# The PRETORIA CENTRE

of the

## Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

**NEWSLETTER MARCH 2014**

## Next meeting

**Venue:** The auditorium behind the main building at Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.
**Date and time:** Wednesday 26 March at 19h15.
**Programme:**

- **Beginner's Corner:** "Reporting meteor sightings" by Johan Smit.
- **What's Up?** by Bosman Olivier.
- 10 minute break — library will be open.
- **Main talk: "Jack Bennett - An Appreciation." Presentation & video about Jack Bennett by Neville Young & Michael Poll. ***
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Pierre Lourens.

***** See page 3 for a summary of this coming talk.

## Next observing evening

Friday 21 March from sunset onwards at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road.

## Contents of this newsletter

## Chairman's Report for the monthly meeting of 26 February 2014 by Bosman Olivier

The February meeting was attended by some 20 members and four guests. Percy Jacobs introduced the winner of the Monthly observing challenge for February, who was Nigel Rotherham. He also issued a new challenge for members to sketch or photograph during March, namely Collinder 70. The challenge was to record the number of stars in the cluster, to describe the boundary of the cluster, using known stars, the magnitude of the brightest and dimmest star, as well as the density distribution and types of stars seen.

The beginners corner was presented by Pat Kuehn, who shared his experiences with his visit to the Radebeul Astronomical Observatory
near Dresden in Germany where his son lives.

It was interesting to note that the local authority contributes to the upkeep of the facility by means of funds and the employment of staff. In his richly illustrated talk Pat described the reception he received from the staff and the tour o the facilities that he was taken on. He also conveyed the greeting from our centre to the observatory.

One of the activities at the observatory was the radio telescope facilities. These are used by a small interest group at the observatory. Pat showed a number of slides of the facilities and equipment he encountered, as well as of some of the staff members who took him on the guided tour after the public event. These events are held regularly at the observatory to stimulate interest in astronomy.

After the Beginners Corner, Fred Oosthuizen provided us with information about the night sky to be expected during March. Besides the normal state of the moon and planets, he also highlighted several interesting object that could be seen in the course of the month.

The main talk was delivered by Sheldon Herbst, a PhD student at Wits, who spoke about the latest Theory of Star formation. His talk elicited a lively discussion. Herewith a summary of his talk as provided by Sheldon himself:

Star forms from the progressive collapse and fragmentation process. This happens on many length scales but in general the process proceeds as follows.

Inside a Giant Molecular Cloud (GMC) there are many density and velocity perturbation (the cloud is not smooth or uniform).

A pressure wave due to a nearby supernova or via turbulence may cause the cloud to collapse globally.

Due to the turbulent motions in the cloud collapse is not evenly spread and individual clumps of high density form.

These clumps continue to collapse almost independent of the cloud and begin to heat up. When density increases to a million times that of the initial density (a few million particles per cubic centimetre) radiation begin to slow down the collapse and a protostar has formed. In general, the star will be rotating (conserving whatever angular momentum it initially had) so it will likely have a disk around it. The protostar also becomes magnetic because of the gas being ionized and this can produce jets around the protostar.

See the image on the next page. **Ω**

## Report of Observing Evening on Friday February 21st 2014 by Michael Poll

Not much to report for the February observing evening!! Cloud +++, rain: 21 mm. Attendance: One member. **Ω**

This image of a small part of the Carina Nebula shows two horizontal jets of particles. They have a total length of 5.6 trillion kilometers. They are being blasted into space by a young star in opposite directions along its spin axis. The young star is hidden in the tip of the pillar-like structure. A bow shock has formed near the tip of one of the jets.

## Summary of main talk to be presented on March 26th 2014 by Neville Young and Michael Poll

## "Jack Bennett - An Appreciation"

April 4th 2014 marks the centenary of the birth of Jack Bennett, a Founder Member of the Pretoria Centre of ASSA. Jack was an astronomer of note, discoverer of two comets, and the first person to discover a supernova visually since the invention of the telescope.

Michael Poll and Neville Young joined the Pretoria Centre of ASSA in 1984, when Jack was still an active member, and we got to know him quite well. The presentation details the time when Michael first heard of Jack Bennett, and his first contact with and first meeting with Jack. Michael will also include a summary of Jack's awards and honours. Neville will include a poster display, and a video of Jack being interviewed by Patrick Moore at Jack's home in Malan Street, Riviera. Neville is the possessor of one of Jack's telescopes, and the scope will be on static display.

In honour of Jack, the Centre will hold a social braai at CBC on **Friday April 4th**. Last April a social braai was held for "Yuri's Night", the anniversary of the first space flight by Yuri Gagarin. Well, this year we can celebrate an anniversary of one of our own heroes!

## Summary of "What's Up?" to be presented on 26 March 2014 by Bosman Olivier

**Sun: rises** between 06:17 and 06:32 and **sets** between 18:06 and 17:42. Moved 10.3 degrees northward, day is 44,6 minutes shorter

**Moon:**
First Quarter – 07/04
Full – 15/04
Last Quarter – 22/04
New – 29

Moon is furthest north (+19 degrees) on 05/04 and furthest south (-19 degrees) on 19/04.

Moon at apogee on 08/04. (404 500 km)
Moon at perigree on 23/04. (369 800 km)

Lunar eclipse (total) on 18/04 09:45:40 CAT, therefore not visible in SA, as it occurs during daylight.

**Planets:**
**Mercury:** Visible in morning twilight, reaches superior conjunction on April 26.
**Venus:** Bright morning start rising about 3,5 hrs before the Sun.
**Mars:** Well placed for observation in evening with opposition on 08/04. It is at its brightest and largest for 2014, and nearest to the earth on 14/04.
**Jupiter:** Visible in first half of the evening, setting about 4,5 hrs after sunset.
**Saturn:** Visible for more that half the night, reaching opposition on 10/05.
**Uranus:** Conjunction on 02/04 and appears in the early morning sky, rising about two hours before sunrise.
**Neptune:** Visible in the morning sky, rising about three hours before sunrise.

**Deep sky objects:**

**NGC 3115** (G Sextans)**, NGC3132** (Pl Vela), **NGC 3195** (Pl Chamaeleon), **IC2602** (O Cl Carina), **NGC 3372** (Neb Carina), **M83** (G Hydra)

**Meteor Showers:**

**April Lyrids**
**Pi Puppids**
**Eta Aquarids Ω**

Left: Our chairman, Bosman Olivier, doing stargazing.

Right: Johan Smit showing some school children the stars.

# Basics: the mass-luminosity relation for main sequence stars

## by Pierre Lourens

Detailed observations, particularly in binary star systems where masses can be determined with some reliability *, indicate that there is a correlation between the mass of a star and its luminosity.

A series of points that were plotted are shown in the image. The Log of the luminosity of a star (in units of solar luminosity) is plotted against the Log of the mass of the star (in units of solar mass). Log means $\log_{10}$. $\mathbf{M_O}$ and $\mathbf{L_O}$ stand for the mass and luminosity of the Sun, respectively. **M** and **L** stand for the mass and luminosity of a star, respectively. We see that on this plot the points for most stars fall very near a straight line. This is called the mass-luminosity relation. This relation between mass and luminosity only applies to main-sequence stars and does not apply to red giants or white dwarfs. The relation for main-sequence stars with masses $\mathbf{2M_O \leq M \leq 20M_O}$ can be expressed to good approximation in a simple formula:

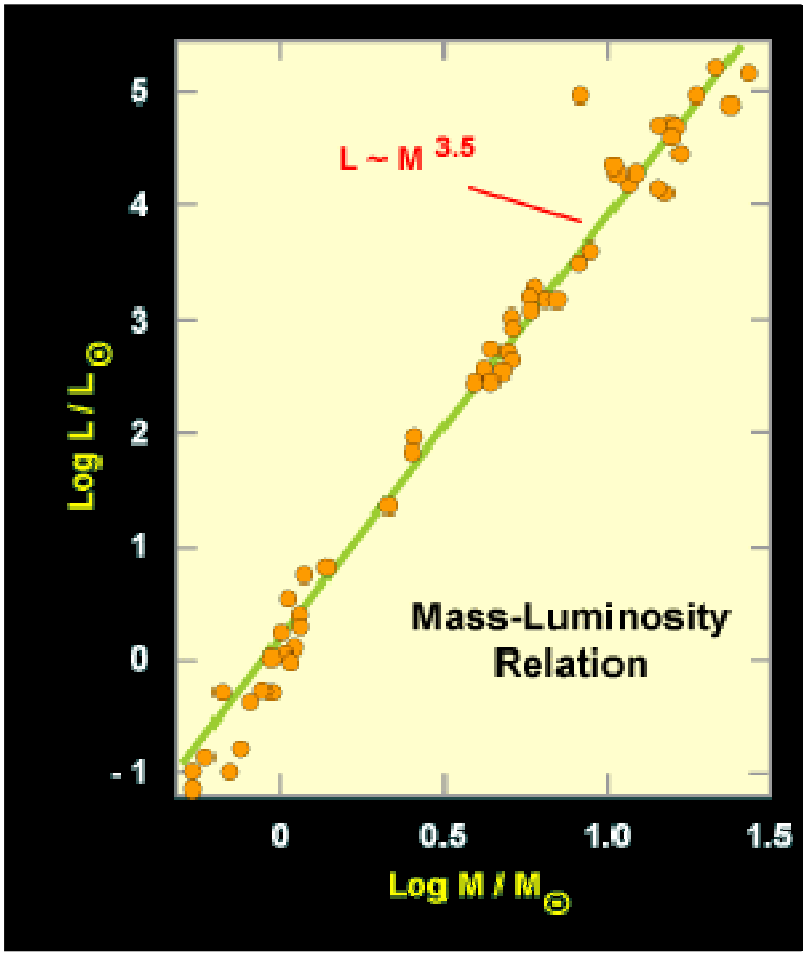
$$\log_{10} (L / L_O) = 3.5 \log_{10} (M / M_O)$$

This can also be expressed as:

$$L / L_O = (M / M_O)^{3.5}$$

The formula implies a very strong dependence of the luminosity on the mass, since the mass is raised to the power 3.5. For example, if I increase the mass of a main sequence star by a factor of 2, the luminosity increases by a factor of $2^{3.5}$ = 11.3. Thus, stars like Sirius that are twice as massive as the Sun are 11.3 times as luminous. An O-type star is only 20 times as massive as the Sun, but has a luminosity $20^{3.5}$ = 36 000 times as much as that of the Sun.

* See the newsletter of January 2013, page 4. **Ω**



## Feature of the month: Giant black hole blasting holes by Pierre Lourens

A black hole with mass equal to **10 billion solar masses** is at the centre of a galaxy in a cluster of galaxies. Two immense jets of particles being spewed out from it along its spin axis are tearing galaxy-size voids in the gas cloud surrounding it.

http://newswatch.nationalgeographic.com/2014/01/27/picture-giant-black-hole-blasting-holes-in-surrounding-galaxy-cluster/#.Uutv1MEXW-g.email

**50 fabulous deep-space nebula photos.**
http://www.space.com/12605-50-deep-space-nebula-photos.html

**Animation of how the Mars Rover got to Mars.** http://www.youtube.com/embed/XRCIzZHpFtY?rel=0

**Venus glory.** A rainbow-like feature known as a 'glory' has been seen by ESA's Venus Express orbiter in the atmosphere of Venus. http://www.esa.int/Our_Activities/Space_Science/Venus_Express/Venus_glory

## NOTICE BOARD

**Libration in longitude and latitude of the moon during a lunar month.** I (your newsletter editor) attached a video clip showing this with last month's newsletter, but it had poor resolution. Another video clip showing this with better resolution can be found on Neville Young's website at http://www.starwaders.com/AWRreferences.php

**Astrophotography challenge.** Read about a challenge to photograph asteroid Pallas, the second largest asteroid in the solar system, and obtain a finder chart for it.
http://assa.saao.ac.za/sections/astrophotography/

**New planetarium in SA. History was made on 1 November 2013 when the first digital planetarium in sub-Saharan Africa was inaugurated – right here in South Africa, on Naval Hill in Bloemfontein. It will now screen regular shows.**
http://www.ufs.ac.za/templates/archive.aspx?news=3935&cat=1

**Asteroid challenge.** NASA's Asteroid Data Hunter contest series will offer **$35,000** in awards over the next six months to citizen scientists who develop improved algorithms that can be used to identify asteroids. http://www.nasa.gov/press/2014/march/be-an-asteroid-hunter-in-nasas-first-asteroid-grand-challenge-contest-series/

Photograph (taken by Johan Moolman) of part of the moon's surface.

**Are we alone? Alien encounters.** See seven video clips on this topic. Since Internet Explorer is out of date, you probably won't be able to watch the video clips if you still have it on your computer.

http://www.sciencechannel.com/tv-shows/are-we-alone/videos/alien-encounters.htm

**Cygnus.** See an image of the new commercial spacecraft Cygnus as it approached the ISS on the first demonstration flight in September 2013. http://www.esa.int/spaceinimages/Images/2014/02/Cygnus

**Rosetta's self-portrait at Mars.** As spacecraft Rosetta flew by Mars 7 years ago, its lander, Philae (intended for landing on comet 67P/Churyumov–Gerasimenko in August 2014), took this self-portrait.
http://www.esa.int/spaceinimages/Images/2014/02/Rosetta_s_self-portrait_at_Mars

# Noteworthy items on the Internet

## Solar system

- **Giant storm on Saturn.** A storm the size of Europe was studied by the spacecraft Cassini which is presently orbiting Saturn. See an image of the storm when it had already lasted for three months.
  http://www.esa.int/spaceinimages/Images/2014/02/Churning_atmosphere_on_Saturn
- **Biggest observed meteorite impact on Moon.** Spanish astronomers spotted a meteorite with a mass of about half a ton crashing into the lunar surface last September.
  http://www.bbc.com/news/science-environment-26325934

## Our Galaxy

- **NASA's Chandra sees runaway pulsar firing an extraordinary jet.** NASA's Chandra X-ray Observatory has seen a fast-moving pulsar escaping from a supernova remnant while spewing out a record-breaking jet.
  http://www.nasa.gov/press/2014/february/nasas-chandra-sees-runaway-pulsar-firing-an-extraordinary-jet/
  http://www.universetoday.com/109531/runaway-pulsar-produces-longest-jet-trail-ever-observed/#.UwRSzbbAAAo.email
- **The shocking behavior of a speedy star.** Kappa Cassiopeiae (aka HD 2905) is a massive, hot supergiant star moving at about 1100 kilometers per second relative to its neighbours. It creates a bow shock in the interstellar medium in front of it.
  http://www.nasa.gov/content/the-shocking-behavior-of-a-speedy-star/
- **First weather map of brown dwarf.** ESO's Very Large Telescope has been used to create the first ever map of the weather on the surface of the nearest brown dwarf to Earth.
  http://www.eso.org/public/news/eso1404/#.UupDmGyTsek.email
- **The purest star tells an ancient tale.** Astronomers have discovered the purest star to date. It is extremely metal-poor**:** it is composed almost exclusively of hydrogen and helium. It illuminates what happened among the first supernovae in the early Universe.
  http://www.skyandtelescope.com/community/skyblog/newsblog/The-Purest-Star-Tells-an-Ancient-Tale-246192521.html
- **Star factory NGC 7538.** See a false colour image from ESA's Herschel observatory of part of NGC 7538, a stellar nursery for massive stars.
  http://www.esa.int/spaceinimages/Images/2014/03/Star_factory_NGC_7538

## Extragalactic astronomy

- **Intense starburst spotted in nearby galaxy.** M82 (aka the Cigar Galaxy), located in the constellation Ursa Major (the Great Bear), is undergoing a rapid burst of star formation.
  http://newswatch.nationalgeographic.com/2014/02/11/intense-starburst-spotted-in-nearby-galaxy/#.Uvtc3f-c6Po.email
- **Runaway galaxy.** Galaxy ESO 137-001 is a runaway galaxy from which gas is being stripped as it moves around in the Norma galaxy cluster.
  http://hubblesite.org/newscenter/archive/releases/2014/14/
- **Star cluster hurtles through space.** An entire globular cluster was launched into intergalactic space so fast that it's leaving its host galaxy, M87. But what launched it?
  https://www.sciencenews.org/blog/science-ticker/star-cluster-hurtles-through-space-tremendous-speed
- **Direct measurement of spin of black hole.** Astronomers have directly measured the spin of a super massive black hole in a quasar. It means that the event horizon is moving at over half the speed of light. http://chandra.si.edu/photo/2014/rxj1131/

- **Hubble watches stars' clockwork motion in nearby galaxy.** Using the HST, astronomers have for the first time precisely measured the rotation rate of a galaxy based on the clock-like movement of its stars. They found that the central part of the LMC completes a rotation every 250 million years. http://hubblesite.org/newscenter/archive/releases/2014/11/full/

## Applications of artificial satellites

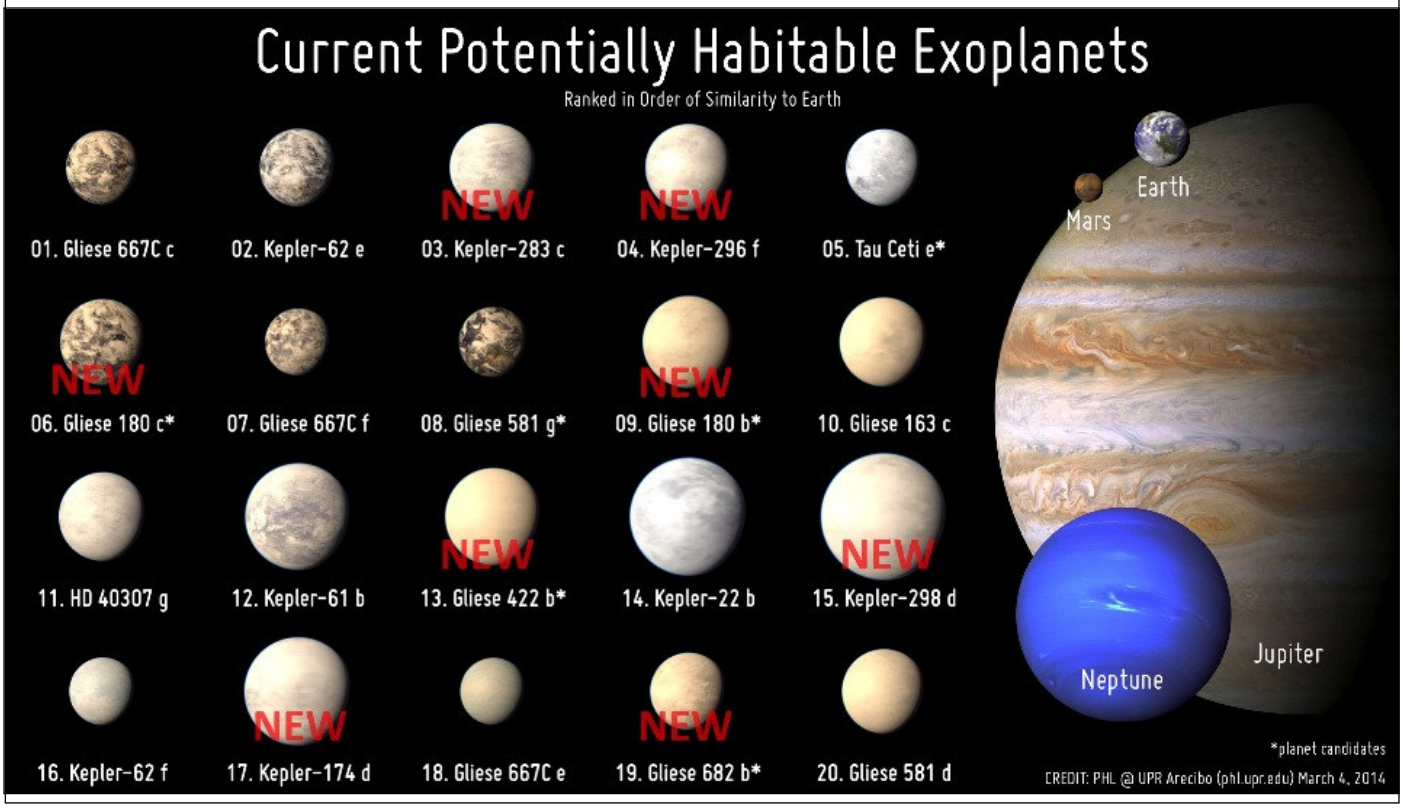
- **Sharp-eyed Proba-V works around the clock.** The vegetation-monitoring Proba-V minisatellite has yielded a valuable harvest for about one hundred scientific teams around the globe. http://www.esa.int/Our_Activities/Technology/Proba_Missions/Sharp-eyed_Proba-V_works_around_the_clock

## Timekeeping

- **World's most precise clock only a second out every five billion years.** The strontium lattice clock sets new standards for precision and stability. http://www.gizmag.com/strontium-lattice-atomic-clock-nist-jila/30563/

## Exoplanets

- **A breakthrough in planet discoveries.** On 26 February 2014, astronomers announced the discovery by the Kepler spacecraft of another 715 planets orbiting 305 stars. http://science.nasa.gov/science-news/science-at-nasa/2014/26feb_multiplication/
- According to the **NASA Exoplanet Archive**, a total of 1690 planets around 1023 stars have now been found. (964 (57%) of these have been found by the Kepler spacecraft.) A total of 440 systems have multiple planets. (These figures are as on 3 March 2014. They will already be outdated by the time you read this.) http://exoplanetarchive.ipac.caltech.edu/docs/counts_detail.html
- See also **The Habitable Exoplanets Catalog** at http://phl.upr.edu/hec. Earth might be in a similar, much larger calalogue of habitable exoplanets somewhere out there**.....**



The full moon through an opening in the clouds, photographed by Johan Moolman.

**Pretoria Centre committee**

| | | |
|---|---|---|
| Chairman | Bosman Olivier | 082 883 1869 |
| Vice Chairman | Pat Kühn | 082 895 5686 |
| Secretary | Michelle Ferreira | 073 173 0168 |
| Newsletter Editor | Pierre Lourens | 072 207 1403 |
| Treasurer and Membership Secretary | Rynhardt van Rooyen | 082 325 8745 |
| Assistant Treasurer | Michelle Ferreira | 073 173 0168 |
| Librarian | Danie Barnardo | 084 588 6668 |
| Assistant Librarian | Pat Kühn | 082 895 5686 |
| Curator of Instruments | Johan Smit | 072 806 2939 |
| Public Relations Officer | Fred Oosthuizen | 072 373 2865 |
| Observing Coordinator | Percy Jacobs | 082 498 4680 |
| Webmaster | Danie Barnardo | 084 588 6668 |
| Member | Michael Poll | 074 473 4785 |
| Member | Tony Viljoen | 072 247 6648 |

**Old newsletters:** **All old newsletters from January 2004 onward are on our website. They contain a record of our Centre's activities as well as astronomical information.**

**Database:** **Members are reminded that a database of the books in our library is to be found on our website. The database was created by Danie Barnardo, one of our committee members.**