TRANSIT

The Newsletter of

Cleveland & Darlington Astronomical Society

10 January 2007

Guisborough Market Cross Sundial

(refurbished by Harriet James in 2006)

Editorial

Last meeting : 08 December 2006**,** Jurgen Schmoll – "Eclipse in Turkey". Jurgen produced his usual well-informed and humorous delivery for the talk on his visit to Turkey to observe the 2006 Total Eclipse. His fanaticism in carrying as many cameras as possible worked out for him as he suffered a 50% failure. This might account for the vast funds Durham University Astronomy Department receive on their detector equipment projects – why build one when you can build two. Good talk Jurgen.

Next meeting : 12 January 2006, Members' Night – Volunteers needed!

Letters to the Editor :

Any new observations, any comments on local or international astronomy, anything you want to share with your fellow members?

Dear Editor,

Sorry, no letters received this month.

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INTERNATIONAL HELIOPHYSICAL YEAR

- exploring the Solar System, Feb 2007 to Feb 2009

The Wynyard Woodland Park Planetarium and Observatory has become a partner in the International Heliophysical Year (IHY) Outreach Programme in association with the UK Rutherford Appleton Laboratory. The WWP P&O will arrange IHY events and offer members of the Public information on the progress of the associated solar experiments undertaken across the world.

The IHY celebrates 50 years of space exploration with a worldwide programme of scientific research and outreach events based around the Sun and its effects on the Solar System. It is an initiative from the United Nations.

About IHY

International Heliophysical Year (IHY) celebrates 50 years of space exploration and marks the 50th anniversary of International Geophysical Year (IGY). The aim of IGY in 1957 was to understand the Earth's atmosphere and oceans and it

required scientists from countries all over the world to co-ordinate their efforts. It was a monumental year that saw the launch of the first artificial satellite, Sputnik 1, and observations that confirmed the theory of plate tectonics. IHY expands the science of IGY out into the Solar System. Our Sun is a magnetic star and creates a gigantic magnetic bubble which surrounds all the bodies in the Solar System. The magnetic bubble is called the heliosphere and it gives its name to International Heliophysical Year. The scientific aims of IHY are to:-

- understand how the planets respond to emissions from the Sun
- study fundamental processes which occur throughout the heliosphere
- study how the Sun and the heliosphere interact with the interstellar medium which surrounds it

IHY in the UK

UK scientists are world leaders in the area of heliospheric research. Starting from the interior of the Sun through to looking at the furthest reaches of the Solar System, UK scientists are building the necessary instrumentation and analysing the data.

The main focus of the science during IHY is based around emissions from the Sun and how they effect the Earth's environment. In particular the ionosphere, the layer of the Earth's atmosphere that is ionised by the Sun's radiation, and the magnetosphere, the magnetic bubble that lies on the outer edge of the ionosphere. The main question being how these layers vary over time due to effects from the Sun; an area of science now known as Space Weather.

The Sun produces a constant solar wind that blows with speeds of between 400-800 km/s and carries charged gases and magnetic fields toward the Earth. Under certain conditions the magnetic field lines of the solar wind join together with the Earth's magnetic field lines, in a process called reconnection. When this happens the Earth's magnetosphere becomes open and solar wind particles penetrate into the magnetosphere. Injection of the solar wind particles causes wave activity along the Earth's open field lines and produces heating in the ionosphere; this in turn leads to ions moving up into the magnetosphere. A new project led by UCL's Mullard Space Science Laboratory will monitor this ionospheric ion outflow using the EISCAT ground based radar in Norway to observe the heated region in the ionosphere and the four Cluster spacecraft to observe the waves and ion heating along the magnetic field lines in the magnetosphere. The aim of the project is to understand the exact mechanism of energy transfer from the solar wind into the ionospheric ion outflow.

Some novel methods are being employed during IHY to further understand the ionosphere. At the University of Bath scientists are using GPS technology as a diagnostic tool. GPS signals can be used to probe the ionosphere and study its structure and electron content. The signal sent between the satellite and the ground station travels through the ionosphere and on the way becomes distorted.

The changes in the signal can be used to produce near real-time imaging of the ionosphere. At Aberystwyth University radio signals received from satellites that are in polar orbits are also being used to produce tomographic maps of the ionosphere above the Artic where measurements are normally scarce. The aim of these projects is to understand how the variability in the ionosphere is related to (or driven by) the solar wind and magnetospheric phenomena. Imbedded in the solar wind are sporadic expulsions of vast magnetic bubbles called coronal mass ejections (CMEs). These events have their origin in the atmosphere of the Sun and will be studied during IHY using instruments onboard two missions called Hinode and STEREO, both launched in the latter part of 2006. In the future scientists hope to have an accurate prediction of CME arrival times at the Earth providing a reliable warning system.

Using the Hinode spacecraft a new tool will be developed at the Rutherford Appleton Laboratory that will allow the prediction of CMEs that are Earth directed. These CMEs are then tracked along their journey to the Earth using the STEREO spacecraft. Both missions carry instruments supplied by the UK.

More information can be found at the IHY Website http://ihy2007.org.uk/outreach/

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Variable Stars
II – The Next Steps

By Alex Menarry

"Variable Stars I", in the December issue of Transit, was very successful, from my point of view. Rob Peeling responded to my cry for help in the penultimate paragraph and introduced me to a software package, which he had come across on a course. It is called IRIS and can be down-loaded free. Superb! This seems to be a very comprehensive package for manipulating and carrying out measurements on an astro-images. IRIS is of French origin but the version I now have is in English. What a relief – my schoolboy French would never have survived.

The manuals available from the website are very extensive. Casting an eye down the list of chapters revealed one on 'Photometry'; the very thing. Import a picture – lots of different formats are available – and off we go.

Er . . . well we will, when I can do a bit of brain-bashing. As always, one has to learn to use a software package for a while and then find that life would not be

possible without it. Rob was good enough to introduce me to IRIS on my own computer. Stand by for a report on how it goes . . . A thought has just occurred, prompted by Jurgen's super photos in the December issue and Keith Johnson's AVI pictures on my hard disc. Here are the seeds of a Society collaboration programme. The expert photographers take the pictures, the armchair theorists process them for photometry data. The BAAVSS receive some more observations for the data-base. Thinks . . . would anyone be interested?

In the meantime, to keep everyone occupied and out of mischief in this terrible weather, here is a bit of entertainment I discovered. The Oxford Dictionary of Astronomy has always been a favourite book as a quick and convenient way to look up a subject. Written by a collaboration of astronomers (I've just invented a new collective term!), including Chris Kitchen and Ian Ridpath among the 21, it has about 5,000 items in it. The copy I have is now yellow with age and well thumbed from 1997. Oh crumbs, that's a decade ago and you know how fast astronomy develops. Must invest in a modern copy. Arranged alphabetically, of course, the items are mostly short and sharp (just the thing for someone with my attention span) with indicators to other items in the book for further enlightenment.

The new game is to go to a largish subject – say, Variable Stars? Each heading has a small paragraph describing the essence of what one needs to know to get started. Within each paragraph there are references to other topics in the Dictionary to explain and enlarge on the technical terms used. The entry for "Binary Stars" has 12 references to other places in the dictionary and they point to several other places and they have further references and so on; 'Variable Stars' has 25 starred references.

Here we have a big network of inter-connected topics, which can be imagined as a developing root system branching again and again. Following the paper trail takes you on a journey of discovery, to places you did not know existed, to areas you would not otherwise have gone; to boldly go, perhaps. An evening whizzes by in a flash. There are, inevitably, repeated references and the network doubles back on itself, covering the same topic several times. Eventually it runs out, of course. Some of the leads become remote from the original subject and eventually there are no further references to follow.

And now for the next great development to hit the publishing world. Suppose the Dictionary is presented as an HTML file for use by a web browser, with the cross references as hyper-text links? Click on the link and you are transported by the miracle of hyper-text to the next subject. If I copy the topic descriptions directly from The Oxford Dictionary of Astronomy, with their permission of course (I have already written to them but not mentioned the web-page idea yet - it may not work!), the difficult task of choosing which subjects to include and summarising each complex subject has already been done. There are diagrams, too, but these can be scanned from the book and incorporated in the web page, using

HTML. I'm not sure if there are sites like this on the web already (Wikipedia?) but there should be.

To begin my journey, the chosen subject is, surprise, surprise, Variable Stars, a topic well served with references, leading to Binary Stars, Stellar Evolution, Mass Transfer, Accretion Discs etc, etc, etc. Each important topic has about a dozen major headings within them. Using hyper-text, the layout is not important, of course. Any topic needs to appear only once and can be accessed by a clickable link to wherever it occurs in the original text. Several return paths will arise but that doesn't seem insuperable.

At this stage it is only the germ of an idea and needs quite a bit of sorting out. If it does work, I'll be in touch. Any ideas gratefully received. Stand by.

And another thing - what a wonderful voyage of discovery it becomes, revealing yet more of the wonders and staggering events going on *out there*.

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The 1927 Total Eclipse in UK

Sent in by Ray Worthy who has been researching the total eclipse of 29 June 1927 on behalf of an ex-Hartlepudlian now living in Argentina.

(This account was written by the late Mrs Henrietta Robinson (1916 – 2001) of Hylton Road, West Park, Hartlepool, former Deputy Headmistress of St Aidan's School, Hartlepool and published in the Port Cities Hartlepool Website.)

"I certainly remember very clearly the occasion of the previous total solar eclipse visible from Britain, not only for the event itself but also because it occurred on my eleventh birthday, the 29th June 1927.

At that sort of age one is naturally excited about having any birthday celebration, but in this case all the more so as all the local schools were given a special one-day holiday (it was a Wednesday) to allow the pupils to observe the (to me!) miraculous phenomenon of the Sun itself being blotted out (fortunately only briefly!) by the Moon.

West Hartlepool, as it was then, was considered to be an excellent viewing location for the eclipse, being right on the path of totality and it was said that several eminent astronomers were going to be staying at the Marine Hotel in Seaton. All of the relevant information concerning the forthcoming celestial event appeared in newspapers and magazine articles beforehand and was avidly read by people across the nation – remember that TV had barely been invented then

and very few people even owned a “wireless” set! Special protective “sun glasses” came onto the market since it was known to be highly dangerous to gaze at the solar disc with the naked eye.

The long-awaited event was scheduled to occur shortly after 6 a.m. and was predicted to last for less than half a minute. On the morning of the 29th, my parents and I left our home in Eamont Gardens at the unearthly (excuse the pun!) time of 4 a.m. We walked down to Mainsforth Terrace and over Newburn bridge to join the literally hundreds of people already assembling on the beach. At that time of year, just a week or so after the summer solstice, it was already daybreak and the sea was calm. We earnestly prayed that the few clouds which were present would show us consideration and roll away.

Everyone was very quiet, greeting those people whom they knew almost in hushed tones and even the children were subdued although they of course would be tired at that early hour.

The Sun, rising in the east over the North Sea, was by now becoming higher in the sky and suddenly there was a gasp from the crowd – a small part of the solar circle was missing just as if it had been bitten! There was a general movement as we all donned our sun glasses for the eclipse of the Sun by the Moon had finally commenced. The Moon traversed quite quickly across the solar orb and of course there was an equally rapidly moving shadow which descended upon the beach and upon all the spectators, an incredible experience for me at age eleven, which I have never known again, either before or since. Alas, it was very disappointing for everyone when an ungracious cloud obscured the Heavenly spectacle just when the brief duration of totality of the eclipse was about to be reached and so we were unfortunately denied the opportunity to witness the exact moment of the full eclipse. However, a partial occultation together with a brilliant light, the so – called “diamond ring” effect of the Sun’s corona, was seen through a break in the cloud as the Moon completed her journey across the face of the Sun. The whole experience was rather eerie, definitely out-of-this-world and tremendously awe-inspiring!

In the afternoon I remember going with my friends to see a launching at the shipyard, the vessel concerned being, as I recall, the *Criton*.

I really enjoyed that eleventh birthday of mine and now I am writing this on June 29th 1999, again on my birthday, this time my 83rd, exactly 72 years on and just a few short weeks before the next total solar eclipse visible from Britain on August 11th, which I shall also see, as before, here in Hartlepool. “

Henrietta Robinson

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Basic research is when I'm doing what I don't know what I'm doing.

Wernher von Braun

The History of Dark Energy Goes Way, Way Back

By Sara Goudarzi

Scientists now have evidence that dark energy has been around for most of the universe's history.

Using NASA's Hubble Space Telescope, researchers measured the expansion of the universe 9 billion years ago based on 23 of the most distant supernovae ever detected.

As theoretically expected, they found that the mysterious antigravity force, apparently pushing galaxies outward at an accelerating pace, was acting on the ancient universe much like the present.

All supernovas of a certain variety, called Type-1a, burn with the same brightness, so scientists can calculate relative distances in the universe based on how dim or bright these exploding stars get. In the late 1990's it was realized that these standard candles were dimmer than expected and that the expansion of the universe was accelerating.

Scientists blamed the acceleration on an inexplicable repulsive force, dark energy.

"Although dark energy accounts for more than 70 percent of the energy of the universe, we know very little about it, so each clue is precious," said Adam Riess, a professor at Johns Hopkins University who was involved in the initial discoveries back in the '90s. "Our latest clue is that the stuff we call dark energy was present as long as 9 billion years ago, when it was starting to make its presence felt."

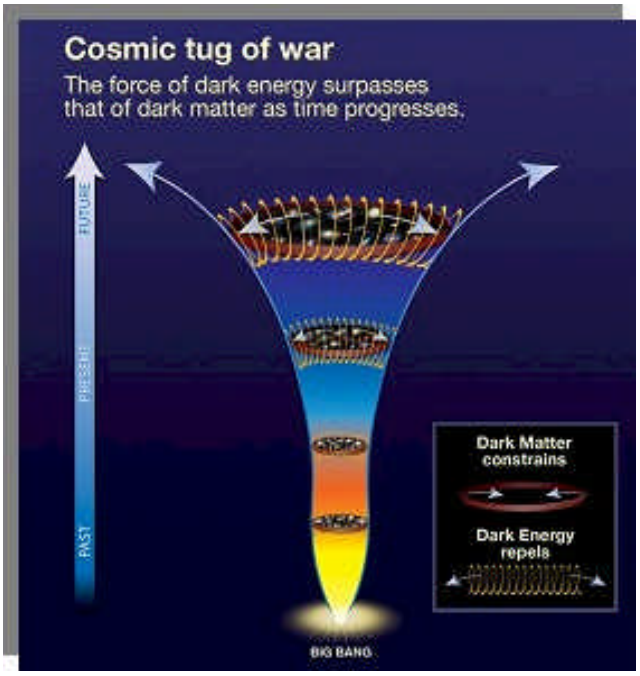
The universe is about 13.7 billion years old.

The researchers believe that although this new observation is a significant clue in the quest to understand what is probably, in Riess's words "one of the most, if not the most, pressing question in physics," it's far from the proof to what dark energy actually is.

Mario Livio from the Space Telescope Science Institute put the situation in perspective at a media teleconference at NASA headquarters today. "Water covers 70 percent of the surface of the Earth," Livio said, yet it took humans many centuries to first discover the properties of water. With dark energy, he said, researchers are still in the phase of determining its properties.

Previous observations revealed that the early universe was comprised of matter whose gravity was trying to pull it all inward and slow down its expansion. But the spreading out of the cosmos started speeding up around 5 billion to 6 billion

years ago. That's when scientists believe dark energy started to win the cosmic tug of war.



"After we subtract the gravity from the known matter in the universe, we can see the dark energy pushing to get out," said Lou Strolger from the University of Western Kentucky.

Another important finding, the researchers said, is that they can now compare the properties of ancient stellar explosions to today's explosions.

"This is important because we use these tools to measure the universe [and] we need to make sure that our understanding of their nature themselves have not changed," Riess said. The chemical composition in these 9-billion-year-old supernovas look remarkably similar to those that occur in the modern universe. So this finding continues to validate the use of supernovas as cosmic probes for understanding the nature of dark energy.

This latest finding is consistent with Einstein's explanation for what dark energy is, the researchers noted. Einstein's "cosmological constant" idea, which he called his biggest blunder and later rejected, turned out to be the same thing that scientist now see as the repulsive form of gravity called dark energy.

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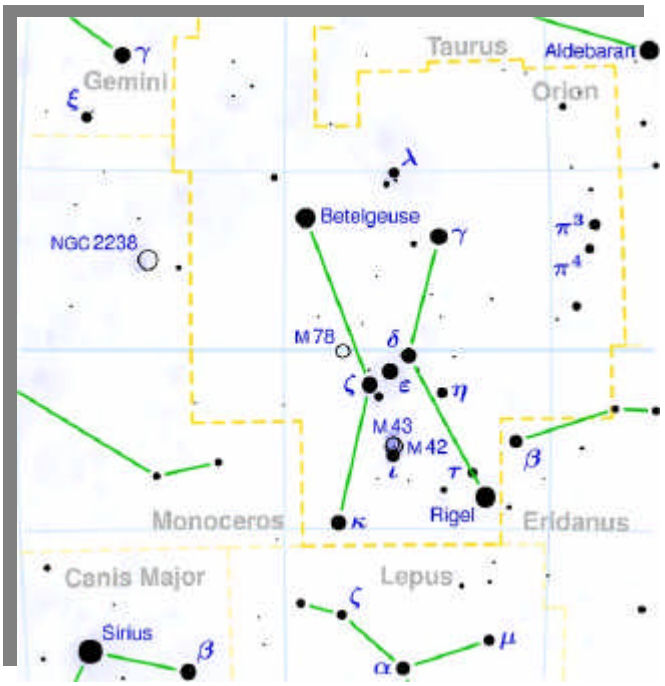
The universe is like a safe to which there is a combination, but the combination is locked up in the safe. *Peter de Vries*

Constellation Orion

Permission has been granted to use the original
text from Richard Dibon-Smith's website, www.dibonsmith.com.
(a highly recommended website full of goodies)



(image- wikipedia)

Finding Orion should be no problem. Its stars are some of the most familiar in all the heavens. Above the belt, slightly to the left, is *Betelgeuse, alpha Orionis.Betelgeuse*, the right arm of Orion (or "armpit" as the name suggests), glows with a dull red. Although labelled *alpha Orionis*, it is less bright than *beta Orionis* (Rigel), in the opposite corner of the constellation, to the southwest. Yet if slightly less bright, it is much larger, estimated at around 250 Suns. If one were to replace our Sun with Betelgeuse, its size would completely engulf the Earth and extend as far as Mars.

As the brightest star in Orion, *Rigel* ranks as the seventh brightest star in all the heavens, just behind Capella. It is a visual binary; its companion is much fainter, but quite visible if you are persistent enough (PA 202º, 9.4").

The other corners of the constellation are formed by *Bellatrix (gamma Orionis)* and *Saiph (kappa Orionis).* The constellation's main feature is of course the three

stars which form the "belt" across the middle of Orion: from west to east *Mintaka, Alnilam,* and *Alnitak*.

The last of these stars is also known as *zeta Orionis*, and is a well known triple star system. The primary is a blue-white star, and its companion (165º, 2.3") is a dull red. Close by, just to the south, is the renowned Horsehead Nebula, a so-called dark nebula that is not visible in scopes but quite spectacular in long-exposure photographs.

Binary stars in Orion:
There are many double stars in this constellation visible in small telescopes. Below are several selected from a wide list.

Beta Orionis (Rigel) has a 10.4 visual magnitude companion at 202º and a wide 9.5" separation. This is a fixed system.

Lambda Orionis (between Betelgeuse and Bellatrix) is another fixed binary, with a 5.5 companion at PA 43º and 4.4" away.

Theta^{1} is a complex system of fixed stars. The four brightest form The Trapezium, an outstanding multiple system for small telescopes. AB is at a position angle of 32º and separation 8.8", AC: PA 132º, 12.7", and AD: PA 96º, 21.5".

Theta^{2} is also a fine binary, a triple system to the southeast of The Trapezium. Component B is a binocular object: 6.4 magnitude at a position angle of 92º and separation 52.5". Component C (8.5) is even wider: PA 98º and separation 128.72".

Sigma Orionis is one of the few orbiting binaries found in Orion. Component B has an orbit of 158 years and is one of the few components that traces a not-quite-perfect circle. That's to say, we see it nearly face on, as a wheel spinning around its hub.

The separation never changes much from its current distance of only 0.2". Its 2000.0 position angle is 132º.

Much easier to resolve is component E, with a visual magnitude of 6.7, this is a binocular object at a position angle of 61º and separtion of 42".

Zeta Orionis (1.9, 4.0) has a very slow orbit of 1509 years, and is currently at 165º and 2.3" separation.

Variable stars in Orion:
A dozen stars in this constellation are visible in small scopes, but most of them are of the EA type of eclipsing binaries, which change very little. These include two stars of the Trapezium (theta 1A and 1B).

EA variables are old stars, nearing the end of their evolutionary process. The companion has grown to the size of a subgiant, perhaps equal in size to its primary. But their luminosities are quite different; thus, as the dimmer companion revolves around its primary, variations in the total brightness occur.

The maximum brightness occurs of course when the two are not eclipsed, with each one adding its luminosity to the total output. Two minima also occur: the principal minimum is when the companion blocks out the primary; while a secondary minimum occurs when the companion is eclipsed by the primary.

The only interesting Mira-type regular variable is *U Orionis*, which usually has a brightness of 4.8 but every 368.3 days it drops down to 13. In 2000 the minimum is scheduled to occur on 5 December.

Deep Sky Objects in Orion:
M42, The Orion Nebula is perhaps the most photographed deep sky object in the heavens, a vast nebula of gas and dust exquisitely lit by surrounding stars.
This is a celestial nursery; soon (that's to say, in several hundred million years) young stars will appear from this wealth of cosmic matter. Inside the nebula is the fascinating four-star system known as *The Trapezium*: theta 1A, 1B, 1C, and 1D - four stars held together by common gravity (actually at least two other stars are part of this complex system.) They are visible in medium sized telescopes and, with the nebula, form one of the most beautiful binary systems in the heavens.

M43 (NGC 1982) is a detached part of the Orion Nebula, with a ninth magnitude central star. A dark lane of gas separates M43 from M42, although the two are actually part of the same vast cloud.

M78 (NGC 2068) is a faint reflection nebula NE of Alnitak (zeta Ori), that looks best in long-exposure photographs.

The Horsehead Nebula is an intriguing and devilishly difficult dark nebula found just between zeta Orionis and sigma Orionis, visible in medium to large telescopes given the right sky conditions. An H-Beta filter is also helpful.

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The less one knows about the universe, the easier it is to explain.
Leon Brunschvicg

Cosmologists are often in error, but never in doubt.
Lev Landau

Changing Mars Gullies Hint at Recent Flowing Water

By Tariq Malik

The changing appearance of gullies on Mars over the last seven years suggests that liquid water flowed recently on the red planet and may still seep out in brief bursts, researchers said Wednesday.

In what is billed as "the squirting gun," new images of known gullies on Mars show evidence of new flows and deposits, pointing to explosive events in which some form of water burst from crater walls and ran down their slopes. "We've had this story of ancient water on Mars," said researcher Kenneth Edgett, who participated in the Mars gully study, during a press briefing at NASA's Washington, D.C. headquarters. "Today we're talking about liquid water that is present on Mars right now."

Edgett and colleagues used images from NASA's now silentMars Global Surveyor (MGS) to revisit regions earlier this year where gullies, depression-like landforms on the red planet's surface, were found in 2000. What they found were new, light-colored deposits that do not appear to have formed from landslides, but could be the work of frost, salt deposits or long-sought evidence that water flowed recently on Mars [images]. The research is detailed in this week's issue of the journal *Science*. "I think the evidence for liquid water is compelling," said Philip Christensen, a leading Mars researcher at Arizona State University who did not participate in Malin's study. "But I think certain questions still remain...but that's the natural flow of science."

Those remaining questions, Christensen said, include determining the source of water at the gully sites, and making in-depth spectral analyses to confirm the photographic evidence of liquid water. Pinning down the source of any liquid water source, be it a subsurface aquifer, ice pack or melting snow, is key, he added. "The great news is that NASA has the tools to do that," said Christensen, who also serves as the principal investigator for the Thermal Emission Imaging System (THEMIS) aboard NASA's 2001 Mars Odyssey orbiter currently circling Mars. "I think we're really positioned to go forward with a view of Mars as a dynamic, active place."

Gully science

Researchers have known of gullies on the Mars since 2000, when the MGS spacecraft's Mars Orbiter Camera (MOC)—built by Malin Space Science Systems in San Diego, California—first observed the eye-catching landforms. Found mostly on slopes or ridges, the gullies sparked long-running debates on whether they formed from groundwater seeping out of the martian surface or in dry landslides. "Our level of certainty which we can address the question of whether the gully features that we're reporting on were formed by water is high, but not extremely high," the study's leader Michael Malin, chief scientist at Malin

Space Science Systems in San Diego, California, told *SPACE.com*. "The evidence is mostly suggestive," he said.

Malin's team also used the MOC instrument in their new study, which compared base images of two mid-latitude regions in Mars' southern hemisphere taken in 1999 and 2001 to more recent images captured in the years since. In an area known as Terra Sirenum, new light-toned deposits coating gullies in April 2005 were not present in December 2001. Similar changes were seen in a crater etched into the Centauri Montes region of Mars, which apparently changed sometime between August 1999 and February 2004.

"I think this is pretty interesting evidence that says yes there's is subsurface water," Christensen said, adding that aquifers, snow packs and ground ice are all plausible sources for liquid Martian water. "It remains to see which ones are most plausible." Malin and his team believe that some form of water, be it briny, acidic or slushy, may be bursting out from underground sources at the gullies and leaving the tell-tale signs. The result, Malin added, could resemble the sort of mudflows seen on Earth after torrential rains or flash floods.

Edgett said early estimates call for somewhere between five and 10 swimming pools' worth of water to have formed the gully changes seen on Mars. "And if you were there, and this thing was coming down the slope, you'd kind of want to get out of the way," Edgett said, adding that Mars' thin atmosphere would force the water to boil off as it flowed out.

A watery trail

That liquid water once existed on Mars in some form has been known conclusively since 2004, when NASA's Opportunity rover found evidence that it permeated rocks in the planet's ancient past. Mars scientists have long associated the search for liquid water on red planet with the possibility of life, since the two are closely linked here on Earth. The existence of subsurface liquid water on Mars could also serve as a potential supply source for future red planet explorers.

But determining conclusively that the gully changes seen by MGS stem from liquid water is daunting, and will likely require an up-close visit—a challenge due to the risk of contaminating a gully site with Earth microbes or other material. "Personally, I think you're going to have to go to one [and see]," Malin said, adding that the contaminate hurdle is daunting. "It's something that will not be trivially easy to go to, but something there's a lot of interest in."

Christensen said that NASA's proposed Astrobiology Field Laboratory would be a good candidate as a robotic gully visitor, because it would not only be sterilized but also capable of traversing rough terrain. Edgett told *SPACE.com* that the gully changes seen by MGS may be the first of many to be found by Mars-watching orbiters.

"More of these could happen if we just watch," Edgett said.

The Search Continues with the Allen Telescope Array

by the SETI Institute Staff

After three years of research and development, the SETI Institute unveiled a three tier construction plan for the Allen Telescope Array, the worlds newest multiple use radio telescope array that will be built and operated in partnership with the University of California, Berkeley. Investor and philanthropist Paul G. Allen has committed $13.5 million to support the construction of the first and second phases of the Allen Telescope Array (the ATA-32 and ATA-206). The ATA will eventually consist of 350 x 6.1-meter dishes (ATA-350), when construction is completed late in the next decade. Construction of the ATA is underway at the Hat Creek Observatory, 290 miles northeast of San Francisco on a site operated by the RAL in an area that is radio quiet, thereby reducing the level of interfering signals from man-made sources. The ATA-32 is scheduled to begin conducting scientific investigations by the end of 2004, significantly earlier than the 350-element array can be completed.

R & D has proved that one of the primary advantages of the array design its scalability makes it possible for the ATA to conduct scientific investigations as soon as the first 32 dishes are installed.

The ATA will be a general-purpose radio telescope that will provide fundamentally new measurements and insights into the density of the very early universe, the formation of stars, the magnetic fields in the interstellar medium, and a host of other applications of deep interest to astronomers. At the same time, this 21st Century radio telescope will also have the capability to search for possible signals from technologically advanced civilizations elsewhere in the galaxy.

Allen's $13.5 million funding, structured as a challenge grant, will allow construction and operation of the first phase of 32-dishes by the end of the year. It will also support construction of the second phase of 174 additional dishes (the ATA-206), which is contingent upon fulfilling the Foundations challenge grant, in response to which the Institute will raise $16 million in additional support.

The ATA differs in practice, appearance, and cost from traditional radio telescopes currently in use. Rather than a single enormous dish or several large dishes, the ATA will be constructed using hundreds of specially produced small dishes. The telescope will incorporate innovative technologies and modern, miniaturized electronics in concert with increasingly affordable computer processing. These new technologies, combined with the ability to conduct continuous observations, will increase SETI search speed by 300 times over previous efforts and simultaneously allow astronomers to conduct complex radio astronomy projects requiring long-term observations. And the instrument will achieve these goals at one-fifth the cost of traditional radio telescopes of comparable collecting area and complexity. When completed, the ATA-350 will be among the world's largest and fastest observing instruments.

In its first phase, the ATA-32 will have more antennas than any of the worlds other centimeter-wavelength radio telescopes. The individual antennas will be linked by fiber optics. The fiber, power, and air distribution systems will be installed in ten-antenna "nodes," an efficient way to maintain the cool operating temperature required by the equipment.

In addition to conducting a SETI survey of the inner galaxy, the ATA-32 will observe in the direction of the galactic anti-center to detect primordial deuterium, study dark matter in nearby dwarf galaxies, and generate maps of polyatomic molecules in molecular clouds.

Scientists believe that radio waves, such as those commonly produced by a variety of technologies on Earth and traveling at light-speed through interstellar space, may offer the easiest way to detect evidence of a technologically sophisticated civilization elsewhere in the galaxy. With sufficient collecting area, it is possible to detect signals from a distant technology that are no more powerful than those produced on Earth today.

Dr. Leo Blitz, professor of astronomy and director of the Radio Astronomy Laboratory at UC Berkley said, "The ATA will revolutionize radio astronomy, making it possible to provide answers to the two biggest questions in astronomy: How did we get here? Are we alone?" Blitz went on to say, "The ATAs ability to make radio images over large swaths of sky, to make measurements over an unprecedented range of radio wavelengths, and its ability to do several kinds of observations at once, provide a power and flexibility that will allow astronomers to address whole areas of astronomy that are currently inaccessible. Because of the telescopes unique capabilities, I expect that well discover things we dont even know.

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Why Doesn't Venus Have a Moon?

Back when Earth was very young, our home world was steadily pummeled by large solar system debris. While Earth withstood the barrage of hits like a prizefighter that wouldn't fall down, one blow nearly destroyed the world. A Mars-size body plowed into us, completely disrupting both bodies and splashing massive amounts of debris into orbit which, most astronomers agree, coalesced to form our Moon.

But if something that large hit us, how did our nearest-neighbor planet, Venus, dodge the same fate? According to a new study, it didn't. Billions of years ago, according to work announced yesterday, Venus once had a moon that formed the same way Earth's did.

On Monday at the American Astronomical Society's Division of Planetary Sciences meeting in Pasadena, California, Caltech undergraduate Alex Alemi presented models created with David Stevenson of Caltech that suggest Venus was not only slammed with a rock large enough to form the Moon, the event happened at least twice.

According to Alemi and Stevenson, in models of the early solar system it is nearly impossible for Venus to avoid a big hit. Most likely, Venus was slammed early on and gained a moon from the resulting debris. The satellite slowly spiraled away from the planet, due to tidal interactions, much the way our Moon is still slowly creeping away from Earth.

However, after only about 10 million years Venus suffered another tremendous blow, according to the models. The second impact was opposite from the first in that it "reversed the planet's spin," says Alemi. Venus's new direction of rotation caused the body of the planet to absorb the moon's orbital energy via tides, rather than adding to the moon's orbital energy as before. So the moon spiraled inward until it collided and merged with Venus in a dramatic, fatal encounter.

"Not only have we gotten rid of the moon, but we've also done well to explain Venus's current slow rotation rate [and direction]," says Alemi. If a second moon formed from the second collision, it too would have been absorbed the way the first one was.

The models do allow for more than two impacts, but the probability of Venus enduring several massive collisions is low. "You can do this with multiple collisions, but the hypothesis is that [the net result] adds up to a negligible contribution" to the planet's final state, says Alemi.

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The Restoration of Guisborough Market Cross Sundials

By Harriet James (sundial restorer), printed in the Guisborough Town Pride News - from John Crowther

There are not many towns in Britain that can boast a set of magnificent Grade II listed sundials. The restoration of Guisborough's five sundials had just been completed. Sitting on the top of the column in the Market Cross at the east end of Westgate, they consist of a 24" cube of York stone with a sundial on each vertical face. The cube is topped with a York stone stalk supporting an 18" diameter York stone spherical sundial and a weather vane.

The date and maker of the sundials are unknown, but in order to have calculated them their designer must have been well-educated in mathematics. Cube sundials were common in public places such as market places and outside churches in the days before accurate clocks. There are over 400 records of cube

sundials in the British Sundial Society's register of sundials. Those that bear dates are now in poor repair and very few of them are painted. Although these cube sundials were often topped with an ornamental spherical stone finial, it is rare for the sphere to be made into a sundial as in Guisborough.

The shapes of the Arabic numerals on the East and West faces of the cubes at Guisborough suggest it dates from the late 17th Century or early 18th century. The long tails of the 7s and 9s and the upturned tops of the 5s were common on dated gravestones at that time. It is likely the sundials were carved by a mason whose main trade was making gravestones.

The numeral shapes on the spherical sundial suggest that they were made at a later date. They are now more typographical in style and probably date from the early 19th century.

The sphere may just have been an ornament to the cube before it was also made into a sundial. The stone of the sphere is of a harder type than that of the cube and stalk suggesting that it may have been a later addition.

Alterations to the Market Cross took place in 1817 around the time that nearby Guisborough Hall was sold and demolished for its saleable masonry. It is possible the cube and the sphere were brought from the extensive ornamental gardens of the Hall at the time.

There are photographs of the sundials taken by Francis Frith in the late 1800s and early 1900s. By 1995 the sundials seem to have lost all their gnomons (shadow casting bars). Replacement gnomons were made copying the shapes visible in the early photographs. The same weathervane with a wooden "acorn" filial, wind arrow and cardinal points is visible in all Frith's photographs. Ornate scrollwork was added to the vane at a later date. A copy of the weathervane was made by Goldbold Blacksmiths of Edgton for the restoration omitting the scrollwork. The 'acorn' was saved and reused.

When the sundials were removed for restoration they were badly weathered and pitted. Many layers of old lead-based paint were removed and analysed to determine the oldest colours that had been used on the stone. The stone was repaired and repainted with Holkam linseed paints which are made with traditional pigments. It is not permitted to use lead-based paints except on Grade I and II listed monuments. A replacement stalk was made as the old one was cracked and weakened.

The sundials on the cube were designed to read solar time (which is not the same as clock time) and to face due north, south, east and west but the orientation of the present day Market Cross column does not match this alignment, perhaps another clue to indicate that the sundials originated from elsewhere. They were found to be mis-aligned to the extent of a 45 minute error.

They are now accurately aligned and show Greenwich Mean Time. The sundials were finally replaced on 15th October 2006.

(further sundial information on Harriet James website at www.sunnydials .co.uk)

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" Bloody Intelligence."

from Ray Worthy

This will be the only part of my army experience that had anything to do with astronomy. Once again, it concerns the problem of finding one's way around by knowing something about the night sky. This time, it was a very wet experience. The time, the spring of 1951 and the place, somewhere near the Elbe estuary in northern Germany.

After my infantry basic training in Yorkshire was completed, I was posted to a battalion of a Yorkshire Regiment. For some reason, I was placed in the intelligence section. It was probably something to do with the fact that I could both read and write and my reading material was somewhat different from the Beano and the Dandy.

Anyway, for a period, I enjoyed my army experience playing about with maps . My very first task turned out to be a salutary experience. It was to sort out the contents of a cellar in a barracks that had belonged to a unit of Kreigsmarines. Stacked from floor to ceiling were thousands upon thousands of British Ordnance Survey maps overprinted in gothic German. They had been prepared for Operation "Sea Lion", the invasion of England. It was most disconcerting to see the details of the area where I lived at the disposal of the Nazi forces. The beaches of Redcar and Seaton Carew were earmarked as good landing zones.

One feature of this intelligence work was that I was always in and out of the battalion headquarters and became a familiar face to all the officers. Then I blotted my copybook. The Intelligence Officer was another National Serviceman and, like me, he was no professional soldier. We got on together very well, rather too well in fact and in private, we were on first name terms. The Intelligence Section was a bit like a club. Our office when in barracks had a series of struts underneath a peaked ceiling and these would support the weight of a man. If you stood on a certain desk you could launch yourself off and swing along like Tarzan. The Intelligence Officer was in the middle of this exercise and I was attempting to hang on to his trousers, when in walked the Adjutant.

The Intelligence Officer was moved to be the Adjutant's assistant and I was transferred into a rifle company where I became the company clerk. The person who was nominally in charge of the company office was the Company Sergeant Major and this fine gentleman had it in for me. Nobody actually spelled it out for me, but I have my suspicions that he had received "The word" from someone higher up to make sure I learned what it was to be a soldier. They could not bring formal charges against me without implicating the Intelligence Officer and they did not want to do that.

The Sergeant Major always referred to me as "Bloody Intelligence"
“Come here, Intelligence," he would say disparagingly, " Do you think you could manage to do this?" Or, after giving me an impossible task, " You are supposed to be intelligent , "Intelligence". Why couldn't you manage that?"

Being the company clerk was all very well when we were in barracks, but for most of the time the battalion was out on exercise, in which situation, I was the company runner. In a real war, I would have had a very short shelf life, because the runner was continuously being exposed. On exercise I was always on the move, taking messages here and there.

In this particular exercise, our battalion was supposed to be working closely with an American infantry outfit and our opposition was a Canadian unit. Until two weeks previously, we had preferred the Yanks to be our opponents. Some of our lads had discovered that if you were captured and ended up in their prisoner pen, you were fed marvellously and even got ice cream. Strangely enough, in the ensuing exercise, the Americans got more prisoners than they could cope with. Since then, we had been warned that we would not be fed for two days after capture.

To cut a long story short, in this particular exercise, we had worked our way on to some very flat land and found ourselves in an area of marshy fields surrounded by raised dykes. The umpires had been along and informed us that we were pinned down by machine guns of the enemy and if we stuck a head above the parapet it would get shot off. We had all heard the ratatatat of the blanks, but it is not easy to source the sound without the bullets flying.

All the paths and roads were forbidden to us infantry, because in this terrain, they ran along the top of the dykes and anyone who exposed his outline above a dyke would naturally stand out like a sore thumb. It was a stupid situation to be in. We should not have been there in the first place, but anyway this was the British Army. We were stuck there until nightfall.

That evening should have been the end of our stint in the front line, because we were due to be relieved by some Americans who would take over from us. We were all looking forward to a hot meal and some kip.

This expectation was turned topsy turvey when the Yanks turned up. They were on time all right, I'll give them that, but they arrived, I kid you not, sitting upright, in jeeps. They were four men to a jeep each man sitting to attention if you can call it that, each man with his rifle upright between his knees.

What was the matter with their officer? Had he never been to the pictures? The young American officer got out of his lead jeep at the cross roads just above my head, when he was stopped by an umpire with his distinctive armband.
The conversation went something like this :-
" I am afraid that this exercise is over for you young man."
"What do you mean Sir?" The American asked, "We have only just arrived. We were given this map reference and we are here. We are supposed to relieve a unit of British troops at this position."
" Oh! You have come to the right spot all right, but unfortunately you have just been machine-gunned and you are all dead. You see over there." And the umpire pointed with his arm. "You see that little shed or hut thing. Well, that is the site of an enemy machine gun, pinning down the British. The British crawled three miles to get this far and now you arrive like this. "Where are they, the Brits?" the Yank asked.
"In the ditch behind me. No, don't stare at them. “You'll give their position away."
But, covertly, he looks down at me and some dozen others, up to our waists in squelch.
"Well Goddam !" he murmured , and got back into his jeep.
"Yo!" He shouted and gave a gesture with his arm and off they went, each soldier sitting upright four to a jeep; not a speck of dirt on their uniforms. Our company commander sent me back to the CO to inform him that there would be no relief that night.

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As company runner, my duties included being at the beck and call of the company commander, and be ready to take any message too private to go over the radio. As we were on the move all the time, the telephone lines had not been laid. Because of this, I was nearby when the CO came through to have a look see and have a conference with our company commander.

I was crouching by the wall of the dyke, when I overheard the CO tell the Major that he intended to move us out over the dyke behind me in a particular direction.
" Excuse me Sir." I said, " Can I give you some information.?"
"Who is that?" He asked. It was dark by now.
" Sir, there is a Canadian machine gun across on the next dyke. If you move along to the cross roads over there, the machine gun will be on a bearing of about seventy five degrees from Venus at the moment"
"What do you mean, at the moment? Has the gun moved?
Our Major interjected, " How the Hell do you know that? How can you be as certain as that?" he hissed" You haven't been over this wall have you?"
" No Sir", I answered, " I cheated. "The Umpire pointed out the machine gun to the American when he sent him back. I was below in the ditch at the time. That

was an hour ago Sir. The bearing then was ninety degrees. Venus will have moved fifteen degrees."
The S.M. was there as well.
" Bloody hell man, how can you know that its moved fifteen degrees?" He asked sarcastically.
" Strictly speaking Sir," I went on, " It isn't Venus that's moved . It's the Earth .
"Thank you private," the CO said, " I shall see you tomorrow".
" Yes Sir." I answered, like the butler Jeeves.

The upshot was that the CO got hold of the umpire and told him the co-ordinates of a mortar barrage he intended to cover our extraction from the bog. The umpire examined the co-ordinates of the mortar barrage and said and said to the CO, "Congratulations Colonel, You did not know it but you have just knocked out their hidden machine gun emplacement." He got on the radio to his counterpart with the Canadians.

We, all of us, every man jack, unstuck ourselves from the bog and ran like hell along the top of the dyke in the dark and we were on to dry ground before the enemy could rally. and sort something else out. As we reassembled and got our new HQ settled and dug in, this time on dry land, the company commander came over to me and said quite clearly,

"Thanks Private Worthy. Venus got us out of that mess."
I could hear the S.M. mutter as though to himself, "Bloody Intelligence"

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There was a most peculiar sequel to this story. Something like ten years later, Josie, my wife and I were walking down a main street in Lincoln, when I saw this sergeant major again. He was a be-ribboned doorman outside of some company offices. I introduced my wife, Josie to him. He beamed at me as though he was hugely pleased to see me.
After some pleasantries, he said, grinning all over his face,
" I seem to remember that I threw the book at you".
" Yes " I laughed back. " You bloody did!"

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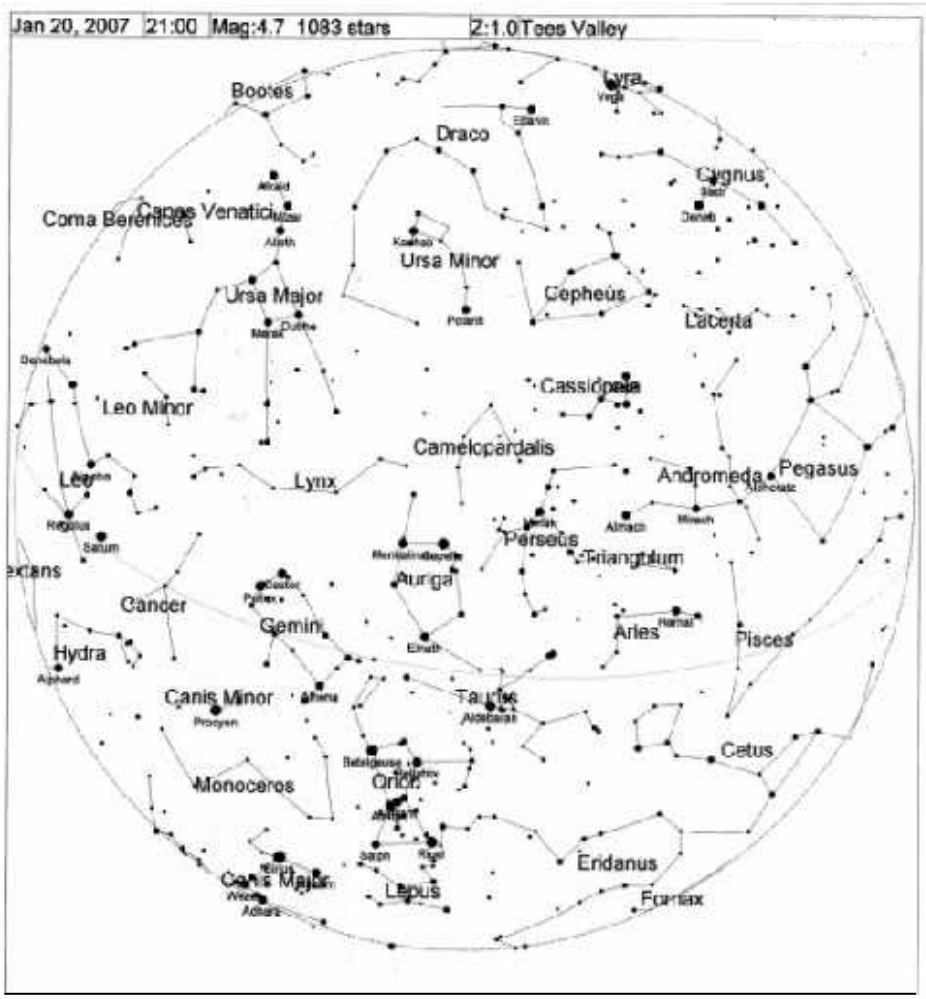
Personally, I don't think there's intelligent life on other planets. Why should other planets be any different from this one?

Bob Monkhouse

The night sky at 2100 hours, January 20th 2007

facing North

facing East



facing West

facing South

Skymap courtesy of KlassM Skyglobe

The Sky map can be used during the month of January 2007 and is valid for the whole month. For early January the map represents the stars at approximately 2200 hours, mid-January at 2100 hours and end of January at approximately 2000 hours.

To use the map, choose a suitable compass point on your horizon with clear visibility, initially hold the map above your head and rotate the map until the map edge matches the compass direction you are looking in (its probably best to start with a North direction and look for the easily identifiable and always visible seven stars of the Plough).

The stars shown above the map's horizon now match what is in the sky. With confidence you can then re-orientate yourself with the stars above the other compass points.

NB the planets are only shown correct for January 20th (they gradually move East to West along the ecliptic during the month). Saturn rises in the East after mid-December onwards and is midway along the ecliptic (highest) about 0400 hours in the morning.

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Transit Tailpieces

Custom Telescopes UK.

Glen Oliver, a long-time member of the Society, can supply telescopes and accessories of all kinds. He operates from Hartlepool and has a website,
http://homepage.ntlworld.com/glen.oliver/custom.htm
e-mail glen.oliver@ntlworld.com.

Support local businessmen! Glen tells me that he now has an Astronomy and Space books page on his website

Transit Adverts : If you wish to let members know what you want to sell or what you are looking for, please send an advert for the magazine.

CaDAS Website : Don't forget to visit our very own website at www.**wynyard-planetarium**.net.

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.
