The PRETORIA CENTRE
of the
Astronomical Society of Southern Africa
www.pretoria-astronomy.co.za

NEWSLETTER SEPTEMBER 2007

The next meeting of the Pretoria Centre will take place at Christian Brothers College, Pretoria Road, Silverton, Pretoria

Date and time	Wednesday 26 September at 19h15
Chairperson	Lorna Higgs
Beginner's Corner	**"The dark side of light"** by Johan Smit
What's Up	Danie Barnardo

++++++++++ LEG BREAK - Library open ++++++++++++

MAIN TALK

"New meteorite impact site discovered in North West Province, South Africa"
by

Carl Anhaeusser

The meeting will be followed by tea/coffee and biscuits as usual.
The next social/practical evening will be held on Friday 21 September at the Pretoria Centre Observatory, which is also situated at CBC. Arrive anytime from 18h30 onwards.

INSIDE THIS NEWSLETTER

Last month's meeting — Michael Poll

Percy Jacobs presented "Beginner's Corner" with an overview of where our place is in within the Virgo Supergroup of galaxies. On the edge of the Supergroup, is the Local Group of galaxies, which consists of the Andromeda Galaxy (M31) and the Milky Way as the two major galaxies, two large satellite galaxies each for these, and a number of associated dwarf galaxies. Percy then took us closer to the sun and named the arms of the Milky Way including the ones near the sun.

Johan Smit stood in at short notice to present What's Up? He showed the calendar that Auk Slotegraaf has on his website that lists, and illustrates, events that are taking place during the current month. (psychohistorian.org). Johan showed us where to find some of his favourite objects in the northern sky including the star Albireo in Cygnus and M57, the Ring Nebula, in Lyra. He then mentioned some globular clusters in Capricornus, and some southern globulars in Ara and Pavo.

The main talk of the evening was given by Adrian Tiplady from the Square Kilometre Array (SKA). South Africa is bidding for the SKA telescope. If finalised the SKA project aims to be fully operational by 2020.

After introducing us to the radio sky, and radio telescopes, Adrian said that the purpose of the array is to have as large a collecting area as possible, which is done by having many small (50 metre) dishes. These can be spread out over a large area, (even as far as Mozambique and countries to the north) and therefore have "stereoscopic" capability. The SKA will eventually have 4500 dishes, with a total collection area of one square kilometre which is the equivalent of 1 million DSTV satellite dishes. The technology for the whole project does not yet exist, but given the rate of increase of computing power (Moore's Law : every two years, processing power doubles and cost halves), it eventually will. Adrian also mentioned the use of a Vivaldi Element, which does not need dishes and no pointing is required – it comprises focal plane phased arrays.

Adrian explained the kind of observations the SKA would make. Examples are: Determination of the fundamental properties of particles and forces; Finding the missing mass in the universe considering that what we know as "normal matter" (baryonic matter) comprises only 4% of matter, the rest being dark matter (21%), and dark energy (75%); Investigation of astrobiology; Trying to detect gravity waves (predicted by general relativity); Cosmic magnetism; How galaxies form, and tracing their development; Finding out more about the "dark ages" at the beginning of the universe; Examining the cosmic microwave background radiation, which takes us back to 300 000 years after the big bang; Looking for protoplanetary discs and Earth like planets, and Serendipity – finding of new things that we do not yet know about.

There is currently a prototype telescope, called the meerKAT under construction. MeerKAT proposes 80 x 50metre dishes, which will be 2% if the collecting area of the SKA. Currently 7 are under construction and will be completed by 2009, there will be 20 by 2010.

The positive aspects of the proposal is that there is an excellent site, probably the best in the world, in the Northern Cape. Only 2% of the South African population lives in the whole province, so there is very little radio noise - there are only 800 transmitters within 200 km of the site, the figure is 80 000 within a comparative distance elsewhere. It was Adrian who was out in the field to assessing the amount of radio noise, and found that there was an SABC transmitter in Carnarvon that transmits to a "about 5000 humans and 20 000 sheep".

There is also a strong, firm, government commitment to the project. Adrian has been involved with the drafting of the Astronomy Geographical Advantage Bill, which is designed to protect areas around specific astronomy sites, and which will thus legislate against light pollution, radio noise and aeroplane overflights. South Africa will be the only country in the world with such legal protection for these sites. The bill will be debated in parliament on December 4th this year.

After a very stimulating and interesting talk, we had coffee and further discussions.

Last month's observing evening - Michael Poll and Johan Smit

This was another successful observing evening, with many members and telescopes, and a number of visitors, including those from a primary school in Kempton Park, as well as some visitors from Johannesburg, Richard and Cliff, our longtime telescope makers, and Julian, one of the instructors in the Amateur Telescope Makers.

The moon was the first item to be looked at. The moon will drift through our observing evenings for the next few months, so a moon map will be handy. A couple of us identified the Mare Crisium, which is an isolated "sea" and about the first of the Maria seen after new moon, and we also looked at the craters Cleomedes, Macrobius, and Langrenus. Jupiter was high overhead in Scorpius, and other objects in Scorpius that were viewed were M7 and M6. Omega Centauri was shown, but it is getting lower in the evenings now, and we looked at Alpha Centauri.

The children had a good view of the moon, Jupiter, the Jewel Box (NGC4755), Omega Centauri and some double stars which included the ever popular Albireo - a colourful pair, other wise known as Beta Cygni. The Bennett telescope was used to have a good look at extended objects like M6 and M7 and the Coathanger Cluster. Lastly they had a look at the Ring Nebula. The fact that they have seen a star at the end of its (main sequence) lifetime really impressed them and initiated many questions about what stars are, and how they "live" and how they die.

Once the children discovered that Percy had a home-made telescope they stormed him and he entertained them with the splendid views his instrument is capable of. Thanks to Percy for his help in keeping them entertained.

The August observing evening is always the month when we try and split the "double-double", which is the star Epsilon Lyrae in the constellation of Lyra. The first split is easy in a small telescope and with binoculars. This split can also be seen with the naked eye, given a dark sky. This month the second split was seen in Eban's eight inch Dobsonian. One is always reminded that the components of each star are at right angles to each other.
The Messier objects in Sagittarius are well placed. Amongst others, we looked at M8 (the Lagoon) and the Trifid Nebula, M20.

After most people had left, Johan, Julian and Percy stayed behind and proceeded to give the [Astronomy Africa] computerised 10 inch LX200 telescope a good try-out. The menus were paged through and the telescope was asked to go to all of them. Many objects were tried and located, but the fact that we did not find them by ourselves feels like cheating and I (Johan) am not counting these as "real" observations.

A lot of the objects were just about invisible due to the light pollution, but most of the sightings were also tried using Percy's 10 inch Dobsonian telescope. Percy is justifiably proud of his homemade telescope, and it gave consistently better views than the sophisticated LX200.

The LX200 seems to have a liking for the Caldwell catalogue and some pretty clusters in the south were "discovered". The nicest ones were Caldwell 91 (NGC 3532) [Open cluster in Carina] and Caldwell 93 (NGC 6752) [Globular cluster in Pavo]. The highlight of the evening was finding the Saturn nebula (Caldwell 55, NGC 7009) [Planetary nebula in Aquarius]. We were surprised at how bright it actually is. The fact that it was not included in the Messier catalogue also baffled us. It is right next to M72 and M73, which are much less spectacular objects. The Ring Nebula (M57) was also viewed and the fact that this similar object was included by Messier sparked much speculation. We also had a look at Neptune, Uranus and Pluto (80% certain that we identified it correctly).

At 02:00 three very tired, cold and satisfied observers decided to call it a night.

First X-ray detection of a colliding-wind binary beyond the Milky Way

Imagine two stars with winds so powerful that they eject an Earth's worth of material roughly once every month. Next, imagine those two winds colliding head-on. Such titanic collisions produce multimillion-degree gas, which radiates brilliantly in X-rays. Astronomers have conclusively identified the X-rays from about two dozen of these systems in our Milky Way. But they have never seen one outside our galaxy -- until now.

Thanks to the European Space Agency's XMM-Newton X-ray observatory, with help from NASA's Chandra X-ray Observatory, an international team led by Dr Ya Nazof the Universitde Lie in Belgium has found such a system in a nearby galaxy. This galaxy, the Small Magellanic Cloud, orbits the Milky Way and is located about 170 000 light-years from Earth.

The binary system, known as HD 5980, contains two extremely massive stars, 'weighing' about 50 and 30 times the mass of the Sun. Each star radiates more than a million times as much light as the Sun, meaning they put out more light in one minute than our host star generates in an entire year. The sheer photon pressure of this incredible outpouring of light blows off gas from each star in a supersonic 'wind'. These winds are so powerful that they carry away roughly an Earth mass each month, a rate 10 thousand million times greater than the solar wind, and at a speed 5 times faster than the solar wind itself.

HD 5980's two stars are separated by only about 90 million kilometers. (For comparison: the Earth's average distance from the Sun is 150 million kilometers.) "These stars are so close to each other that if they were in our solar system they could fit inside the orbit of Venus," says Naz. As a result, the winds smash into each other with tremendous force, heating the gas and generating enormous amounts of X-rays.

HD 5980 is one of the Small Magellanic Cloud's brightest stars, situated on the periphery of the star cluster NGC 346. The image below left shows a Hubble Space Telescope view of NGC 346 with the position of HD 5980 indicated and the image below right shows an artist's representation of XMM-Newton orbiting Earth.

See website **http://www.esa.int/esaSC/SEMPYIO2UXE_index_0.html**

The Metonic Cycle, the Saros, and the Moon Part 1 — Michael Poll

If the moon were at a particular phase, in a particular part of the sky, on a particular date, when would these ***exact*** circumstances repeat themselves? The simple answer might be "one month later", but, even ignoring the fact that the date will be different, there will not be an exact repeat of phase and position.

The moon will return to the same star background every 27.322 days. This is called a **Sidereal Month** [Sidereal : "Relating to the distant stars" from the Latin "*sidus*" – "star"]. However, because of the movement of the Earth around the sun during this period, the phases of the moon repeat about two days later than the sidereal month, i.e every 29.5306 days on average. This period of 29.5306 days is called a **Synodic Month** [Synodic : "Relating to, or involving a conjunction", from the Greek: *sunodikos* from *sunodos* "meeting"] A synodic month is measured from new moon to new moon. At the time of new moon, the moon is in conjunction with the sun (i.e as viewed from Earth, the moon is in line with the sun). This synodic period is called a Lunar Month, and will be a day or two less than a Calendar Month, depending on the number of days in the particular calendar month.

Given the above, when the moon next returns to the same part of the sky (i.e returns to the same star background), it will be one ***sidereal*** month later, but the phase will not be the same, so the criteria are not met.

The circumstances one year later will not apply either. Twelve synodic months (ie. 12 returns of the moon to the same phase) gives 12 x 29.5306 days = 354.372 days. This period is called a Lunar Year and is about 11 days shorter than a calendar year. Note that, although the moon will have repeated its *phases* 12 times, in 354.372 days, considering the sidereal month of 27.322 days, the moon pass the particular area of the sky 13 times (13 x 27.322 days = 355.19 days). The situation does not meet the original requirements because, although the phase is the same because an exact number of synodic months has passed, the calendar date is now 11 days earlier, and because 12 synodic lunar months are not exactly the same as 13 sidereal months, the moon has not returned to exactly the same place – it would require another 19 hours to get there (355.19 days - 354.37 days = 0.82 day)

A cycle where a number of calendar years and a number of synodic months are precisely the same is required for the moon's circumstances to repeat exactly. The answer is a period of exactly 19 calendar years and 235 lunar synodic months, a period known as the Metonic Cycle.

19 calendar years = 19 x 365.24 days = 6939.56 days

235 lunar synodic months = 235 x 29.5306 days = 6939.691 days

254 lunar sidereal months = 254 x 27.322 days = 6939.788 days

The number of calendar years tells us that the date is the same.
The number of synodic months tells us that the phase is the same.
The number of sidereal months tells us that the star background is the same.

Nineteen calendar years differ from 235 synodic months by about 2 hours. The error in the Metonic Cycle amounts to one full day every 219 years, about 12.4 parts per million. The coincidence of these cycles is a chance occurrence, there is no physical resonance between the duration of the Earth's orbit around the sun and the moon's orbit around the Earth.

The discovery of the Metonic Cycle is attributed to a Greek astronomer, Meton, who lived in Athens in the 5th Century BC, but there is evidence that knowledge of the cycle pre-dated Meton. It was known to a Chaldean astronomer in the 4th Century BC, and was probably known to the Babylonians.

PRETORIA ASTRONOMICAL SOCIETY

FINANCIAL STATEMENTS 01 JULY 2006 - 30 JUNE 2007
INCOME STATEMENT FOR THE YEAR ENDED 30 JUNE 2007

	2007 RAND	2006 RAND
INCOME		
Observations	950	670
Subscriptions	9890	9975
Donations	1185	1495
Sky guide sales	330	960
Sales	3030	
Purchases	-3600	
Inventory	900	
Mug sales	-	400
Vredefort visit	-	40
Recovered	-	740
Expenditure	-	700
Nylsvlei visit	180	900
Recovered	180	4500
Expenditure	-	3600
Advertisements	25	-
T-Shirt sales	225	-
Interest received	478	295
Sky and Tele-scope sales	395	375
TOTAL INCOME	13658	15110
EXPENDITURE		
Books pur-chased	-	3400
Laser pointer purchased	-	995
Stationary	1010	1241
Bank fees	694	768
Website	2080	2080
Refreshments	505	296
Gifts guest speakers	863	1017
TOTAL EXPEN-DITURE	5152	9797
NET INCOME 01/07/06 - 30/06/07	8506	5313
Min : Non cash items	-1247	980
NET CASH IN-COME FOR THE YEAR	7259	6293

M E POLL
CHAIRMAN

R VAN ROOYEN
TRESOURER

SA's second satellite*: launch postponed

The launch of South Africa's first state-owned satellite from a Russian submarine, planned for June 2007, has been postponed indefinitely. "It has been postponed because official documentation still needs to be arranged to issue a decree for the launch," said Nhlanhla Nyide, spokesperson for the Department of Science and Technology. "They are currently working on the process ... We will hear from them when they have set a new date for launch." He said no additional costs would be incurred and South Africa's nascent space programme would not be affected by the cancellation of the launch, which was to have taken place in the Barents Sea near Norway.

The R26-million satellite, intended to orbit about 500km above Earth and have a life-span of three years or longer, would carry high-resolution imaging cameras. The images from the South African-built satellite would be used across a wide array of applications, from agriculture to land use and infrastructure mapping.

South Africa has pledged millions of rand to build its astronomy and space sector, with the construction of the South African Large Telescope creating a hub for astronomy research in Southern Africa. In July 2006 the Cabinet approved the establishment of a South African Space Agency as an institutional vehicle to look at space science and technology.

*SUNSAT was SA's first satellite. It was launched in early 2000. It was designed and built almost in its entirety by postgraduate students from the University of Stellenbosch. SUNSAT heralded South Africa's entry into the Space Age. Read more about it on website

http://www.cellular.co.za/sunsat.htm

Condolences

It is with sadness that I inform you of the death of a member of our centre, Fiona Ferguson. Fiona and her boyfriend Bruce died in a veld fire (in Mpumalanga?) on 28 July. She is survived by her mother and brothers and sister. Details of what happened can be found in one of the recent issues of the magazine "Huisgenoot". Our sympathy to her family.

Fresh news about old news

Mauritz Geyser has placed old newsletters of our Centre on our Centre's website. Old newsletters from August 2003 onward are there and can be downloaded. Future newsletters will also be placed on our website, but only after the monthly meeting for that month has passed.

Next "Get to know the Sky" (for children 9-12 years old)

Saturday 22nd September 18h30 at the Johannesburg Planetarium
Cost: R20pp. Bring a torch and pencil

Record-breaking neutron star

A neutron star with a record breaking spin rate has been found near the center of the Milky Way.

Observations made with an instrument built at the Danish National Space Center on ESA's INTEGRAL satellite have been instrumental in the discovery of a record breaking spin rate in a neutron star near the center of the Milky Way. The star was found to spin at the dizzying rate of 1122 revolutions per second, more than 50% faster than any spinning star previously known.

The discovery is of importance for modelling the forces which keep neutron star matter together. A person standing on the equator of the neutron star would move at a quarter of the speed of light and be subject to a centrifugal force one thousand billion times the Earth's gravity force.

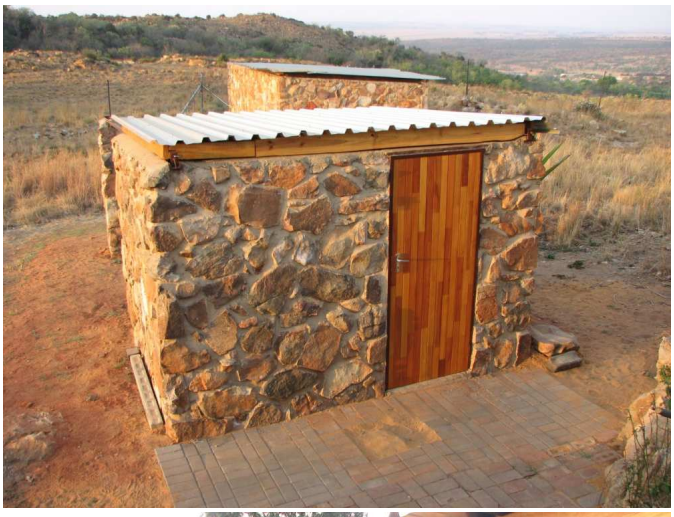
Besoek aan Bronberg Sterrewag 14 September 2007 — Pierre Lourens

Vier persone het die sterrewag besoek. Hulle was Pierre Lourens, Diethelm Scmieder, Ad Sparrius en Michael Poll. Eersgenoemde twee het om 17h00 opgedaag en het saam met Berto Monard in die bewarea gaan stap waar hulle ‘n trop blouwildebeeste gesien het. Die ander twee het later opgedaag. Berto het aan almal sy twee sterrewagte en sy toerusting gewys. Hy het ook van die data wat hy ingewin het, op ‘n rekenaarskerm gewys en gedemonstreer hoe hy te werk gaan om sekere inligting daaruit te sif.

Links onder is sy sterrewag wat die 14” Meade teleskoop huisves. Links heel onder staan hy langs hierdie teleskoop. Hy gebruik nie tans hierdie teleskoop nie, want die rekenaar waaraan dit gekoppel is, is onlangs een nag gedurende ‘n waarnemingsessie gesteel.

Regs onder op die voorgrond is sy sterrewag wat die 12” Meade teleskoop huisves, met die ander sterrewag in die agtergrond. Regs heel onder staan hy langs hierdie teleskoop.

Waarnemingstoestande was die aand swak en geen ons het nie deur teleskope na die sterre gekyk nie.



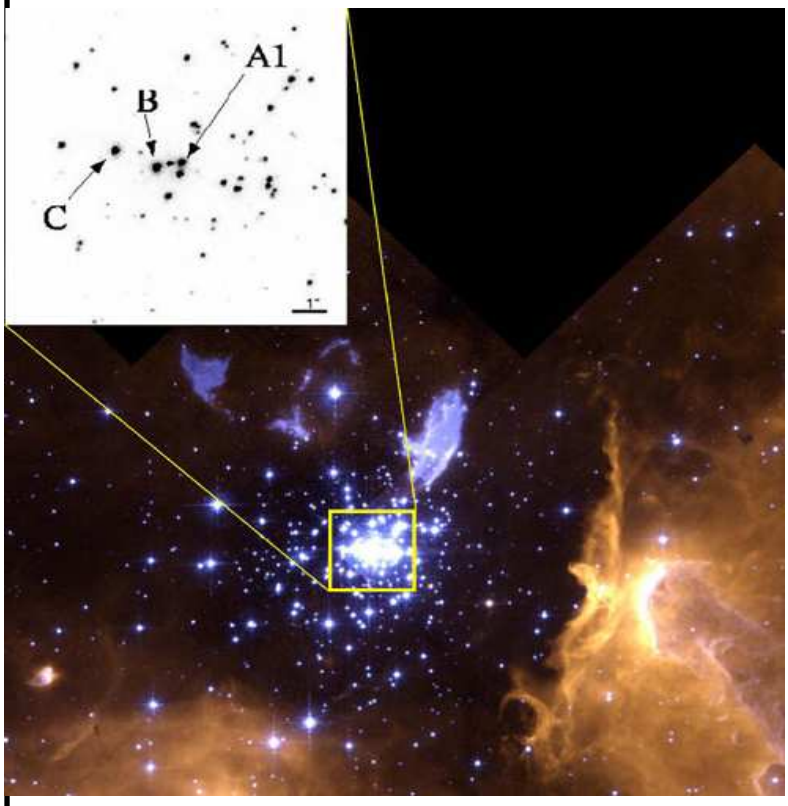
Two heftiest stars found in Milky Way

The two most massive stars ever have been discovered in the southern Milky Way galaxy. The double super heavyweights are actually in orbit around each other, and both break the record — 83 times the sun's mass — for the most massive stars found to date. The heavier of the two weighs in at 114 solar masses and its little brother at 84 solar masses.

The two stars, which form a binary system called A1, are not only very massive, they are quite young. This makes sense since it is the most massive and brightest of stars that live the briefest, according to stellar evolution theory. They will not last beyond two or three million years. Less massive stars like the Sun, on the other hand, can burn for many billions of years.

It's partly this short lifespan that makes these high-mass stars so hard to find. To hunt them down, astronomers need to look closely at the sites where stars are born – stellar clusters. The newly found very massive double star system was found in a very dense, young star cluster in the nebula NGC 3603, using data from both the Hubble Space Telescope and the Very Large Telescope at the European Southern Observatory in South America. The image shows the location of A1 in the cluster.

The Sun was probably born in such a cluster, but its brothers and sisters are spread out over the galaxy now. If there were any high-mass stars in the Sun's birth cluster, they died explosively long ago.



What also made the new discovery possible was the fact that there were two stars involved. The interplay between the two provides plenty of data with which to calculate the masses of the stars. A lone giant would be much harder to weigh.

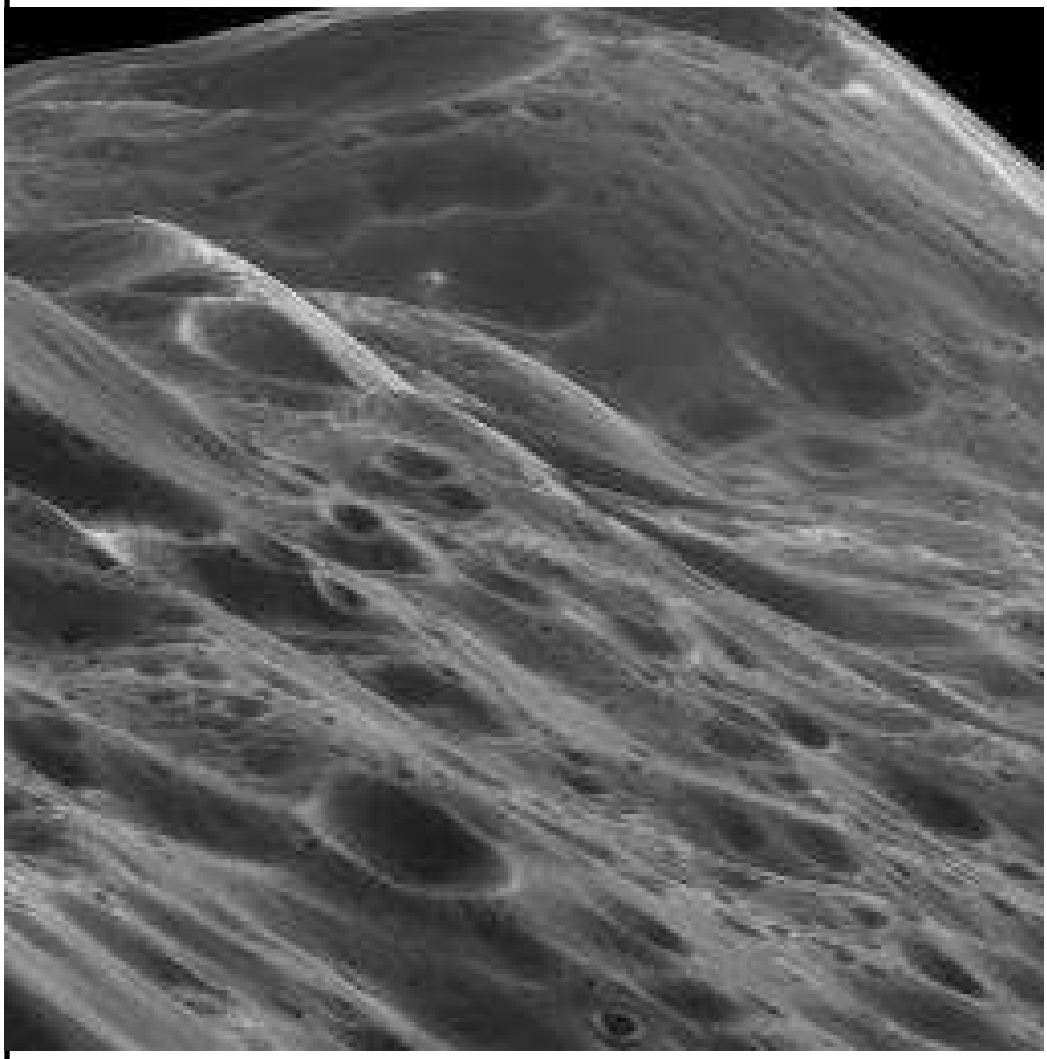
Another downside of the shorter lifespan of very massive stars, from an astronomer's point of view, is that they are completely outnumbered by low-mass stars. Typical stars have about the mass of the Sun.

High-mass stars make up about five to ten percent of the stellar population. But that doesn't mean they are unimportant. On the contrary, they are the factories that make the heaviest elements. Modest stars like the Sun can only cook up elements as massive as carbon — merely the sixth element out of more than two hundred and sixty. Astronomers have theorized for years that stars should be able to reach masses of up to 150 solar masses. Beyond that mass, the star is unstable.

About NGC 3603

NGC 3603 was discovered by John Herschel in 1834. It is an emission nebula. It is in the constellation Carina, in the Carina spiral arm of the Galaxy, and is about 20,000 light-years away. It is home to the open cluster (in the square in the image), thick dust pillars, and a star about to explode. The cluster contains about 2000 bright stars, each of which is much brighter and more massive than the Sun. Together, radiation from these stars are energizing and pushing away surrounding material, making NGC 3603 one of the most interesting HII regions known. There are also a large number of dim stars in the nebula. These stars are less massive than our Sun, demonstrating that great numbers of low-mass stars also form in active starburst regions.

The Himalayas of Iapetus



Cassini, which is presently orbiting Saturn, completed its closest flyby of the odd walnut-shaped moon Iapetus on Sept. 10, 2007.

This stunning close-up view shows mountainous terrain that reaches about 10 kilometers high along the unique equatorial ridge of Iapetus.

Iapetus is a world of sharp contrasts. The leading hemisphere is as dark as a freshly-tarred street, and the white, trailing hemisphere resembles freshly-fallen snow.

The image was taken with the Cassini spacecraft narrow-angle camera at a distance of approximately 3,870 kilometers from Iapetus.

See website **http://saturn.jpl.nasa.gov/home/index.cfm**

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