stars can be late parents.** TW Hydrae is 10 million years old, but the massive protoplanetary disk around it still has enough mass to spawn 50 Jupiter-sized planets, several million years after most other stars have already given birth.
http://www.esa.int/Our_Activities/Space_Science/Stars_can_be_late_parents

Extragalactic astronomy

- **NASA's Hubble provides first census of galaxies near cosmic dawn.** Looking deeper into the Universe also means looking further back in time. Using NASA's Hubble Space Telescope, astronomers announced they have seen further back in time than ever before and have uncovered a previously unseen population of seven primitive galaxies that formed more than 13 billion years ago. The results also show a smooth decline in the number of galaxies looking back in time. The observations support the theory that galaxies assembled continuously over time. http://www.nasa.gov/home/hqnews/2012/dec/HQ_12-428_Hubble_UDF.html
- **Fine-tuning galaxies.** 61 nearby galaxies studied by ESA's Herschel and NASA's Spitzer space telescopes are presented in this interactive tuning fork diagram. http://www.esa.int/Our_Activities/Space_Science/Fine-tuning_galaxies_with_Herschel_and_Spitzer
- **NASA joins ESA's "Dark Universe" mission.** NASA has officially joined ESA's Euclid mission, a space telescope designed to investigate the mysterious natures of dark matter and dark energy. Scientists hope to solve key problems in our understanding of the evolution and fate of our expanding cosmos. It is to be launched in 2020.
http://www.esa.int/Our_Activities/Space_Science/NASA_joins_ESA_s_dark_Universe_mission

Solar system

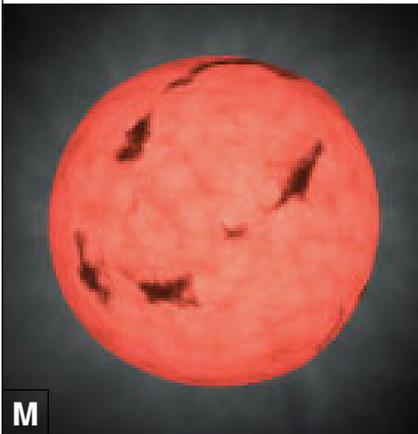
- **Cassini spots mini Nile river on Saturn moon.** A miniature extraterrestrial version of Earth's Nile River has been discovered on Titan. http://www.esa.int/Our_Activities/Space_Science/Cassini_spots_mini_Nile_River_on_Saturn_moon
- **Sun launches a beautiful arc of plasma.** We are currently experiencing a very exciting time in the 11-year cycle of our Sun. <http://news.discovery.com/space/astronomy/sun-unleashes-a-beautiful-arc-of-plasma-130123.htm#mkcpgn=emnws1>

- **Jupiter: how to observe the solar system's giant.** <http://news.discovery.com/space/astronomy/jupiter-astronomy-tips-telescope-binoculars-130131.htm#mkcpgn=emnws1>
- **Comet ISON.** Astronomers are keeping a close eye on newly-discovered Comet ISON, which could become visible in broad daylight later this year when it skims through the atmosphere of the Sun. Some reporters have dubbed ISON the "Comet of the Century," but experts aren't yet sure how bright the Sun grazer will become.
Video clip: http://www.youtube.com/watch?v=5_1HdOCOJ_Q
Full story: http://science.nasa.gov/science-news/science-at-nasa/2013/18jan_cometison/

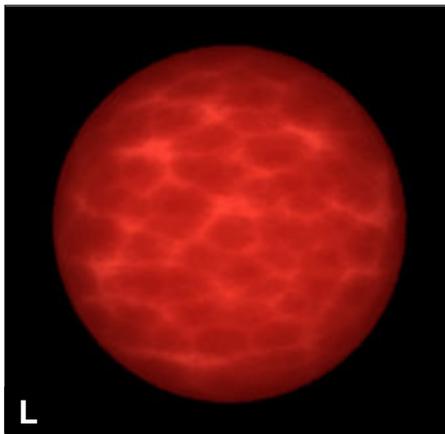
Spaceflight

- **See a slide show of a concept of NASA's Orion spacecraft.** It will be used to carry astronauts into space. http://www.esa.int/Our_Activities/Human_Spaceflight/Highlights/Orion
- **Do a virtual tour of the International Space Station.**
<http://www.youtube.com/embed/doN4t5NKW-k>
- **Warp speed: this is what you'd really see.** The science fiction version of travelling close to the speed of light isn't entirely complete. <http://news.discovery.com/space/this-is-what-you-d-see-traveling-at-warp-speed-130115.htm#mkcpgn=emnws1> Ω

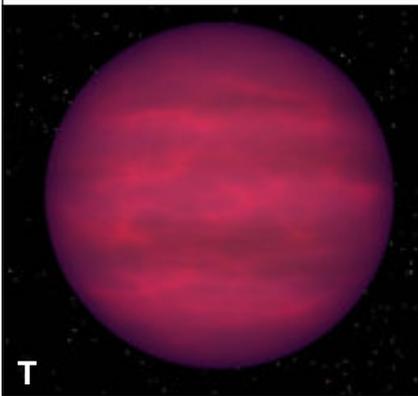
Basics: Brown dwarfs - by Pierre Lourens



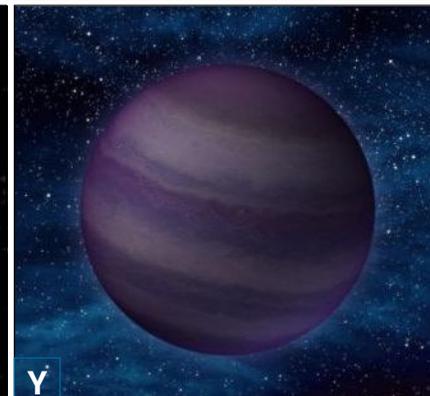
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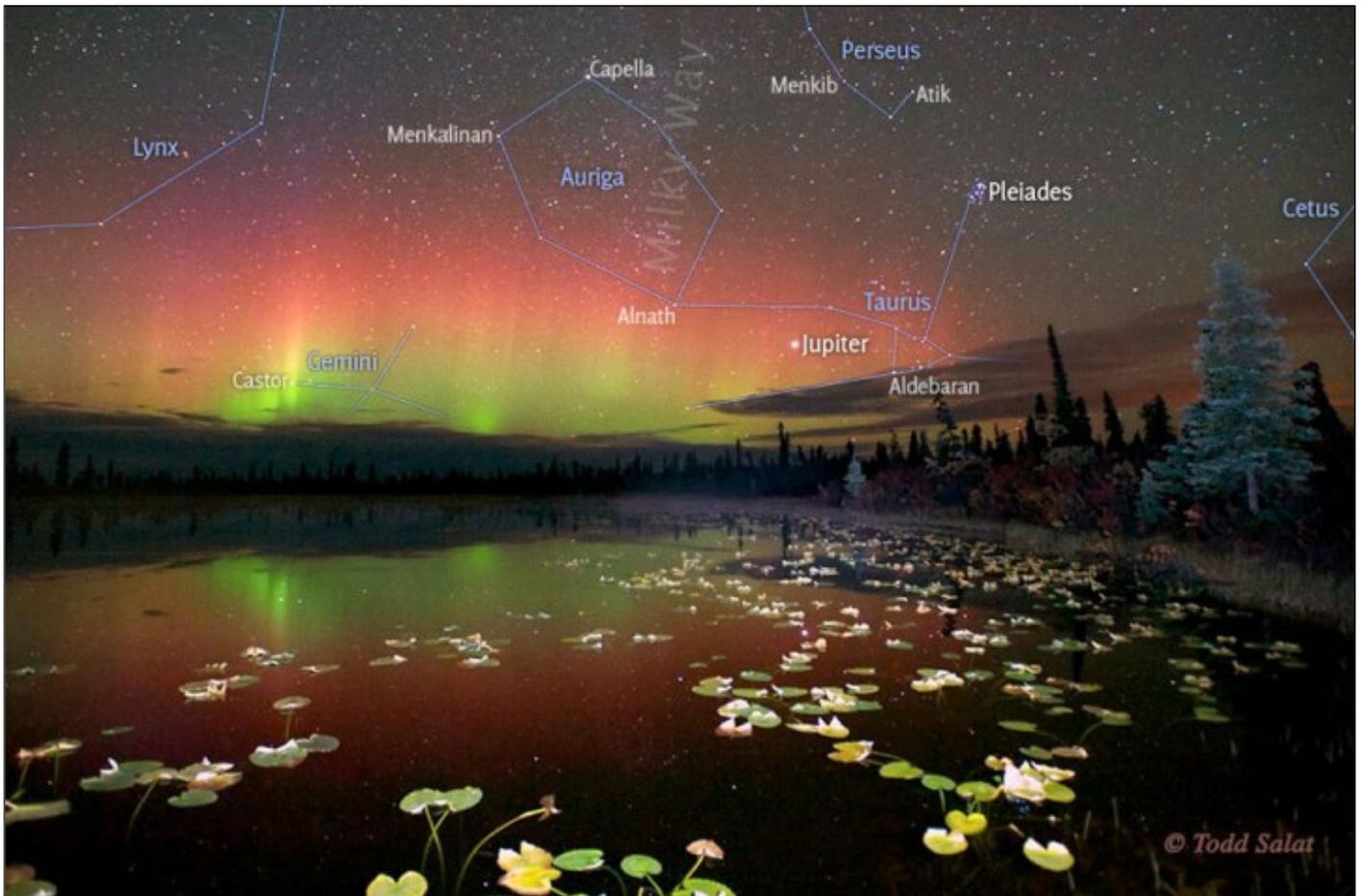
Y

Temperatures in the cores of stars that have masses less than 80 Jupiter masses (or 0.08 solar masses), do not rise high enough to start thermonuclear reactions in their cores. Such stars are, however, luminous as they slowly shrink in size and radiate away the released gravitational potential energy. As their surface temperatures are below the 2500 K lower limit of red dwarf stars, they are known as brown dwarfs. A brown dwarf is something between a star and a planet. The higher the mass, the closer it is to a star, and the lower the mass, the nearer it is to a planet. The lower limit of their mass is taken (rather arbitrarily) as 13 Jupiter masses (or 0.013 solar masses).

They were theorized to exist in the 1960's. For many years, efforts to discover brown dwarfs were frustrating and searches to find them seemed fruitless. But many hundreds of brown dwarfs have now been discovered by infrared telescopes.

Brown dwarfs form independently, like stars. Like all stars, they can occur singly or in close proximity to other stars. Some orbit stars and can, like planets, have eccentric orbits. A remarkable property of brown dwarfs is that they all have roughly the same radius as Jupiter. According to theories of their structure, the radii of brown dwarfs vary by only 10% –15% over the range of possible masses.

They are classified into 4 spectral types: M, L, T, Y. In the images are shown artist's depictions of brown dwarfs of these 4 spectral types. From M to L to T to Y, the 4 spectral types are less massive and cooler. Ω



Reflected Aurora Borealis over Alaska

Pretoria Centre committee		
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