TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

05 March 2008

Lunar Eclipse, 21 February 2008. An image of the eclipse captured by John Gianforte at the University of New Hampshire observatory.

Sadly the UK was covered in cloud that night.

Editorial

Last meeting : 08 February 2008. Rod Hine on "Orbits, Spin and Chaos". A great trip back to Astronomy 101. All we should know about the physics basics of our hobby. Rod was very courageous. Presenters are advised never to share the stage with children, animals or weapons of mass destruction.

Next meeting : 14 March 2008 : "We Are Not Alone" by Neil Haggath

Another Moonwalker visit :

Ken Willoughby & Carleton Community High School present an evening with Colonel Edwin "Buzz" Aldrin (Apollo 11 Lunar module Pilot and 2nd man on the Moon).

Sunday 30th March, 2008.
Carleton Community High School,
Green Lane,
Pontefract WF8 3NW

Admission £20.00

SAE to Ken Willoughby, 11 Hardistry Drive, Pontefract, West Yorkshire, WF8 4BU,
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Letters to the Editor

Dear Editor,

Comments on February's "Transit"

We had a colourful picture of Olympus Mons on the cover. If it was situated near one of the Martian poles it would then resemble this picture, which is Mt. Kilimanjaro photographed from the International Space Station? (from Astronomy and Space July 2007).

Another article also tells us that every second the Sun loses mass which approximates that of sixteen Empire State buildings. Also in two hundred years Mercury will be "moving slower and it will lag behind it's current orbital position by 5.5 Km".

Or does this mean it will have moved slightly away from the Sun and that its orbit will be 5.5Km longer?

So in two hundred years the Sun will have lost 6 billion kilograms x 60 x 24 x 365 x 200. An astronomical number indeed with many zeros.

Lastly has anyone any ideas as to why those who receive a printed "Transit" responded to the Editor's questionnaire made up just under half of the total, whilst of those who receive the e-mail version only under a sixth responded?

John Crowther

Editor : It is a well researched fact that computer screen readers often operate in an entirely superficial world – they scan screen content and probably discard (or forget) most of what they read to prevent information overload. On the other hand magazine and book readers, having made the effort to obtain a paper copy, pay the material a much greater compliment by actually reading it and committing it to their little grey cells. (also, you can't take a computer to bed with you for that "best of the day" read before sleep kicks in).

Dear Editor,

Could I remind the Society that the Planetarium is to host a Public Solar Observing session on Sunday March 09 2008 as part of the National Science and Engineering Week, NSEW, (formerly National Science Week).
Website is www.the-ba/nsew

This is an opportunity for people of all ages, areas and organisations to take part in science, engineering and technology activities.

The session starts at 1.00pm. CaDAS volunteers will be supervising the use of the Planetarium telescopes fitted with stringently safe Sun filters, including visual, hydrogen alpha and calcium wavelength filters. Could the CaDAS volunteers please appear at the Planetarium at least one hour before the start

Ed Restall

The Largest Stars

From Rob Peeling

Much in astronomy is concerned with extremes. Consider our Sun where superlatives are generally used to describe its brightness, size, mass, temperature and lifetime. The Sun's vital statistics almost paralyse our imagination. Yet, astronomy tells us that the Sun compared to other stars, is very far from exceptional in almost all respects. The single exception is, that to the best of current knowledge, the Sun is the only star in existence that has a life-bearing planet orbiting it.

The Sun is 1.4 million kilometres in diameter. If that is a "small" star then just how big can stars get and which ones are they? To answer that we need to ask two more questions; what sorts of stars are likely to be very big, and how do astronomers measure them?

The Sun is powered by nuclear fusion reactions in its core, consuming hydrogen and converting it to helium. Detailed mathematical models can be devised to describe the behaviour of the Sun. These can be used to predict what will happen when the hydrogen in the core starts to run out. The model shows that the core will contract under its own gravity, releasing energy to heat the surrounding gas that still contains hydrogen to a high enough temperature for nuclear reactions to start.

As the nuclear energy is now being released closer to the surface, the outer layers of the star start to puff up, becoming less dense but as they expand they also cool down because the same available energy is now being spread over a larger surface area. The star's diameter will increase by at least a factor of ten, so in the case of the Sun it is now 14 million kilometres and stretches 10% of the way to Mercury. The star is now a red giant.

The model provides a clue to help search for the largest stars. We are looking for stars that have consumed the hydrogen in their cores and are therefore beginning to die. An observer on Earth can identify them because they are redder than most other stars.

The next clue is more like common sense than clever physics. If you take a big, hot glowing globe i.e. a star and place it a long way away (i.e. a star) and compare it to a similar but much smaller globe at the same distance, then it is pretty clear that the bigger one is going to appear brighter than the little one.

We now have all the clues we need. To find the biggest stars we should investigate the ones that are red and bright. Two candidates immediately come to mind; Betelgeuse and Antares. Both of these are very bright stars and most

people looking at them with the naked eye agree that they are at least a little orange coloured. There are a number of other fainter naked eye stars, which seem white to the naked eye, are noticeably coloured when using binoculars. These are a Herculis (Rasalgethi), μ Cephei (Herschel's Garnet Star) and VV Cephei.

Being bright and coloured doesn't mean a star is necessarily large. It could simply be close to Earth. Astronomers need to find out the distance to the star. The distance to a star is most accurately measured by determining its geometric parallax. This is the small angle a relatively nearby star appears to move against much more distant background stars when observed at an interval of 6 months during which the Earth moves half way around its orbit. As we know the diameter of the Earth's orbit around the Sun, this makes it possible to directly calculate the distance to a star.

The first astronomer to be able to measure very small angles sufficiently accurately to be able to put this method into practice was Friedrich Bessel in 1838 when he determined the distance to 16 Cygni. The brightness of the stars listed implies that they are may be close enough for geometric parallax to be used to measure their distance. This proves to be the case for Antares, Betelgeuse and Rasalgethi. The distances to the two stars in Cepheus are estimated using other techniques.

Most stars are both small enough and far enough away that they always seem to be points of light rather than a disk even with the best telescopes. As the stars in the list can be detected as disks this is a clear indication that they are truly large. Measuring the diameter of the disk and knowing the distance to the star it is a simple calculation to find out how big the star actually is. The answers are astonishing.

Star	**Apparent Visual Magnitude**	**Distance [light-years]**	**Radius [AU]**
Betelgeuse, α Orionis	0.50	430	3.6
Antares, α Scorpii	0.96	600	4.2
Rasalgethi, α Herculis	3.48	400	2.0
Herschel's Garnet Star, μ Cephei	4.08	2000	5.7
VV Cephei	4.91	2000	8.8
Note: 1 AU is the distance from the Earth to the Sun ~150 million kilometres			

The diagram shows that if any of these five stars were substituted for the Sun at the centre of our Solar System then all the planets out to and including Mars would be *inside* the star. The biggest, VV Cephei, would swallow everything out to nearly the orbit of Saturn. These stars are immensely larger than the red giant described earlier.

The diameter of the largest star VV Cephei has been confirmed in a surprising way. VV Cephei is not alone in space, it has another star orbiting it and it as it happens the orbit is angled such that from Earth we can see the smaller star eclipsed by VV Cephei itself. This happens every 20 years but the amazing bit is that when it happens the eclipse is detectable as a drop in brightness lasting 1.2 years, a testament to the gigantic size of this star.

It is clear that these enormous stars are reaching the ends of their lives and that they are much bigger than standard red giants. These are the red supergiants and their position in the sky gives away their true nature. This type of star is always found associated with stars known to be young (*only* 10s of millions of years old) and yet they are "old" and dying.

The solution to the paradox is that these are very massive stars containing at least 10 times as much matter as our Sun. Such stars burn their hydrogen fuel fast due to the extreme conditions within them and so die very young. These supergiants are some of the prime candidates for future supernovae in our galaxy.

Where and when to see the red supergiants

Betelgeuse is at the top left corner of Orion and can be seen during the winter.

Antares is visible in the summer. From Teesside it never rises very far above the southern horizon.

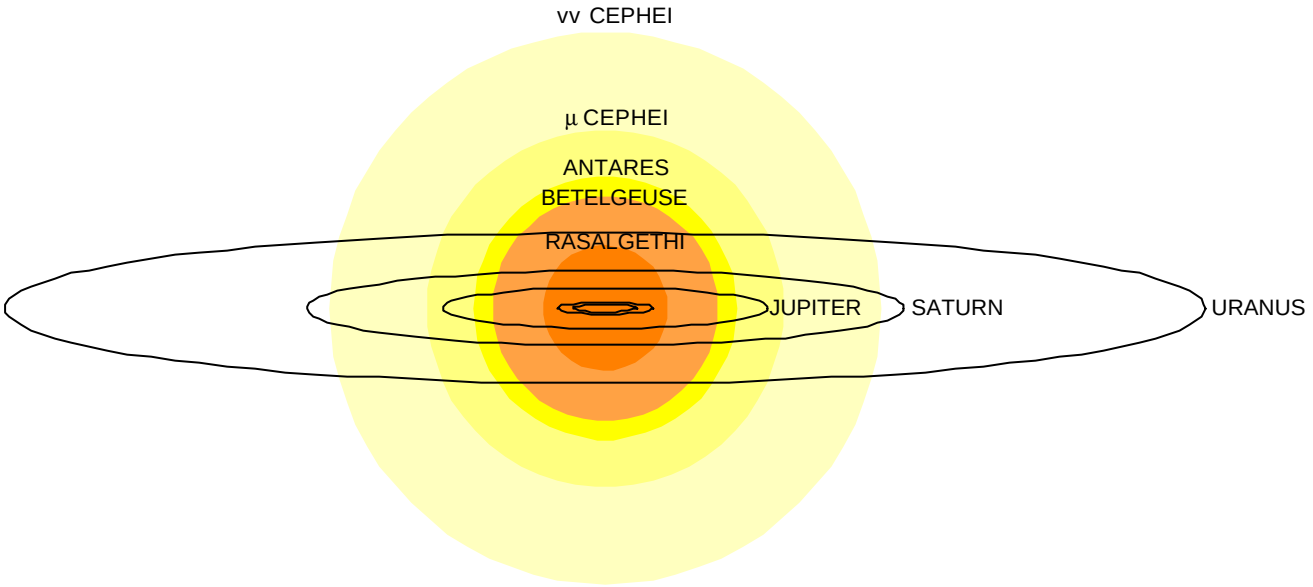
Rasalgethi is an autumn star. Find Vega and then look down and to the right for the next bright star. This is a Ophiuchi (Rasalhague). Look for a prominent but fainter star to the right and below of a Ophiuchi and that is Rasalgethi. Have a careful look with the naked eye and see if you can tell if it is yellower than nearby a Ophiuchi. With a telescope Rasalgethi is an excellent colour contrasting double with a fainter blue/green companion.

The two supergiants in Cepheus are visible all year round but from Teesside are best looked for in the autumn when they are overhead. If you are facing northwards then the famous W of Cassiopeia will be upside down and somewhat to your right. Use the right-hand two stars of the W to point upwards to the next fairly bright star. This is a Cephei (Alderamin) and both the supergiants are nearby.

Part of the way back to Cassiopeia, but slightly off-line, a small, thin triangle of stars should be noticeable. Halfway between these and a Cephei you will see another star. This is μ Cephei. Once again, see if you can detect any yellowness with your naked eye. Check the colour with binoculars to be sure you have the right star. With the light pollution around Teesside, you'll need binoculars to find VV Cephei. Slowly scan from a Cephei towards Cassiopeia to find a small "funnel" of stars. VV Cephei is bright near the narrower end on the same side as a Cephei. It will look distinctly yellowish.

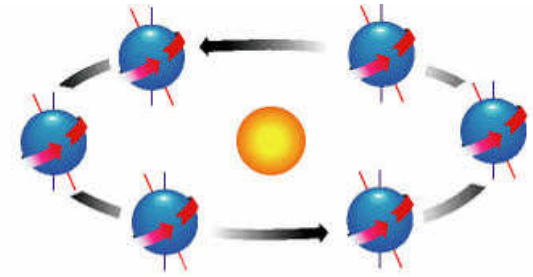
The size of the largest stars compared to the orbits of planets in the Solar System

Diagram after J.B. Kaler, Extreme Stars, at the Edge of Creation, Cambridge University Press 2001



Earth's 24-hour Day: "A Transient Thing."

Posted by Josh Hill.



Earth's orbit around the sun is not the perfect circle that many would like to believe; this is how we get our leap years every four years. But more than that, a new report points to the Earth's elliptical orbit as being responsible for more than just the 29th of February.

According to Michael E. Wysession, Ph.D., associate professor of earth and planetary sciences in Arts & Sciences at Washington University in St. Louis, our planet's elliptical orbit has much more to it though than just the odd extra day.

"All planets travel in an ellipse around the sun, but the shape of that ellipse oscillates," he explains. "When the Earth's orbit is more elliptical, the planet spends more time farther away from the sun, and the Earth gets less sunlight over the course of the year. These periods of more-elliptical orbits are separated by about 100,000 years. Ice ages occur about every 100,000 years, and they line up exactly with this change in the Earth's elliptical shape."

The science behind this is quite extraordinary, while being simultaneously easily accessible to us all. We'll take a quick wander through the intricacies of what makes our seasons and years special.
One of those trivia questions that is always popped out after two beers have been consumed is "How many hours in a day?" A momentary pause will be followed by suspicious exclamations from those who know that they are about to be had.

"Earth's 24 hour day is a transient thing," Wysession says. "It actually takes 23 hours, 56 minutes and four seconds to make one revolution around its axis — that is, to go all the way around so that the stars will appear in the same point in the sky day after day.

"However, during that time, the Earth also has moved one more day along its orbit around the sun, so it actually has to spin a little bit more for the sun to arrive back in the same place in the sky. This amount of time is three minutes and 56 seconds, which makes the 24 hours."

But that isn't even the big problem, when you consider that it doesn't actually take us 365 days to orbit the sun, but rather 365.25. This is where we get our leap year from, because every 4 years we add up those .25's to make ourselves February 29. If we were to have just let it keep going, then the marker by which our artificial calendar is attached to would fly out the window.

The winter solstice is our marker, and the equation is to make sure that each December 21st, in the middle of the Solstice, at around noon, the same point on the Earth is tilted toward the sun.

However our artificial calendar of 60 seconds, 60 minutes, 24 hours, means nothing in the long run. 100 million years ago the Earth spun faster than it does now, and, to use the somewhat unfortunate description in the Washington University in St. Louis press release, "like aging baby boomers, it is slowing down."

As to how all of this could affect our climate?

"Seasons occur because in January, for instance, the North Pole points away from the sun, so the southern hemisphere gets more direct sunlight," Wysession says. "Six months later, that will be reversed. In terms of climate change, this has an impact because land heats up much more quickly than water, five times more quickly. The northern hemisphere has most of the land on Earth; the southern has most of the water. On January 3 or 4 (it varies) the Earth is at its closest point to the sun (the perihelion), but because water heats up so slowly, it doesn't make as much difference in temperature in the southern hemisphere as it otherwise might.

"In the northern hemisphere summer, despite the Earth being farther away from the sun, land heats up much more quickly than the southern hemisphere's water, and heats up about the same amount consistently. The two hemispheres end up buffering the climate swing, producing less severe winters than we would have otherwise."

But as the Earth moves further away, as Wysession mentioned up the top, and in about 12,000 years the Earth will be further away from the sun in winter, and closer in summer; thus, creating severe extremes in each of the seasons.
"Orbital parameters of Earth, the sun and moon and the planets have great effects on ice ages and other climatic changes," he says. "Those major events are driven by very small changes in the planetary orbital functions."

A Life Under the Stars - part 5

(review of a 70mm refractor)

from David Blenkinsop

On 28th December 2008 Steve Sawdon and I went to Lidl supermarket to have a look at some microscopes that I had seen the day before.

We saw 70mm refractors. We looked at the photos on the box, I opened one but all the parts were individually boxed. We looked at the price too. More later.

We went to the Planetarium that evening as it was “Telescope Night”. In the car on the way home we decided to go and buy one telescope each. When we first looked at them there were five or six on the shelves, on the next day there were only two, so we were lucky.

When we took them home to set them up we were pleased to find three nice eyepieces, with a plastic container for each., a Barlow and a good finder.

Now, to find out what a 70mm refractor can do.

It was near the time of the full Moon. I look at the full Moon with it and tried all the eyepieces. With the 200mm = x 35 magnification you could see all the Moon in the eyepiece with a portion of sky surrounding it. With my own 40mm
Meade eyepiece it was a small Moon with lots of sky around it.

On another night I looked at the Pleiades. They did not all fit in the eyepiece but they did with the 40mm Meade. Later in the night I looked at Saturn and tried all the eyepieces. With the Barlow and the 4mm eyepiece (= x 262) Saturn looked good with a dark line across the disk being the shadow of the rings.

On the 16th January 2008 at 4.15pm I was observing the Moon, which was between Aries and the Pleiades, with the refractor and the higher power eyepieces and the views were very good.

Epsilon Lyra just split with the 4mm, lamda Aries with the 20mm eyepiece was a nice wide double. Orion's sword, M42, plenty of the nebula was seen. NGC1977 and NGC1981 were nicely framed with the 20mm eyepiece.

Delta Orionis (Mintaka) was nice with the 20mm
Iota Orionis split with the 12mm
Lamda Orionis split with the 4mm
In Gemini, M35 looked good with the 12mm
Nu Geminorum was an easy double with the 20mm
20 Geminorum doubled with the 20mm, better with the 12mm
Castor split with the 12mm, better with the 4mm

Well, Dave, we ask, would you recommend the 70mm refractor for a first telescope? Er, no, I would always recommend a 6" Dobsonian.

I did find this telescope a bit hard to use at first as I am a Dobsonian man.

Because of the difficulty of using the finder when looking towards the zenith I removed the finder end from the eyepiece end of the tube and bolted it to the sky end of the telescope tube. I drilled the bracket and bolted it to the dew cap. It is now easier to observe straight up.

With the Barlow lens placed in the in the telescope, then the star diagonal and then the 4mm eyepiece a large crater on the Moon fills half the field of view with some colour, but not much.

I am keen to use this telescope each clear night, just to continue trying it out.

This is a lot of telescope for only £50!

UK Reinstated as Full Member of Gemini Project

Written by Ian O'Neill

It is official: the UK is back as a full member of the Gemini Observatory international partnership. At the beginning of the month, The Science and Technology Facilities Council (STFC) signalled that the UK would *partially* return to the project after January's shock announcement that Britain was going to pull *all* its financial support out of the observatory. Today, the STFC has reinstated the UK as a *full* member of the Gemini Project. What a rollercoaster ride…

An official joint statement from the Gemini partners reads:

> "The Science and Technology Facilities Council has reaffirmed the UK's position as a full member of the Partnership under the terms of the current Gemini Agreement. The Gemini Board welcomes this statement. The Board acknowledges the STFC's need to address its budgetary constraints and notes that, under the terms of the Agreement, the UK is entitled to seek to sell some of its telescope time both within the partnership and, subject to the approval of the Board, outside the current partnership."

This is obviously welcomed news, but the astronomers who were outraged by the initial withdrawal are frustrated as to why selling telescope time wasn't an option in the first place. Allowing other groups (inside and possibly outside the partnership) to buy campaign time on Gemini is a far better solution to the STFC funding crisis. Wasting the money already invested in the project (over £70 million to develop the project alone) and pulling out entirely seemed a very extreme measure, prompting some UK astronomers to say the UK astronomy community was being "sabotaged".

This debacle resonated with the other partners of Gemini (including the US, Canada, Chile, Australia, Brazil and Argentina) who responded angrily to the news that the UK was suddenly withdrawing funding (understandable really). Any

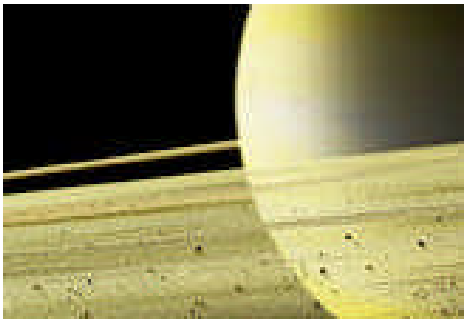
mention of the UK was quickly removed from the Gemini observatory locations and the official website.

Today's announcement has reinstated the UK as a full partner once more to the Gemini project. According to a source, the UK flag has even been returned to the Gemini Northern Operations Center in Hilo, Hawaii.
But there is still a problem. The situation has not changed, the STFC still has to plug its funding deficit, and government assistance is still not forthcoming. There are concerns for other UK physics and astronomy projects, as the £15 million ($30 million) savings from cancelling involvement in Gemini will need to be cut from elsewhere.

It would appear that the outrage caused by the STFC's initial plans to cancel its subscription to Gemini was instrumental in the funding decision U-turn, so the UK physics and astronomy community will have to fight just as hard when more cutbacks are announced in the future. Keep an eye on the *STFC Funding Crisis: Astronomy* website for updated news on the problems facing physics and astronomy in the UK.

See Saturn Now: Lord of the Rings Rocks

from Joe Rao



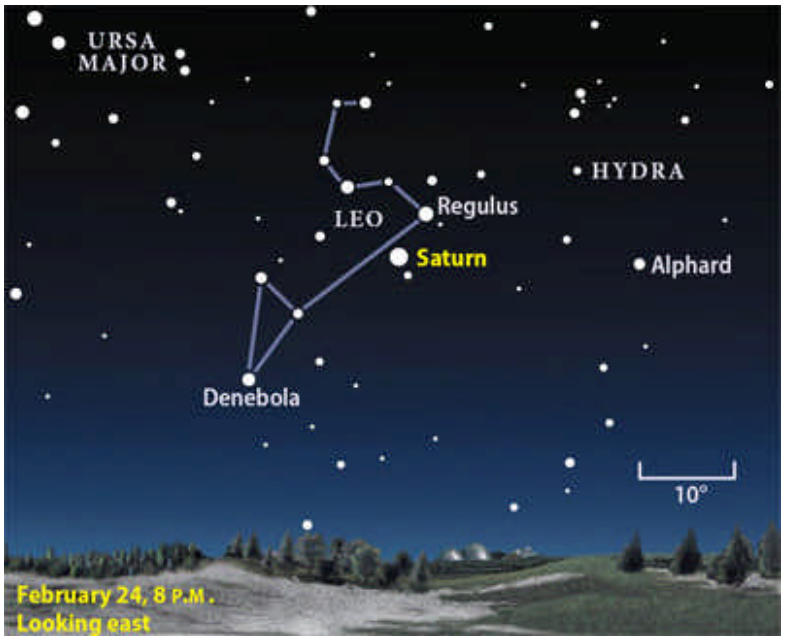
Saturn is now at its best in our late-winter sky. It appears below and to the left of the conspicuous "sickle" or backwards question-mark pattern of stars marking the head and mane of the constellation of Leo, the Lion.

It will arrive at opposition to the sun Feb. 24, when it lies on the opposite side of the sky from the sun; rising as the sun sets, reaching its highest point in the southern sky at midnight and setting as the sun rises.

What we see with the naked eye is a bright yellowish-white "star" shining with a steady light. Through a telescope this object is enlarged into one of the finest showpieces of the night sky, thanks to its great ring system in all of its icy, glimmering elegance.

In small telescopes, the rings surprise even veteran observers with their chilling elegance even though it is expected. Certainly they will delight anyone this winter who received a telescope as a holiday gift. Any telescope magnifying more than 30 power will show them.

Look now!



Take a look at Saturn's rings now, because soon our view of them will be compromised by the fact that they are turning more and more edge-on to our line of sight.

Currently the rings are tilted at just over 8 degrees toward us and actually, they will appear to open slightly to nearly 10 degrees by the beginning of May. However, later this year, the rings will appear to rapidly close up and by the end of this year the tilt of the rings will be less than one degree and they will appear as nothing more than a thin line bisecting the ball of the planet.

And by the late summer of 2009, there will come a period of time when the rings will appear to vanish, as they will be turned exactly edgewise to us.

Some Saturn stats

At an average distance of 886 million miles (1.43 billion km.) from the sun, or about twice as far away as Jupiter, Saturn goes around the sun once in 29.5 Earth-years. Second only to Jupiter in size at 74,900 mi (120,500 km), it's more than nine times the size of our Earth. Like Jupiter, it's wrapped in thick clouds which run in parallel bands across its disk.

At last count, Saturn has 61 satellites; the largest one, Titan, appears as a star of eighth magnitude and appears to orbit Saturn in about 16-days.

But the really impressive feature of Saturn is its famous ring system.

These rings are not continuous sheets, but are actually composed of countless billions of particles which range in size from microscopic specks to boulders the

size of houses, each one circling like a moon around Saturn and reflecting sunlight. Most of these are composed of water ice.

Through a good-sized telescope the rings appear as two bright ones with a narrow dark space between them — called the Cassini Division, discovered in 1675 — and the fainter "crape ring" nearer to the ball of the planet, which is not quite so easy to see. These are considered the Main Rings and measure about 170,000 miles (273,500 km.) across, although over the past 30 years several other much fainter rings have been identified from images taken by the Pioneer 11 and Voyager space probes. These are referred to as the Dusty Rings.

The width of the entire ring system, including gaps, is about 258,500 mi (416,000 km).

Galileo was stumped

Galileo Galilei (1564-1642) was the first to view the rings in 1610 although what he saw through his crude telescope left him completely baffled, as Saturn appeared to him not to have rings but rather two smaller bodies flanking it on either side.

He couldn't make them out clearly and thought that Saturn was a triple body, with two small orbs on either side of a large one. Later, when the rings turned edgewise to Earth and the two companions disappeared, Galileo invoked an ancient myth when he wrote, "Has Saturn swallowed his children?" Galileo lamented that his mind was too weak to comprehend this strange phenomenon.

Actually, it was his telescope that was too weak; a better telescope would have revealed Saturn's companions as rings.

It was not until a young Dutch mathematician, Christiaan Huygens (1629-1695), utilized a much better telescope, and on March 25, 1655 saw the rings for what they really were.

Slow, but steady

In mythology, Saturn closely resembled the Greek god Cronus, but he's more usually recognized as the Roman god of agriculture. The name is related to both the noun satus (seed corn) and the verb serere (to sow).

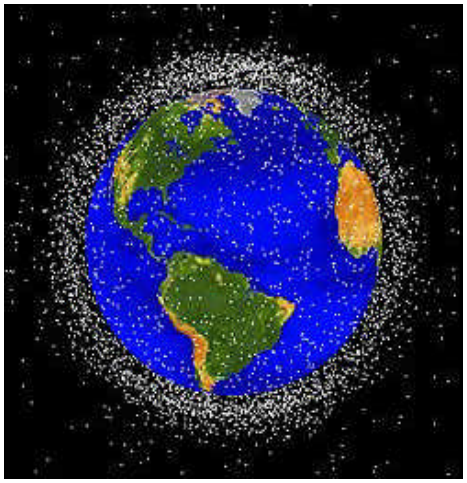
But why would the planet Saturn be linked to agriculture? Perhaps a clue can be found from the ancient Assyrians who referred to Saturn as lubadsagush, which translated, meant "oldest of the old sheep." Possibly this name was applied because Saturn seems to move so very slowly among the stars; it may have also reminded sky watchers of the slow gait of plowing oxen or cattle.

So, if we identify Venus by its great brilliance, Mars by its orange-yellow color and Jupiter which is surpassed only by Venus in brightness, then Saturn is

recognized by its slow movement among the stars, and easiest of all, if we examine it through a telescope, by its beautiful rings.

Space Debris May be Catastrophic to Future Missions (and Google Earth is Watching…)

Written by Ian O'Neill



Kessler Syndrome could be a frightening situation for space travel. No, it's not a health risk to the human body in zero-G and it's not a psychological disorder for astronauts spending too much time from home. Kessler Syndrome is the point at which space travel becomes impossible without hitting into a piece of space junk, jeopardizing missions and risking lives. In extreme predictions, space debris from our constant littering of low Earth orbit, collisions between bits of rubbish may become more and more frequent, causing a catastrophic cascade of debris multiplying exponentially, falling through the atmosphere and making space impassable.

In the meanwhile, space mission controllers must be acutely aware that there could be an odd bolt or piece of old satellite flying toward their spaceship at velocities faster than the fastest rifle shot. Spare a thought for the space debris trackers as they try to keep a record of the 9,000+ pieces of junk currently orbiting our planet… but wait a minute, Google Earth can give us a ringside seat!

Strict international civil aviation-style laws may need to be imposed on the worlds space agencies if future generations of the human race are going to make it in space. This stark warning comes from Tommaso Sgobba, Director of the International Association for the Advancement of Space Safety, who will be presenting his case to the United Nations in April. Sgobba's main argument comes from the danger associated with the escalating accumulation of space debris in Earth orbit, should these high speed bits of junk hit a spaceship, satellite or an astronaut, death and disaster may ensue.

It may get worse than this, possibly paralysing the Earth from having access to space at all.

> "*Failure to act now to regulate space to protect property and human life would be pure folly*." - Tommaso Sgobba.

Other scientists agree with Sgobba, recommending that future missions in to space abide by some strict codes of practice (possibly more strict than those imposed on international civil aviation) to drastically cut the rate of orbital littering by the 20 countries currently able to send stuff into space.

Even the most tightly controlled missions, such as the International Space Station, are expected to shed bits and pieces over the course of their lifetimes. Space junk comes in all shapes and sizes and can be anything from a small screw to entire dead satellites. Recorded examples of space junk include an old glove lost by Ed White during the first ever US space walk in 1965 (during the Gemini-4 mission), a camera that Michael Collins let slip in space in 1966 (during the Gemini-8 mission) and a pair of pliers that International Space Station astronaut Scott Parazynski dropped during an EVA last year.

Mercury's Mysteries, Old and New

By Clara Moskowitz

Mercury, named after the mercurial god of trade who moved swiftly from place to place, has always been just out of scientists' reach.

The elusive planet is hard to glimpse from Earth, as it barely rises above the horizon, and it has received far less attention from NASA probes than its flashy cousins, Jupiter, Saturn and Mars.

Many scientists hope enigmatic Mercury will finally reveal its secrets through data sent back by NASA's MESSENGER spacecraft, which flew by the planet Jan. 14, but so far the probe has only exposed new mysteries.

The mission uncovered strange differences between Mercury's craters and the moon's, puzzling facets of its improbable atmosphere and magnetic field, and an unexplained feature called "the spider," the likes of which scientists have never encountered before.

Misunderstood Mercury

Mercury has confused scientists since they first observed it.

When ancient Greek astronomers saw it rising briefly at sunrise and sunset, they thought the planet was two different objects, naming the morning body Apollo and the evening appearance Hermes. It wasn't until the 5th century B.C. that Pythagoras suggested the two were one.

For a long time, scientists believed the same side of Mercury always faced the sun, similar to the way the moon orbits the Earth. 1960s measurements that the

"dark" side of the planet was much hotter than expected called this notion into question, and subsequent radar observations of its orbit overthrew the theory.

Mercury's small size (it gained the title of smallest planet in the solar system when Pluto was robbed of that distinction) and unassuming appearance have led scientists to underestimate the planet. It was long assumed to be merely a larger version of Earth's moon, where nothing much was happening.

Uncovering secrets

That idea flew completely out the window when NASA's new spacecraft recently passed by Mercury. The probe revealed a "whole new planet," said Robert Strom, a scientist on the mission team.

The spacecraft sent back 1,200 images and data from seven onboard instruments that show the planet is no moon-wannabe, but a dynamic place with secrets of its own.

This bizarre world is the only other inner solar system planet besides Earth to have a magnetic field. Scientists suspect the magnetosphere might be caused by the equally strange presence of an extremely dense iron core that accounts for two-thirds of Mercury's mass.

The magnetosphere, in turn, seems to play a part in drawing a tenuous atmosphere onto the planet, unusual for a small globe whose gravity is not strong enough to retain an atmosphere on its own. The magnetic field may also be involved in creating the tails of hydrogen and sodium atoms that stream off the planet.

The discovery of an atmosphere was one of the big surprises of the only other Earth-to-Mercury mission, the Mariner 10 probe that flew by the planet in 1974 and 1975. Before that, scientists had assumed that Mercury was a barren, pockmarked world just like the Moon.

Pockmarked it certainly is — its grayish surface bears the scars of millions of years worth of space rocks slamming into it. But these craters seem different than the Moon's, and some bear features unlike anything seen elsewhere in the solar system.

For one thing, craters on Mercury seem to be shallower than similar-sized dents in the moon, although measurements of more craters will be needed to confirm if this is true everywhere on Mercury.

The new photos also revealed a bizarre crater surrounded by radiating cracks in the ground that the scientists have dubbed "the spider." They are unsure of what could have caused such a formation, but suggest volcanism might have been involved.

The spacecraft's recent flyby only whetted astronomers' appetites for more information about this peculiar world.

"It was not the planet we expected," said Sean Solomon, the principle investigator of the mission. "It's changing very rapidly, with features that haven't been seen on any other planet. It's a very dynamic planet with an awful lot going on."

The probe is set to make two more passes by Mercury in October 2008 and September 2009, before settling into orbit in 2011. Scientists are expecting these encounters to provide even more surprising revelations.

Photon Addiction – a pathological disease - get help now!!!

Photon addiction is a pathological state. The disorder is characterized by the progression of acute telescope use to the development of photon-seeking behavior. Previously rewarding naked eye stimuli is no longer sufficient. Treatment is difficult, relapse is common.

In past decades, photon addiction was seen in isolated cases. With the increased availability of astronomy books, software and affordable quality equipment, it is fast becoming an epidemic. If you think a friend or loved one is suffering from photon addiction and needs intervention, please consult our handy symptom finder.

Nocturnalism

One of the first major symptoms is that the victim, when left to his or her own devices without daytime obligations, will become a night-dwelling creature. If you suspect that your neighbors have turned into vampires, consider the possibility that they may actually be astronomers. Astronomers are not necessarily repelled by garlic (indeed, a garlic-heavy dinner may help them to locate one another in the dark), and their beverage of choice is likely to be tea, coffee or hot chocolate rather than blood.

Please note that many of the standard vampire-detection methods may result in false positives. For instance, astronomers are likely to hiss at you if you shine a flashlight in their faces. It is also not advisable to sprinkle holy water (or any other liquid) on their telescopes.

Sudden technological aptitude

Even if they do not possess a technical education and do not self-identify as “geeks”, some astronomers will suddenly develop a handy streak (or, at the very least, an ability to use everyday items creatively) out of sheer necessity. A hair dryer or therapeutic heat wrap might be pressed into service as a dew-prevention system. The trunk of the car will fill up with extra 12V battery packs to power electronics in the field.

If no contractor will bore a hole through the middle of an existing house to plant a pier and convert the attic to a roll-off roof observatory, the determined astronomer will learn the appropriate skills. For your own safety, please try to determine whether the astronomer is truly handy or belongs on an episode of When Home Renovation Projects Attack!, and keep your distance accordingly.

Nest-feathering

Astronomers who are not content to merely experience the cosmos at night will surround themselves with its trappings by day. Celestial-motif bed linens, glassware, ties and jewelry are a common expression of this phenomenon. (It may also lead uneducated house-guests to assume that their hosts are astrologers.) Vanity license plates with NGC numbers are a sure sign.

More advanced cases may influence the naming of pets or even children. If your child's classmate is named Luna, Andromeda, or Bellatrix, and owns a dog named Sirius, consider the possibility that her parents might be astronomers as opposed to Harry Potter fanatics.

Telescope hoarding

Sensible astronomers, like sensible pet owners, will choose a telescope that is compatible with their lifestyle. An astronomer may purchase a telescope that is too big to be usable, or even take on a series of increasingly larger scopes, ending up with a houseful of sadly neglected instruments. In some cases, a poorly chosen and unwieldy telescope may get to decide the size of the next car or the location of the family's next home.

Fortunately, most consequences of choosing the wrong scope are relatively minor: a telescope will not mind being shut up in the garage when you don't have time for it, and will not change from a playful little Mak-Cass to a big lumbering slobbery-tongued Dobsonian over the course of several months.

The good news for those afflicted by this condition is that it's much easier to bear when others are supportive. Perhaps future generations will even consider enthusiasm for astronomy something to be celebrated, instead of a disorder that needs to be treated.

Earth's climate will slip past "tipping point" within 100 years

Written by Ian O'Neill

Nine key geographical factors have been highlighted as Earth's critical climate controllers most at risk of slipping past their "tipping points". This means that once damage reaches a certain point, there can be no recovery; the damage will continue in a downward spiral, amplifying global warming and environmental

damage on historic scales. And as if climate news couldn't get any worse, one such tipping point is only a year away…

You can't move these days for articles about climate change, global warming and environmental disasters. All this talk about impending doom and gloom can often lull you into a detached reverie thinking "what the hell can I do about it anyway?"

Although sometimes the outlook seems hopeless, scientists are stepping up a gear to understand what is happening and why humans are having such an impact on our world. In the quest to understand the effects we are having on the planet, new research has drawn up a list of nine key factors and processes likely to change the Earth's climate most dramatically. It is hoped that once we understand how these processes work, and how long we have until the point of no return, action could be taken to allow the climate to heal.

Prof. Tim Lenton from the University of East Anglia, UK, has identified when the tipping points are likely to occur for the nine key geological factors, and the next one is most likely going to be the collapse of the Indian summer monsoon, which is variable at best. The list is as follows (plus predicted time to tipping point):

- Arctic sea-ice melt (approx 10 years)
- Greenland ice sheet decay (more than 300 years)
- West Antarctic ice sheet decay (more than 300 years)
- Atlantic thermohaline circulation collapse (approx 100 years)
- El Nino Southern Oscillation increase (approx 100 years)
- Indian summer monsoon collapse (approx 1 year)
- Sahara/Sahel greening and West African monsoon disruption (approx 10 years)
- Amazon rainforest dieback (approx 50 years)
- Boreal Forest dieback (approx 50 years)

Many of the factors seem obvious. The melting of the Arctic ice for instance will cause a global rise in sea levels and a loss of ice cover causing Earth's albedo to decrease (reflectivity decreases), amplifying the greenhouse effect. Also, El Nino in the South Pacific will occur more often, causing rapid and extreme changes in the large-scale weather structure; hurricanes, flooding, droughts and unseasonal shifts in the jet stream will become more and more common.

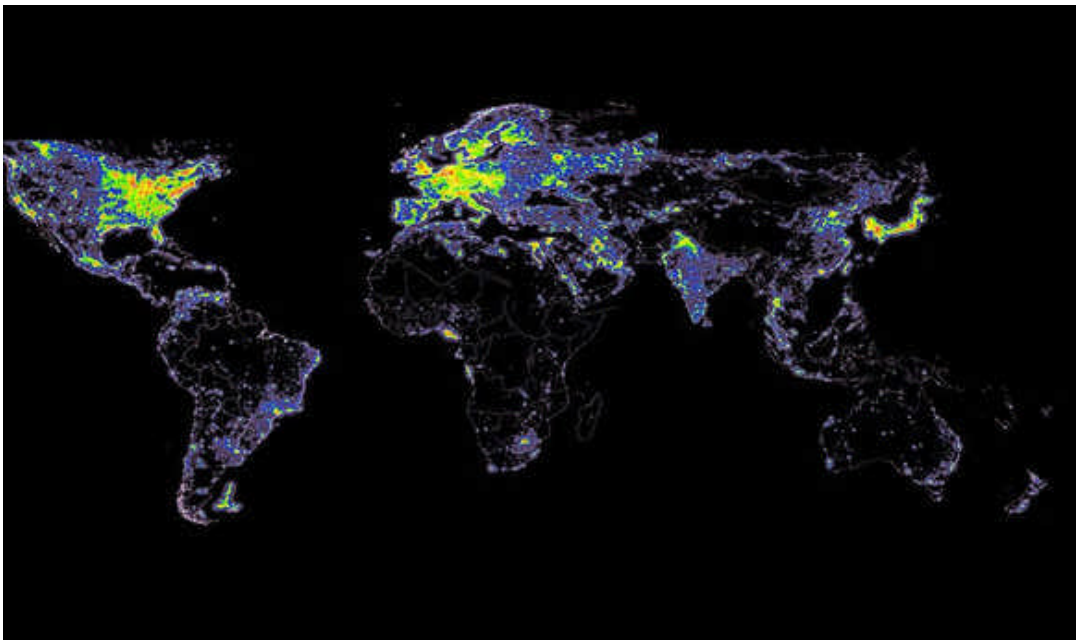
Some of the factors are perhaps less obvious. For instance, the collapse of the Atlantic thermohaline circulation would have a counter-intuitive effect on the north Atlantic, actually cooling the waters around Europe, North America and the Arctic. The thermohaline drives the circulation of the oceans, so should the

Atlantic thermohaline collapse, water from the equator will stop drifting north, providing the warmth at such high latitudes. This effect is unlikely to slow the melting of the Arctic ice-sheets, but it will have devastating effects on biodiversity in the region.

> "*Society must not be lulled into a false sense of security by smooth projections of global change* […] *Our findings suggest that a variety of tipping elements could reach their critical point within this century under human-induced climate change. The greatest threats are tipping of the Arctic sea-ice and the Greenland ice sheet, and at least five other elements could surprise us by exhibiting a nearby tipping point.*" - Prof Lenton

Although worrying, many of the tipping point projections could be averted should strong action be taken by the international community and individuals alike - after all, we can all contribute in some way.

Have You Ever Seen the Night Sky?

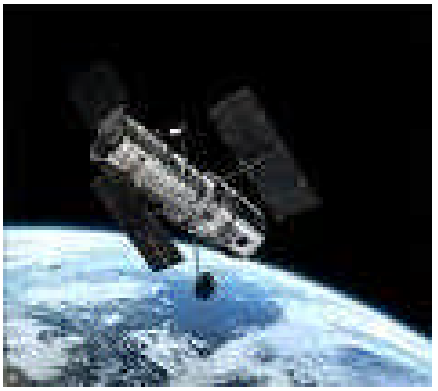


Have you ever really seen the night sky — a sky without any pollution from artificial light sources? Over half of Earth's population lives in urban areas, and have probably never seen a rich, dark sky full of thousands of stars.

Not only does light pollution make it harder for amateur and professional astronomers to observe the night sky, but it affects other living things as well. Birds and other animals that are nocturnal can become disoriented from constant artificial light.

The Plan to Fix Hubble

Written by Fraser Cain



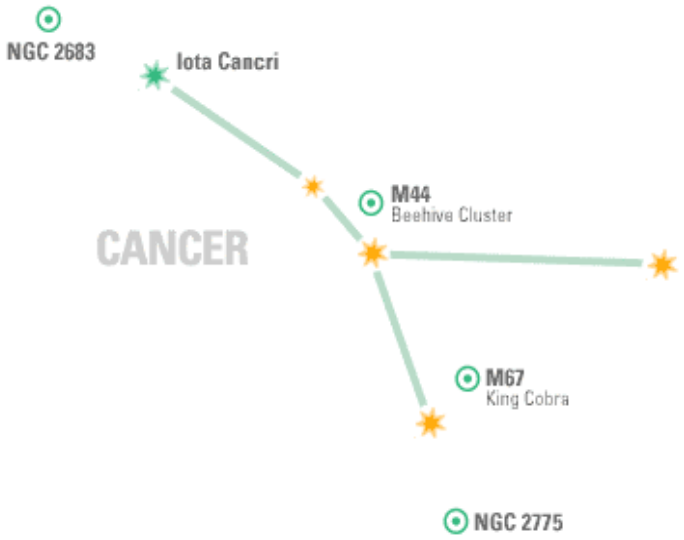
Although the space shuttles have a busy schedule completing the construction of the International Space Station, there's one other job to complete - servicing the Hubble Space Telescope. NASA officials announced the details of the mission today at the Winter meeting of the American Astronomical Society. If all goes well, the space shuttle *Atlantis* will visit Hubble some time around August 2008, carrying 7 astronauts and the spare parts they need to bring Hubble back to top-Notch-condition.

Over the course of 11 days, the astronauts will perform a total of 5 spacewalks. During these trips to service Hubble, the astronauts will install two new science instruments, upgrade existing instruments and replace failing gyroscopes, batteries and thermal blankets. *Atlantis* will also reboost the telescope's decaying orbit.

One of the most critical jobs will be to repair the telescope's Advanced Camera for Surveys (ACS). This is the visible light instrument that produces the pretty pictures that have made Hubble so famous. The instrument suffered a power failure in January 2007.

With this collection of upgrades, Hubble's life should be extended to 2013. David Leckrone, Senior Hubble Project Scientist noted that "when the astronauts leave Hubble for the last time, it will be at the apex of its capabilities - better than it has ever been before." In fact, with these upgrades, Hubble should be 90X more sensitive than before. The repair mission is now scheduled for 8 August 2008.

Constellation Cancer



Lying quietly between Gemini and Leo, Cancer is not the most exciting of constellations. Nonetheless, its modest riches are worth checking out.

M44, the Beehive Cluster, is a great target for your binoculars or finderscope. More magnification than that and you'll loose the lovely sense of loose structure. Can you spot it naked eye?

Even from your back yard 2,500 lightyears away, you should be able to scoop up **M67** in your finderscope or binos. The individual stars of this Mag 6 open cluster will resolve nicely in your telescope's eyepiece.

NGC 2775 is a bright spiral galaxy whose core is visible in 8" scopes. Larger scopes will show hints of its spiral-arm structure. Spiral galaxies are the most common kind of galaxy, making up four fifths of all galaxy types, including our own galaxy, the Milky Way. And close by are two more galaxies, NGC 2777, a true gravitational companion of 2775, and NGC 2773 which is four times farther away from us but happens to lie along the same line of sight; you'll need a 10" scope to spot either.

At the opposite end of Cancer, **Iota Cancri** is a nice orange/green double star and well placed to point you just over Cancer's constellation boundary, into Lynx, where the edge-on 10th Mag galaxy **NGC 2683** sits.

Transit Tailpieces

For Sale : 10" Meade 2120 LX6 Schmidt – Schmidt Cassegrain Telescope with Quartz Drive System, tripod and wedge, lots of eyepieces and filters plus other goodies. £500 o.n.o. Also an Observatory Shed with sliding roof specially manufactured by Hodgson's, £200 ono. Please contact John McCue or Bob Mullen.

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