TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

05 September 2008

Partial Eclipse 01 August 2008 – from "Dangerous Dave"

Front Page Image – Megrez 90FD, Thousand Oaks solar filter, Canon EOS300D, ISO200, 1/500 to 1/800 second exposures. Courtesy of Dave Thompson. See his other great astro images on http://www.flickr.com/photos/21317360@N03/.

Last meeting : 13 June 2008. Dr Jim Wild of Lancaster University will give a talk on "The Aurora Borealis" as part of the International Heliophysical Year (IHY) programme.

Next meeting : 12 September 2008. Presidential Address:
Title : "George Ellery Hale and the Palomar 200" Telescope"
by Jack Youdale FRAS, Honorary President of CaDAS

Letter to the Editor

From John Crowther

Some thoughts after reading the August "Transit".

1) From Michael Roe's article "Between the Galaxies" – " Any world there would have a sky of total darkness unless it was a planetary system".

So what sort of cosmology would intelligent life have on such a planet? Probably a planet-centric one like ours before Copernicus. If the rotation of the planet was realised, without stars it would be difficult to discover that the planet was in orbit.

It would have pitch black nights with no galaxies, no nova or supernova but perhaps a comet now and again with accompanying meteorites.

Would astronomical telescopes be developed on a planet where there wouldn't be much to study.

2) "By the IAU's definition a planet is a celestial body that orbits the Sun…"

What about planets which orbit other stars? But it is of course a Solar System guide.

Thanks also for Ray's latest humorous recollections from his teaching career

A reminder for this years Astromind competition

Dear Society,

The Astromind quiz is to be held by Sheffield Astronomical Society this year and we want to attract as many people as possible. For this reason we're devising a longer programme for the day, possibilities for the day include; a few talks, trade stands, a break for food (probably a barbecue) and availability of telescopes for solar observing during the day, and the faint and fuzzy stuff after dark. We will also be holding a public open session that evening, so why not bring a telescope along and show them what it's like to be an astronomer?

This year it's "NOT JUST A QUIZ" so please come along, even if your society doesn't field a contestant. I've already been volunteered as our contestant, a triumph of nerves over knowledge, especially when facing the resident quizmaster, Neil Haggath.

If you have someone in your society that is willing (or press-ganged) to enter the quiz, please give me his or her name before 31st August. This will give Neil enough time to set the questions.
There will be more news to come in the next few months as plans for the day develop, but plans also depend on the number of people and contestants attending.
We hope we will see a contingent from your society there on October 18th.
Remember, it's more than just a quiz, it's a day out!

Darren Swindells
Secretary
Sheffield Astronomical Society

Dear all,

As some of you know, Darran Summerfield has acquitted himself admirably the last few years, as our society's contestant in the prestigious Yorkshire Astromind competition - and has managed to win it on one occasion.

Unfortunately, Darran isn't able to compete this year, due to an unavoidable commitment. But the good news is, Rob Peeling has bravely volunteered to take the dreaded Hot Seat and uphold the honour of CaDAS.
Good luck, Rob!

Neil Haggath

www.sheffieldastro.org.uk

Location

Saturday 18th October 2008

2pm to Late

Mayfield Environmental Education Centre
David Lane
Fulwood
Sheffield, S10 4PH

Sheffield
Astronomical Society

To book a place a place at the astro quiz of the year, please call or write to the address below

Contact: Darren Swindells
102 Sheffield Road
Woodhouse
Sheffield
S13 7EU
Phone: 0114 2692291
darren@sheffieldastro.org.uk

Featuring:

- **Astromind Quiz—4 rounds or more of questions by Neil Haggarth!**
- **Trade exhibitors from around the region**
- **Food/Barbeque (not necessarily the same thing!)**
- **Telescopes available Daytime and Evening (As if the weather will behave!)**
- **& Other things we haven't really thought of yet…….**

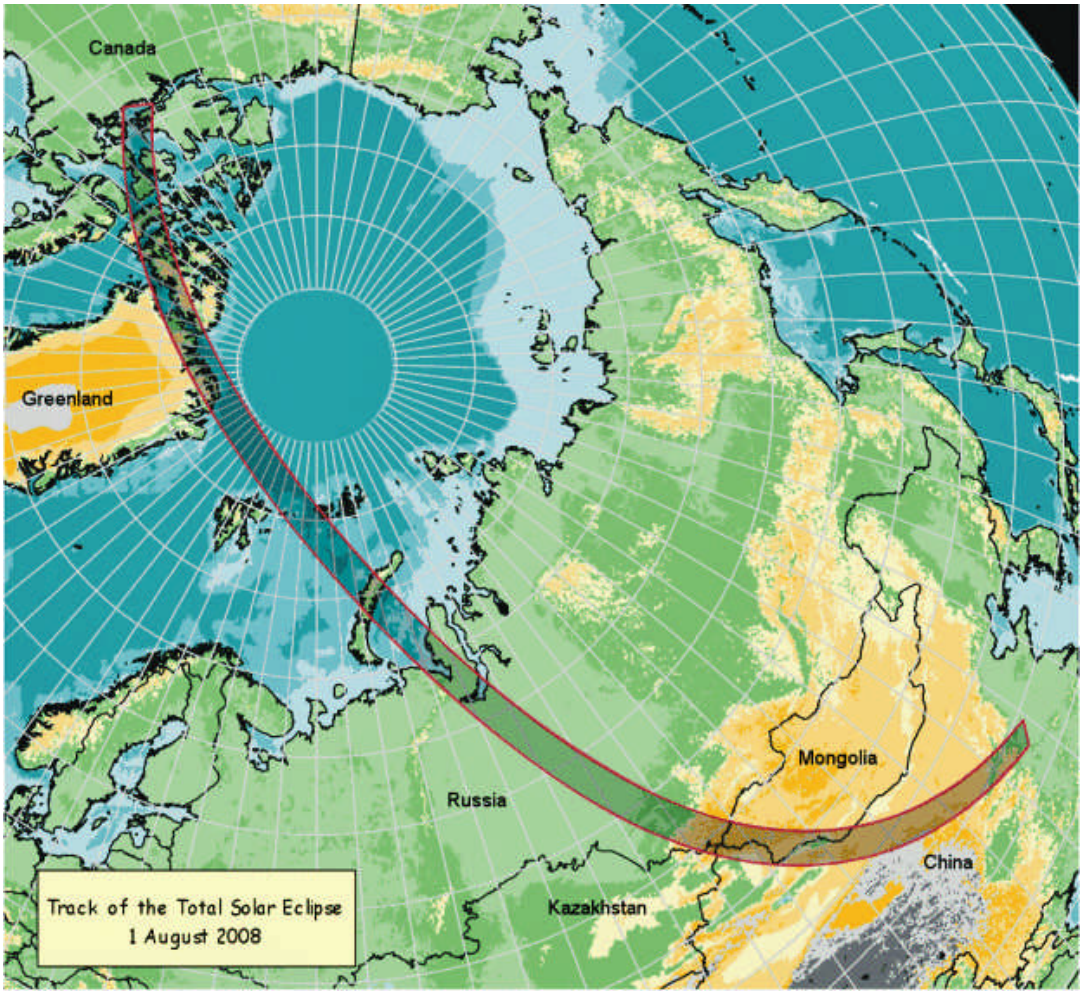
NOT JUST A QUIZ!

A Total Solar Eclipse in China

Rod Cuff, 21 August 2008

Two years ago (see *Transit*, 5 June 2006) I wrote up a journey to the last previous solar eclipse, which my partner Brenda and I saw from the oasis settlement of Jalu in the Libyan Sahara. I commented at the time, when talking about the post-totality period, that "the pleasure then is in sharing the excitement and comments with other watchers – and vowing to catch another total eclipse *soon*".

Well, the next one (Figure 1) was on 1 August this year, with the most reliable weather being on the Chinese/Mongolian border – very close to a branch of the old Silk Road, an area we've always wanted to visit anyway. Irresistible ...



We travelled with a company called Explore! (the exclamation mark is theirs, not mine) – not to be confused with Explorers, the company we used last time and vowed never to use again. The 25-day trip was a repeat of one they'd run many times before, but now with a big detour in the middle that took us to the viewing site at the edge of the Gobi Desert. We started by flying into Tashkent, the capital of Uzbekistan, and spending about nine days (by train and coach) visiting beautiful buildings in Bokhara and Samarkand, among other places.

We visited the remains of one of the Middle Ages' most famous observatories, that of Ulugh Begh, the emperor/scientist grandson of the great conqueror Timur (known to the West as Tamburlaine). Alas, all that remains now is underground: an impressive length of the great quadrant (the largest transit instrument ever built, 40 m high) that he used to derive and publish accurate positions for astronomical bodies (see Figure 2). His 15th-century determination of the length of the year was only 30 seconds out.

We then flew on to Bishkek, the capital of Kyrgyzstan, the next country to the east. We found it a dull city, but from there we took a long, long drive south and east across increasingly high and impressive mountain passes and plateaux, staying in a yurt (which leaked), crossing the Torugart Pass at 12,000 ft (where it snowed lightly, a slight contrast from temperatures in the high thirties Celsius earlier in the week), and taking six hours to negotiate the various levels of border

officialdom before we could coast downhill towards China's westernmost city, Kashgar.

We had three whole nights there (we'd been living out of suitcases for too long), catching up on sleep, enjoying the unCommunist experience of an ancient city 3000 km from the capital, before winding our way by plane and bus to the eclipse camp that the Chinese authorities had built at the tiny and remote village of Weixia, about 100 km from the Mongolian border. In Figure 3, it's near the bottom right, on the eclipse midline on the road between Yiwu and Nom.

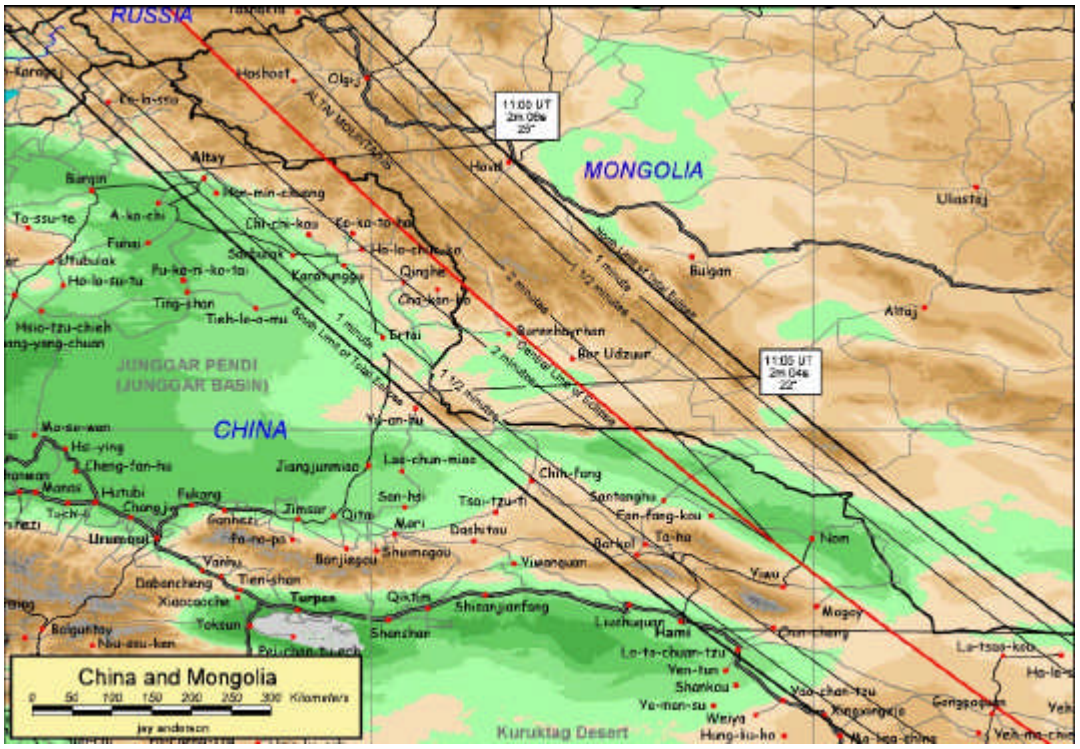


Figure 3. The eclipse path along the Chinese/Mongolian border region

(Jay Anderson & www.legendtour.ru/eng/mongolia/tour/total_solar_eclipse.shtml)

As the eclipse wasn't until about 7 pm local time, there was a lot of day to fill. To prepare us for what we might see, we had a talk in a local outdoors cafe from Prof. Paul Murdin from the Institute of Astronomy at Cambridge (incidentally, Paul helped to set up the Faulkes Telescope project, making research-level telescopes remotely available to UK and Australian schools – Ed and the Planetarium team run on-line live Faulkes sessions from time to time).

Somehow this led to a group lunch, group beer consumption and group dancing to strange local instruments. All eclipses should be prepared for in this way. We were installed on a low, unshaded stony plateau more than 90 minutes before the partial phase was due to start, which was over-much of a good thing with temperatures still in the low thirties Celsius. Still, it gave us, and the

hundreds of others scattered around several square kilometres, plenty of time to choose good spots. I decided the criteria included being:

- elevated enough to have a view of the Moon's shadow rushing across the plain
- far enough away from others to feel that the intensely personal experience of totality wouldn't be compromised
- close enough to others in our group to be able to socialise and get excited as totality got closer, and to celebrate it all afterwards
- on ground flat enough to enable me to scrape away several square metres of small stones to leave a monochrome dirt layer on which we might be able to see shadow bands if they appeared (as they did for the 2006 eclipse)
- in an area populated with a few softish plants to gather and sit on while waiting (Figure 4).

Figure 4. Waiting in 'comfort'

Although we were at the site with the least chance of cloud on the whole eclipse path, there was a lot of broken white cloud around, and one or two ominous-looking small rain clouds. This worried us, and clearly worried the Chinese authorities too, who were going to have neither the Olympic opening ceremony *nor* their eclipse ruined by atmospheric conditions. So we were entertained during our wait by two trucks loaded with rocket launchers, which criss-crossed the darkling plain looking for clouds to shoot at. However, they sent only one rocket (presumably loaded with silver iodide) up into the clouds, to no discernible effect, and only in the final three minutes before totality could we be sure that the Sun would be seen in a clear part of the sky.

The 15 or so minutes immediately before totality are almost disquieting. The light is subtly changing all the time, and although for the most part your eyes are adapting, it leaves you feeling uneasy – we've not evolved to be comfortable with the increasing 'steeliness' of the light, the way the shadows on the ground are much sharper than normal, the way that sunlight looks when filtered through the

leaves of trees (or holes in cardboard – see Figure 5). A breeze may start blowing; it gets colder, and somehow quieter.

Figure 5. Sun images projected through circular holes in a card

In the last minute, events move very rapidly. Bright planets and stars pop out: in this case, Venus and Mercury were readily visible. The sky darkens, and your eyes give up the unequal struggle to adapt to the diving levels of light; your rational brain knows perfectly well what's happening, but you can't ignore the undertone of panic that primitive man must have felt. This time, a rising level of hubbub came from the scattered watchers all around, the Sun showed a double diamond-ring for a couple of seconds, and then *poof!* The corona sprang out of the sky – one of nature's heart-stopping moments. I'm not ashamed to say that there were tears in my eyes, and I later found that at least three of our party had had the same experience, two of them men. (We're just so much more sensitive ...)

A fiery red prominence glared against the background of a beautiful solar-minimum corona: neat, symmetrical, full of equatorial streamers but only short and stubby lines into the magnetic poles (Figure 6). Totality lasted just under two minutes, the end signalled by a dazzling diamond-ring effect and a lot of ecstatic shouting all around.

I still didn't see the Moon's shadow approaching and then receding across the plain; and there were no shadow bands this time. But everything else felt perfect. Group pictures, 'How was it for you?' chat, a bus ride back to the camp, supper, a glow of satisfaction. Magic.

Figure 6. The 1 August corona from Gansu

(Ivanip, Wikipedia)

The next day, the temporary town that was Weixia Eclipse Camp soon began to empty itself. Coach after coach disappeared with its passengers, including the one from Hong Kong displaying not-quite-correct English but inadvertently a much more evocative description of the eclipse: “When the Moon mates the Sun”. We drove off ourselves in mid-morning, and no doubt within 24 hours the good people of the village would have been wondering whether they'd imagined the whole thing.

And so we went on further east, to the wonderful painted Buddhist caves at Dunhuang (http://en.wikipedia.org/wiki/Mogao_Caves), to a pre-dawn camel ride to the ridge of a huge Gobi sand dune to watch the sun come up, to the Terracotta Army (http://en.wikipedia.org/wiki/Terracotta_Army) and Han Mausoleum (www.travelchinaguide.com/attraction/shaanxi/xian/hanyang.htm) at Xi'an, and finally to a smoggy Beijing in time to get caught up in the anticipation of Olympics opening night and to be there for fireworks near our hotel timed to coincide with the mightier display in the Bird's Nest.

Overall, a great journey with marvellous sights on land and in the sky. We'll ignore for now the huge amounts of travelling in land transport, the paranoid security for internal Chinese flights, the heat and humidity, the fact that every member of the group (including our excellent leader) went down with stomach problems in the first 10 days. Besides, it's a great way to slim – I lost nine pounds!

A Sundial Stone of Mystery

By John Crowther

This stone , which is now in All Saints Church, Skelton, was probably above a church entrance more than a thousand years ago. At the top, part of a sundial can be seen. Has anyone any idea as to the meaning of the words? The engraved lines at the top of the stones show hour marks from noon until 3pm

The complete sundial would have closely resembled the Anglo Saxon sundial found above the door of St. Gregory's Minster, Kirkdale, near Helmsley, which marked the times of the monastery's services.

above – St Gregory's stone

A Life Under the Stars

From David Blenkinson

At this time of year I like to paint my wooden Dobsonian telescopes and mount, or make things to use with my telescopes while it is pleasant in the yard.

A few weeks ago I made a wooden platform to put my 6" Dobsonian on, so I can see down the southern part of the sky over the southern part of the wall towards Jupiter.

On 01 August we were lucky with the sky conditions to observe the partial eclipse of the Sun. On that night I got the 6" telescope out and put it on the platform and had a look at pi, omicron and xi Sagittarius. From there I found mu and then up to M24. It was like a big star cluster with bright stars at the north and a cloud of faint stars at the south. I could see something of it with the 10 x 50 binoculars, the sky was very good.

I went up to M25, it was a big star cluster with a dense part at the centre and bright, well spread stars as seen through my binoculars. Then up to gamma Scutum near by is sigma 2306, an easy double star. Then to M17, an easy cluster of faint stars with a bar of bright nebula. I tried with the Ultrablock nebula filter and the UHC filter. The filters did help a bit and worked better at 50x than 70x.

I had a look at M18, a nice star cluster, faintish but nice. Next M16, like M25 this is a well-spread star cluster with a dense portion. The filters did nothing, no nebula was seen. I moved up the sky to M11, with low power I could see a star with nebula around it. With high power the nebula was now a dense cloud of stars. It was good at 105x but even better at 165x. I found M26. It was a small cluster of faint stars. On other nights I could not find it, too faint from my brightly lit yard.

I moved to beta Scutum. West of it is a star cluster, in Norton's Star Atlas it is marked as NGC6682, in the Uranometria 2000 to the west of beta Scutum it has TR35 and west of that is DO32. Something to investigate on another night. I then headed for Capricornus. Alpha is a wide binocular double. Both stars are yellow as seen with the 6" telescope. Rho is a very wide double at 50x, omicron is a nice wide double at 70x.

Back in Sagittarius star 54 nice wide double about two field-widths up is a planetary nebula. NGC6818 at 50x is like a fuzzy star, it is bright enough to see at high power. I used 165x, it looked grey and bright.

The sky had turned so that the eastern end of Capricornus had come past the house. So I went for Neptune. August "Astronomy Now" has a finder map to

show where it is. Yes, there is a starry-looking object there. At 165x it still looked like a star so I got my Barlow and used 330x. At that power, yes, I saw Neptune.

I lifted the telescope off the platform and pointed at star 52 Gynus, as I know it is a close double. I did see the faint companion at 165x.

It was a good clear sky with no wind, plenty of objects seen, it wasn't cold, it does'nt get better than that, well that is when observing on one's own.

Get Ready for September 10th: CERN Announces LHC Switch-On

Written by Ian O'Neill

It's official, the Large Hadron Collider (LHC) will begin operations in a little over a month. On September 10th, the most sophisticated particle accelerator will go online, injecting the first circulation of accelerated particles. Actual experiments involving collisions will occur once scientists are satisfied the LHC is fully optimized and calibration is complete.

The LHC has been undergoing "cool-down" for some time, ensuring the LHC's eight sectors are approaching the 1.9K (-271°C) operational temperature (that is 1.9 degrees above *absolute zero*). All going well, on September 10th, the first beam will be accelerated to an energy of 450 GeV (0.45 TeV), the preliminary step on the path to attaining particle energies of 5 TeV, a record breaking target… *awesome*.

Earlier today, CERN announced that the LHC will be ready by September 10th to attempt to circulate a beam of particles. This news comes as the "cool-down" phase of LHC commissioning reaches a successful conclusion, cooling all eight sectors to 1.9 degrees above absolute zero. To manage temperatures this extreme has been a long and painstaking task, referred to as a "marathon" by the project leader:

> "*We're finishing a marathon with a sprint. It's been a long haul, and we're all eager to get the LHC research programme underway*." - LHC project leader Lyn Evans.

Now scientists and engineers must synchronize the LHC with the Super Proton Synchrotron (SPS) accelerator, which is the last component in the LHC's particle injector chain. For the system to work, the LHC and SPS must be synchronized to within a fraction of a nanosecond. This task is expected to begin on August 9th (Saturday). These calibration tasks are expected to continue through August and into the beginning of September, preparing the LHC for its first particle injection on the 10th.

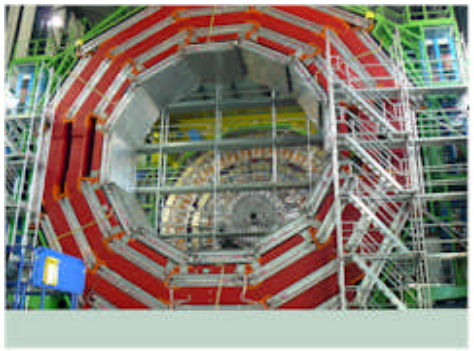
Below is an article written by Chris Reeve (a friend of Society member Gareth Morris) who was invited to visit CERN - lucky devil!

A Visit to the Large Hadron Collider

Chris Reeve

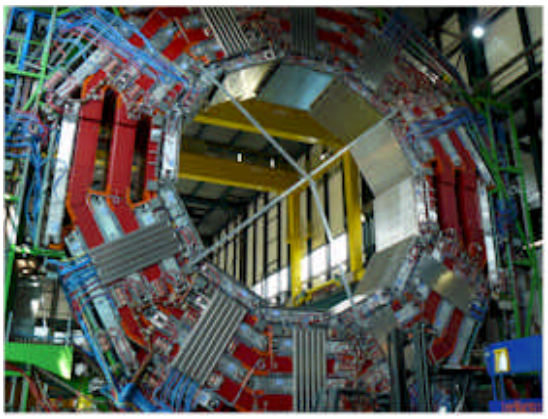
Deep underground between the Jura mountain range and Lake Geneva, finishing touches are being made to the world's largest and most powerful particle accelerator, the Large Hadron Collider (LHC) at CERN. In August 2007, whilst holidaying in eastern France, the opportunity to visit CERN and see at first hand this immense engineering project was too good an opportunity to miss.

An introductory lecture provided a fascinating insight into the history of CERN. Founded in 1954 by 12 European countries as a centre for nuclear physics research it currently comprises 20 European Member States with further countries such as Japan and the USA having observer status.



Although I have a scientific background, I am neither a physicist nor mathematician, however, particle physics remains a fascinating if not mind-boggling subject. Quarks, gluons, the strong and weak forces, it all sounds a bit Star Wars but these are just some of the components that make up the universe we inhabit.

Particle physicists are striving to develop a unified theory that describes the universe in terms of the fundamental particles of which all matter is composed and the forces that interact between these particles. These forces are the electromagnetic force, weak nuclear force, strong nuclear force and gravity. Each is associated with a particle that carries the force such as the photon, the carrier of the electromagnetic force. In 1983 experiments performed in the Super Proton Synchrotron (SPS) at CERN led to the discovery of the W and Z bosons which had been predicted as the carriers of the weak nuclear force. Its discoverers, Carlo Rubbia and Simon van der Meer were awarded the Nobel Prize for physics in 1984.

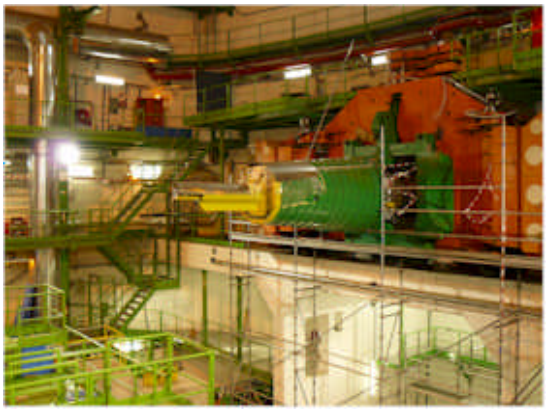


The design of ever larger and more powerful particle accelerators has required innovation in many areas of technology. Strong super-conducting magnets are required to focus the beams of particles as they are accelerated. The collisions between protons which generate the high energies required to create the force carrying particles produce a mass of data which must be analysed.

Developments in super-conducting magnets have led to spin-off applications in medical imaging techniques such as MRI. Arguably one of the most significant developments in information technology, the World Wide Web was invented at CERN by Sir Tim Berners-Lee. Originally conceived as a means of sharing information amongst scientists, it has rapidly grown into an indispensible tool in both personal and business life. The original document describing the idea behind a World Wide Web Project is on display in the visitors centre at CERN. Scribbled in pencil on the front page are the initial thoughts of a colleague - *'vague but exciting!'*

At the heart of particle physics sits the Standard Model. In the Standard Model both matter and the electroweak force (a unification of the electromagnetic and weak nuclear forces) and the strong nuclear force are described in terms of particles (gravity is not included in the Standard Model). Particles are classified into two groups, fermions and bosons. The fermions include quarks, the constituents of protons, and the electron and are what constitute matter. The bosons are the force carrying particles such as the photon described above.

The Standard Model has been very successful and, with the exception of the Higgs boson, all of the particles predicted by the model have been experimentally observed. However therein lies a problem. Without the Higgs boson the model predicts that the other particles would have zero mass. First postulated by Peter Higgs in 1964 as a proof of the Higgs mechanism, a process by which particles can acquire mass, the Higgs boson is predicted to be a massive elementary particle and the race is on to provide conclusive experimental evidence of its existence.



At Fermilab (Illinois, USA) the most powerful operational particle accelerator, a 6.3km synchrotron known as Tevatron which can accelerate protons to a maximum energy of 1Tev, is in the search for the Higgs boson but as yet without success. The LHC will push particle physics research into a new dimension. With a circumference of 27km and the ability to accelerate protons to 7Tev giving a head-on collision energy of 14Tev, it dwarfs the Tevatron.

Built in the existing 27km ring originally engineered to house CERNs Large Electron Positron Collider (LEP), the LHC is set to unmask the elusive Higgs boson. The LHC will contain two proton beams which are circulated in opposing directions. These beams are initially produced in CERNs existing accelerator chain which includes the SPS. The energy of the protons is progressively

increased through this chain of accelerators to 0.45Tev before injection into the LHC where they reach their maximum energy of 7Tev.

At four points around the accelerator ring the two beams of protons are brought into head-on collision within four massive detectors, ALICE, ATLAS, LHCb and CMS. The protons are injected into the LHC in bunches comprising around 100 billion particles. At any time around 3000 bunches will be in circulation around the accelerator. This density of particles is required as the collision frequency is very small due to their size. In fact, of the 200 billion particles crossing each other in the detector only around 20 collisions are predicted. However, travelling at close to the speed of light each proton will complete over 11,000 circuits of the accelerator every second and therefore bunches of protons will be brought into collision around 30 million times per second. This will produce up to 600million collision events every second.

The technology required to deliver this level of performance is quite extraordinary. The accelerator ring comprises over 1600 super-conducting magnets which bend the proton beam around the ring and maintain its focus. These magnets only achieve superconductivity at a temperature of -271^{o}C which requires around 100 tonnes of liquid helium. At this temperature they are able to conduct electricity without resistance allowing the generation of the extremely strong magnetic fields required to control the proton beam. At the time of writing, the LHC was in the final stages of cooling.

Undoubtedly the highlight of the visit to the LHC was the 100m descent down the cavern housing one of the four detectors. The Compact Muon Solenoid (CMS) detector weighs in at around 12,500 tonnes with a diameter of 16 meters and length of 21 meters. Back in August 2007, the CMS was still under construction. The CMS is a general purpose particle detector which is constructed in sections.

Each section is built at ground level before being lowered into the cavern where the detector is assembled in its entirety around the proton beam tube (Figure 1). A transverse section through the detector reveals a series of layers much like the layers of an onion skin each specialised for a particular task[1]. At the centre immediately surrounding the collision zone lies the tracker, 205m^2 of silicon sensors which track and measure the momentum of charged particles produced in the collision.

Surrounding the tracker is an electromagnetic calorimeter composed of scintillating lead tungstate which measures the energies of electrons and photons. This is surrounded by the hadron calorimeter for determining the energies of pions and neutrons. All these layers are encased in a large super-conducting solenoid magnet that enables measurement of the charge to mass ratio of particles. The outermost layer of the CMS (Figure 2) comprises the muon

[1] http://en.wikipedia.org/wiki/Compact_Muon_Solenoid

detector chambers (silver) interleaved within the magnet return yoke (red) which provides a return path for the magnetic field.

Whilst the immediate focus of the project will be detection of the Higgs boson, the LHC will serve the particle physics community for many years to come and with its immense collision energies is expected to lead to new physics. However operation of the LHC at these very high energies has led some to question its safety. One aspect of this is the possibility that micro black holes could be generated which might be captured within the Earths gravitational field and be sufficiently long-lived to accrete matter. The LHC Safety Assessment Group (LSAG) has looked at this possibility along with many other potential issues. Whilst some extensions of the Standard Model could account for the formation of micro black holes, it is believed they would be harmless, rapidly decaying by Hawking Radiation in which the black hole essentially evaporates with emission of particles of matter. Lets hope they are right!

Chris Reeve, 04 August 2008.

All image credits - Chris Reeve.

Large Hadron Collider Rap Is a Hit

(for those who are cool with You Tube)

From Universe Today. Puzzled about particle physics? Want to know what the inside of the Large Hadron Collider looks like?
Like music,
fun and science? Want to know for sure the LHC won't create a black hole that will swallow the Earth?

Find all of the above in a rap song created by Kate McAlpine, 23, who used to work in the press office of CERN, where on September 10, the LHC will be powered up. The song has been a hit on You Tube, and has been downloaded over 400,000 times.

Physicists say the science in the song is
"spot on" and provides a rhythmic tour of the mysteries of modern physics and the workings of the LHC, while noting that "the things that it discovers will rock you in the head." Without further ado, here it is

http://www.universetoday.com/2008/08/27/large-hadron-collider-rap-is-a-hit/

Mars Rover Opportunity Ascends Out of Crater

NASA/JPL NEWS RELEASE
Posted: August 30, 2008

PASADENA, Calif. -- NASA's Mars Exploration Rover Opportunity has climbed out of the large crater that it had been examining from the inside since last September.

"The rover is back on flat ground," an engineer who drives it, Paolo Bellutta of NASA's Jet Propulsion Laboratory, announced to the mission's international team of scientists and engineers.

Opportunity used its own entry tracks from nearly a year ago as the path for a drive of 6.8 meters (22 feet) bringing the rover out over the top of the inner slope and through a sand ripple at the lip of Victoria Crater. The exit drive, conducted late Thursday, completed a series of drives covering 50 meters (164 feet) since the rover team decided about a month ago that it had completed its scientific investigations inside the crater.

image credit: NASA/JPL-Caltech"

We're headed to the next adventure out on the plains of Meridiani," said JPL's John Callas, project manager for Opportunity and its twin Mars rover, Spirit. "We safely got into the crater, we completed our exploration there, and we safely got out. We were concerned that any wheel failure on our aging rover could have left us trapped inside the crater."

The Opportunity mission has focused on Victoria Crater for more than half of the 55 months since the rover landed in the Meridiani Planum region of equatorial Mars. The crater spans about 800 meters (half a mile) in diameter and reveals rock layers that hold clues to environmental conditions of the area through an extended period when the rocks were formed and altered.

The team selected Victoria as the next major destination after Opportunity exited smaller Endurance Crater in late 2004. The ensuing 22-month traverse to Victoria included stopping for studies along the route and escaping from a sand trap. The rover first reached the rim of Victoria in September 2007. For nearly a year, it then explored partway around the rim, checking for the best entry route and examining from above the rock layers exposed in a series of promontories that punctuate the crater perimeter.

Now that Opportunity has finished exploring Victoria Crater and returned to the surrounding plain, the rover team plans to use tools on the robotic arm in coming months to examine an assortment of cobbles -- rocks about fist-size and larger -- that may have been thrown from impacts that dug craters too distant for Opportunity to reach.

Phoenix Mission Conducting Extended Activities on Mars

NASA/JPL NEWS RELEASE
Posted: August 30, 2008

TUCSON, Ariz. -- NASA's Phoenix Mars Lander, having completed its 90-day primary mission, is continuing its science collection activities. Science and engineering teams are looking forward to at least another month of Martian exploration.

Due to the spacecraft's sufficient power and experiment capacity, NASA announced on July 31 that the mission would continue operations through Sept. 30. Once the lander finishes collecting science data, the mission teams will continue the analysis of the measurements and observations.

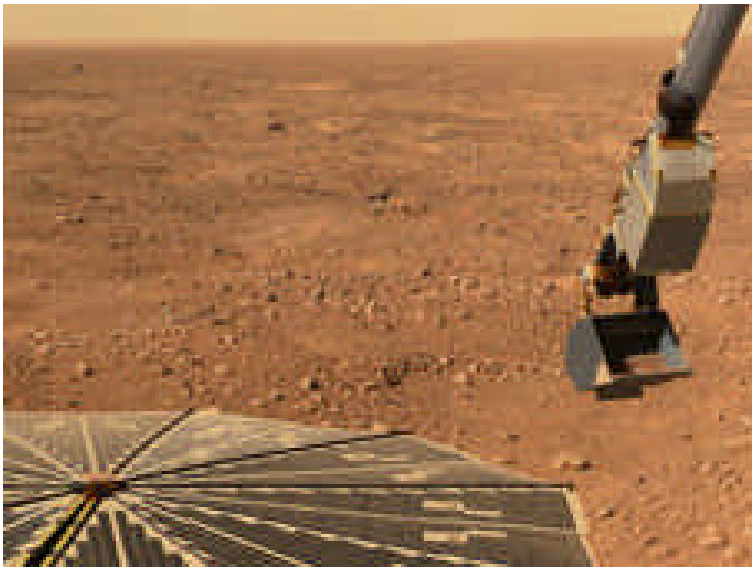
"We have been successful beyond my wildest dreams, and we're not done yet learning from Mars about its secrets," said Peter Smith, Phoenix principal investigator from The University of Arizona, Tucson.

"We are still working to understand the properties and the history of the ice at our landing site on the northern plains of Mars. While the sun has begun to dip below the horizon, we still have power to continue our observations and experiments. And we're hoping to see a gradual change in the Martian weather in the next few weeks," he said.

Among the critical questions the Phoenix science team is trying to answer is whether the northern region of Mars could have been a habitable zone.

Phoenix has already confirmed the presence of water ice, determined the soil is alkaline and identified magnesium, sodium, potassium, chloride and perchlorate in the soil. Chemical analyses continue even as Phoenix's robotic arm reaches out for more samples to sniff and taste.

"It's been gratifying to be able to share the excitement of our exploration with the public through the thousands upon thousands of images that our cameras have taken. They have been available to the public on our web site as soon as they are received on Earth," Smith said. Phoenix's Surface Stereo Imager, Robotic Arm Camera and microscope have returned more than 20,000 pictures since landing day, May 25.



NASA/JPL-Caltech/University of Arizona

The mission's meteorological instruments have made daily atmospheric readings and have watched as the pressure decreases, signaling a change in the season. At least one ice water cloud has been observed and consistent wind patterns have been recorded over the landing site.

The team is currently working to diagnose an intermittent interference that has become apparent in the path for gases generated by heating a soil sample in the Thermal and Evolved-Gas Analyzer to reach the instrument's mass spectrometer. Vapors from all samples baked to high temperatures have reached the mass spectrometer so far, however data has shown that the gas flow has been erratic, which is puzzling the scientists.

Meanwhile, plans call for Phoenix to widen its deepest trench, called "Stone Soup," to scoop a fresh sample of soil from that depth for analysis in the wet

chemistry laboratory of the Microscopy, Electrochemistry and Conductivity Analyzer (MECA). Stone Soup measures about 18 centimeters (7 inches) deep. The first attempt to collect a sample from Stone Soup, on Aug. 26, got 2 to 3 cubic centimeters (half a teaspoon) into the scoop. This was judged to be not quite enough, so delivering a sample was deferred.

In coming days the team also plans to have Phoenix test a revised method for handling a sample rich in water-ice. Two such samples earlier stuck inside the scoop.

Multiple Star Observations in May 2008 (part 3)

from Mike Gregory

O. S. 035/08 – Thursday May 22nd 2008 – A nice sunset though it began to haze over soon after but as Polaris was still on show, albeit just, at 23.00 BST I decided to set up my refractor, using Vega to align up the Gotostar. As ever, little on show when I was ready to go!

Conditions looked better in Corona Borealis as Alphecca (alpha CrB) was reasonably clear so I had a look at three stars that I have seen before, albeit in better conditions.

Zeta CrB is an almost equal magnitude double at 5.1 & 6.0 (though this still means the primary is almost twice as bright as the secondary) with a separation of 6.3 arc seconds. Quite neat, even in these poor conditions at 59x, but not much of a challenge.

Sigma CrB is a similar pair to the above with each component being ½ a magnitude dimmer. The separation is 7.3 though widening from 1.3 since first measured by W Struve in 1827, as sigma is now a proven GB pair with an orbital period of about 1000.0 years. Astrometric measurements suggest a maximum separation of 13.0 arc seconds in about the year 2500 but returning to the present, to my eyes the primary is a yellow star and the secondary bluish or whitish blue or maybe bluish white whilst the Rev Webb says in Victorian times many astronomers saw many colours. More recently JR Burnham says there is no colour difference between either components, but then he declines to suggest what the joint colour might be. Burnham also says that the primary is a spectroscopic pair with an orbital period of not quite eight days. There is also a very wide red dwarf companion of the 13th magnitude that shares a common proper motion.

Now I am looking at Struve 1932 which is a relatively tight GB pair with a separation of 1.6 arc seconds though almost equal magnitudes of 7.3 & 7.4. I was unable to split this pair on March 27th this year though I was successful on

May 24th in clearer conditions than tonight. So, could I split Struve 1932 this night? Yes, I can, but only just. Struve 1932 has an almost proven orbital period of 203.0 years, the primary being yellow white to pure yellow according to the spectrum!

95 Herculis is an interesting though notorious star with almost equal magnitudes of 5.13 & 5.21 and a separation of 6.3 arc seconds. However it's notoriety amongst observers comes from the discordant estimates of the colours. According to the usually conservative Wilhelm Struve 'greenish yellow and reddish yellow'! Modern day observers would say silver and pale gold, which would agree with the spectra of A7 (whitish) and G5 (yellow-orange). On this hazy evening I would say silver and silvery-gold and, though both components were well separated at 118x, they were fuzzy edged rather than precise points of light!

I'm looking at Otto Struve 358, which is not too far away from 95 Herculis on a two-dimensional plane but it's close separation of 1.3 arc seconds is beyond my refractor's resolution so I am moving into adjacent Ophiuchus.

70 Oph is one of the most thoroughly observed GB stars due to its quite rapid period of some 87 years but on this night, with its relatively low declination, it all looked rather fuzzy, and it was just split at about 59x. Higher magnifications simply overpowered the conditions. Therefore it was rather pointless having a try for 39 Oph, said to be a colourful GB star, as all I saw in the eyepiece was my neighbour's garage roof!

So I have moved up a few degrees and to the east and I am looking at spectacular Albireo (beta Cygnii) except that it's not looking all that spectacular as we pass over into Friday morning. The gold primary looks white and the turquoise secondary silver blue. A little voice in my head is saying it's time to retire for the night especially as I set off on what was an almost balmy summer night but now the thermometer is dropping towards zero degrees C. It must be me who is balmy!

Sky Atlas 2000.0 suggests there is an unnamed double star not far from Albireo so I have fitted my widest angle eyepiece and I am searching about for any dim star in the locality with a hint of duplicity. After about fifteen minutes I have found no candidates but, looking upwards with the naked eye, only the two bright stars, Arcturus and Vega are now showing through the haze so it must be time to retire indoors!

O. S. 036/08 – Friday May 30th 2008 – I set the refractor up in clear conditions at 23.20 BST and used Vega to align the Gotostar but as I was ready to start observing there were ominous signs of haze drifting in from the northeast and then I was joined by the police helicopter that hovered over my roof and it is clearly heard on my voice recorder. The only star I observed of any interest was

Struve 2486 (mags 6.6 & 6.8 and separation is 7.9 arc seconds). The Revd Webb says 'singular and beautiful' and, despite the hopeless conditions, I can well agree with that statement. I also looked at Albireo, Izar and xi Ceph and though they were all seen as clear doubles, the views were generally poor. I also had a go for 49 Cygnii but it proved to be positioned below neighbouring foliage so I tried for h1471 (John Herschel 1471 though not measured professionally in his lifetime – magnitudes 7.3 & 9.4 and very wide at 29.0 arc seconds) also in Cygnus, which is a wide coloured double though not on this night as there was no sign of the secondary star. However, Sky Catalogue 2000.0 suggests the primary is much brighter and the secondary much dimmer so I was probably looking at the wrong star. There was a much brighter star in the same field of view.

Overall though, just about the worst observing session ever!

(anybody want to buy Mike's telescope? It may be going cheap soon! Ed)

"What's the Biggest Star in the Universe"?

from Fraser Cain

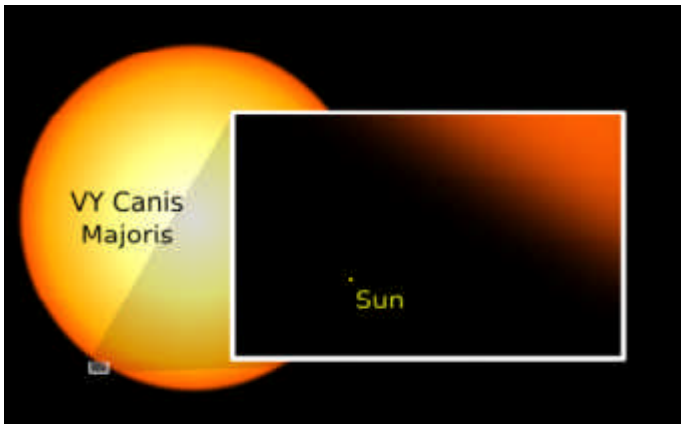
the Universe is a big place, and there's no way we can possibly know what the biggest star is. Lets refined the question. What's the biggest star that we know of?
Firstly, let's take a look at our own Sun for a sense of scale. Our familiar star is a mighty 1.4 million km across (870,000 miles). The Sun accounts for 99.9% of all the matter in our Solar System. In fact, you could fit one million planet Earths inside the Sun.

Astronomers use the terms "solar radius" and "solar mass" to compare large and smaller stars, so we'll do the same. A solar radius is 690,000 km (432,000 miles) and a solar mass is 2×10^{30} kilograms (4.3×10^{30} pounds). That's 2,000,000,000,000,000,000,000,000,000,000 kg.

One huge, famous star in our galaxy is the monster Eta Carinae, located approximately 7,500 light years away, and weighing in at 100 solar masses. It's 4 million times as bright as the Sun. Most stars blow with a solar wind, losing mass over time. But Eta Carinae is so large that it casts off 500 times the mass of the Earth every year. With so much mass lost, it's very difficult for astronomers to accurately measure where the star ends, and its stellar wind begins.

So the best answer astronomers have right now is that Eta Carinae's radius is 400 times the size of the Sun. And as star size estimates go, that's pretty accurate.

And one interesting side note: Eta Carinae should explode pretty soon as one of the most spectacular supernovae humans have ever seen.



But that's nothing. The largest known star is VY Canis Majoris; a red hypergiant star in the constellation Canis Major, located about 5,000 light-years from Earth.

University of Minnesota professor Roberta Humphreys recently calculated its upper size at more than 2,100 times the size of the Sun. Placed in our Solar System, its surface would extend out past the orbit of Saturn. Light takes more than 8 hours to cross its circumference!

Some astronomers disagree, and think that VY Canis Majoris might be smaller; merely 600 times the size of the Sun, extending past the orbit of Mars.

That's the biggest star that we know of, but the Milky way probably has dozens of stars that are even larger, obscured by gas and dust so we can't see them.

But let's see if we can work out the original question, what's the biggest star in the Universe? Obviously, it's impossible for us to actually find it - the Universe is a big place, and there's no way we can peer into every corner.

But according to theorists, how big can stars get?

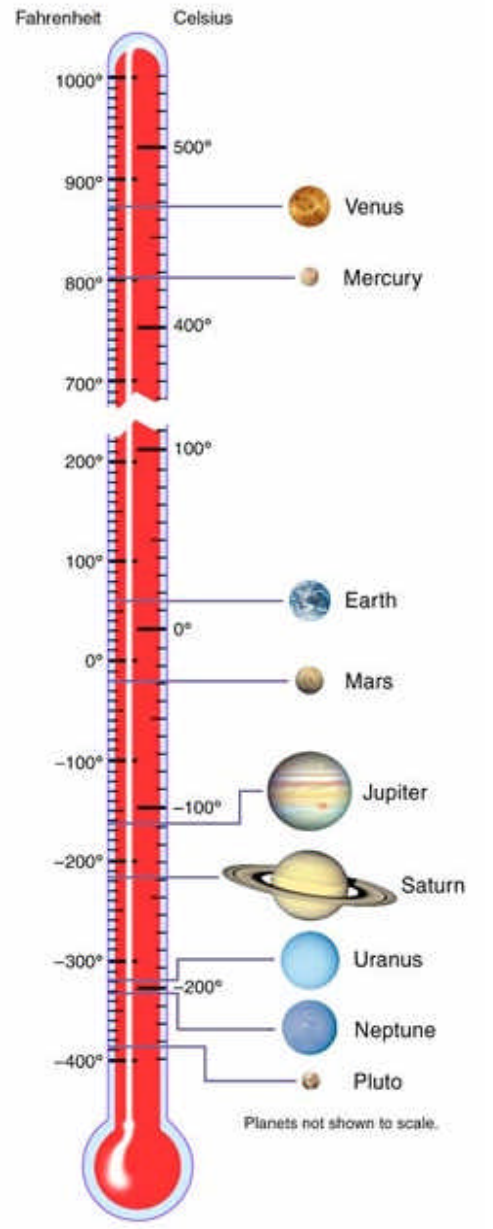
I contacted Roberta Humphreys from the University of Minnesota, the researcher who calculated the size of VY Canis Majoris, and posed this question to her. She noted that the largest stars are the coolest. So even though Eta Carinae is the most luminous star we know of, it's extremely hot - 25,000 Kelvin - and so only a mere 400 solar radii.

The largest stars will be the cool supergiants. For example, VY Canis Majoris is only 3,500 Kelvin. A really big star would be even cooler. At 3,000 Kelvin, a cool supergiant would be 2,600 times the size of the Sun.

That, she believes, is the largest possible star.

How Hot Are The Planets in Our Solar System?

from http://www.livescience.com/mysteries/080818-llm-word-planet.html



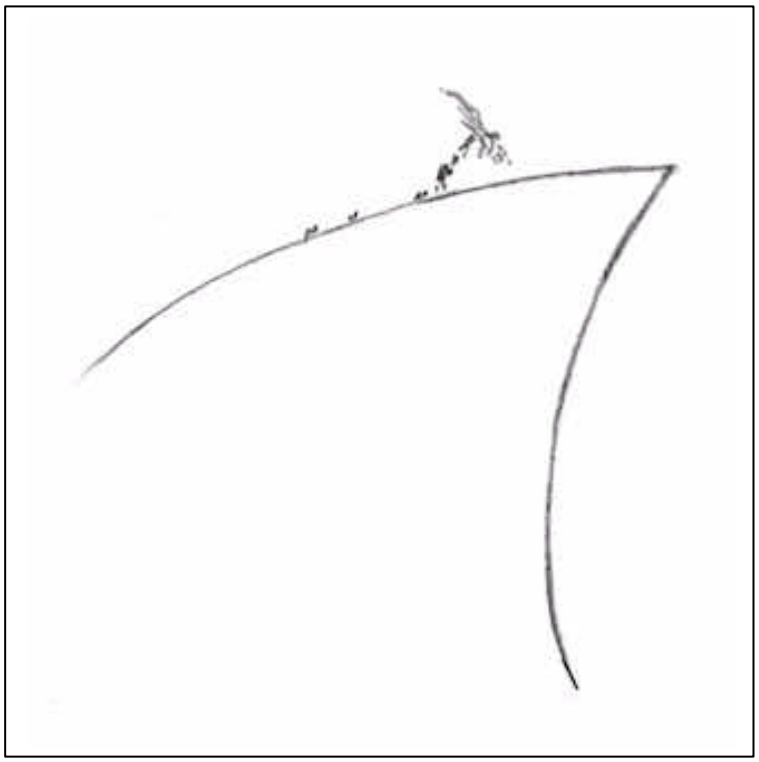
Venus ranks No. 1 for average temperature because its dense atmosphere acts as a greenhouse and heats the surface to above the melting point of lead (3,280 degrees Celsius). Don't try to visit.

Mercury rotates slowly and has a thin atmosphere, and consequently, the night-side temperature can be more than 5,000 degrees lower than the dayside temperature. On Mercury, you either freeze or roast, period.

Earth, well, you know already.

Mars is mostly frigid, as low as -189.67 degrees Fahrenheit (-123.15 degrees Celsius), but during daytime near the equator, temps sometimes reach a comfortable 80 degrees. Because the red planet has only a very thin atmosphere, the temperature plummets at night.

Temperatures for the gas giants (Jupiter, Saturn, Uranus, and Neptune) are shown in this chart at a level in the atmosphere equal in pressure to sea level on Earth.



No, its not a sharks fin with a “fingy” on it. It is Rob Peeling’s hand-drawn sketch of a solar prominence observed through a Meade 8” Schmidt-Cassegrain equipped with a H-alpha filter. Taken at Wynyard Planetarium on 01 August at 09.37UT during the partial solar eclipse

NASA has put up a vast archive of space images on the following

www.**nasaimages**.org/

They have a ton of images there. When they load, they are fitted to your screen, but then you can zoom in or out. There are descriptions on the sidebar (generally tapped from the press releases) and there are animations as well. There are some gizmos, like an "Embed This" link with clear instructions on how to embed a given picture into a blog or web page and of course there is the ubiquitous "Share This" link, too.

Articles : Please send contributions for the newsletter to Bob Mullen,

18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 (b2mullen@hotmail.com) Copy deadline date is the 20th of each month.).

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