

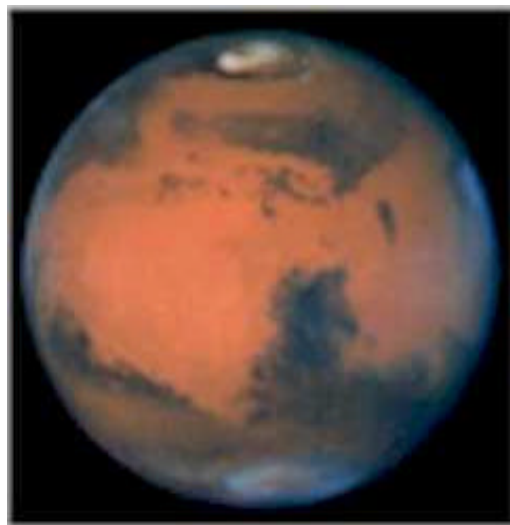


TRANSIT

The Newsletter of



9th December, 2005. Julian Day 2453713



Mars is still close, high and bright, show it to your friends and neighbours.

Editorial

If you want to view an excellent and intuitive weather website for this area (there is so much rubbish out there!) I strongly recommend our very own Don Martin's Teesside Weather Station found on <http://homepage.ntlworld.com/d.e.martin/> , a great resource.

CaDAS meeting, 11 November 2005. Anthony Southwell of Derby AS, the DAS Secretary and Editor of their revived Aries Newsletter, gave a very sobering presentation on the Near Earth Object threat to Earth. Luckily, Anthony's humorous presentation manner helped prevent a mass exodus of attendees to our old Anderson shelters. The word 'inevitable' has a sinister feel to it and also the oft-used word in the impact business of 'overdue'. The political world is now finally waking up to the threat, admittedly a goodly long time after astronomers first blew the whistle, but resources are now being made available for the observation, actual visiting and eventual repelling of these heavyweight intruders.

*Lost in the Milky Way,
Smile at the empty sky
And wait for the moment
When a million chances may all collide.
- The Lightning Seeds, "The Life of Reilly"*

Help needed – the Planetarium carpet is well past its shampooing date. Does anyone have a carpet shampooer we can borrow for a day, if necessary we can collect and return. Please ring Bob or Ed on 01740 630544

Apologies and amendment. It would appear I made a Freudian slip in reporting the results of the Thomas Wright Trophy Quiz results in last month's Transit. The York Astrocomical Society is in fact the York Astronomical Society.

Do not worry about your difficulties in Mathematics. I can assure you mine are still greater
- Albert Einstein.

In science, it doesn't matter if you're wrong, as long as you're not stupid. In business, it doesn't matter if you're stupid, so long as you're not wrong.

- Unknown

**Inscription in the Visitors Book of
the Castle Eden Observatory.**

The telescope is the gateway to the sixth continent, stretching without limit to beyond our imagination. Here there are deserts, infernos, turmoil and wonders awaiting discovery. Our journey can take as little as a few seconds or as long as a million years. It is available to all sighted people who wish to observe the greatest natural spectacle known to man.

Your journey starts here. Barry Hetherington

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The CaDAS Telescope was the Star of the Star Party.

From Pat Duggan

In October we got around to having a ‘‘Star Party’’ in Osmotherley to celebrate our Astronomy GCSE results!

The weather forecast was unpromising. Low cloud and fog had obscured the sky for the entire previous fortnight so we weren’t expecting much. We had a few bottles of wine and a pigeon pie and then, hey presto, the sky cleared! The CaDAS telescope is a little rickety but at the hands of Fred Stevenson, we were soon whizzed around the beauty of many Messier sights including M31, M32 (and NGC 205) , M45, M81, M82 and M57, the Ring Nebula in Lyra, which I had always failed to locate myself and a stunning wealth of sights in Cygnus. The double stars like Mizar, Sheliak and Albireo showed up in all the clear colours we could have possibly wished for and even the surface of Mars appeared to have a darker patch. Even a few meteors flashed across. Much enjoyed by all, thank you CaDAS.

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From Edward Harrison’s Cosmology

‘‘We are unable to obtain a model of the Universe without some specifically cosmological assumptions that are completely unverifiable. The problem is that we observe isotropy, which we cannot explain, and we assume homogeneity, which we cannot verify. We observe only those events that lie on our backward lightcone and the rest of spacetime – except for a small region around our world line – is unobserved. All our knowledge of the Universe is limited to a small region surrounding the Earth’s world line and around the backward lightcone. The theory of inflation changes this picture but, so far, inflation is itself an unverified theory.’’

CCD Imaging – an introduction for the beginner

From the Telescope House Website

The urge to record what you see through a telescope runs through many of us. Many amateurs are now turning to CCD cameras to record the night sky and forsaking the traditional methods of film photography.

CCD cameras offer numerous advantages over conventional film. The CCD is able to capture images with a far greater dynamic range than conventional film, giving the amateur the possibility of capturing high quality data even under light polluted skies. CCD cameras produce digital images upon which it is possible to perform a whole range of image processing and enhancement routines.

But for many that first leap into the digital world of CCD cameras can be a little confusing. There are lots of new terms, techniques and items of both hardware and software that the prospective CCD user will need to become familiar with.

What follows is advice for anyone at the entry level stage who has yet to purchase a CCD camera and who may be concerned at the steep initial learning curve that they face.

First principles

It is often said that the most important single item in any imaging chain is the telescope mounting. And this is certainly true for CCD Imaging.

To ensure success it is important that your telescope/CCD camera are placed onto a mounting which is stable, has at the very least dual axis drives, preferably with an autoguider input, and which can be accurately tracked and polar aligned.

Stability and accuracy of tracking are essential for any long exposure imaging.

Telescopes such as the Meade LX200 range include all the features that are desirable in an Astro-Imaging platform. Features including backlash compensation and Periodic Error Correction enable the LX200 to track very accurately.

Other suitable platforms include the Losmandy range of German Equatorial mountings, which all feature highly accurate gearing and sidereal drives.

Choice of Telescope

The general rule is that telescopes from 60mm aperture upwards can produce high quality CCD images. But choosing a telescope with quality optics is important.

Schmidt Cassegrain Telescopes offer certain advantages, not least because of their high compactness and moving mirror focusing systems which allow a lot of latitude to use a wide variety of accessories, filters, focal reducers, flip mirrors and still achieve focus.

Apochromatic refractors also make very good choices, particularly for wide field CCD imaging where their highly corrected fields of view are a great advantage.

Newtonians, particularly Schmidt Newtonians with their better off axis correction are also another good alternative.

Not to forget the Maksutov Cassegrain/Newtonian range of telescopes which tend to feature highly corrected optics at varying focal ratios.

Choice of CCD cameras

It can often be difficult to choose which camera is best for your purposes. Requirements vary greatly depending upon whether you wish to undertake Deep Sky long exposure imaging or Planetary imaging in which individual exposures are usually only fractions of a second.

Lunar and Planetary Imaging

For Lunar and Planetary imaging a great choice is the Meade LPI, a high quality sensitive USB camera which can produce very good quality images of the moon and bright planets as well as take short exposure images (up to 15 seconds) of deep sky targets.

Deep Sky Imaging

Cameras suitable for deep sky imaging tend to be slightly more complex and expensive. This is because both the electronic and mechanical complexity and quality of these cameras is several notches above a typical consumer digital camera.

Most dedicated Astronomical CCD cameras feature a cooled CCD, which greatly reduces the amount of electronic noise and improves significantly the quality of the resultant images.

A good entry level, but still a high quality CCD camera for deep sky imaging is the Starlight Xpress MX716. Also fine cameras are Meade's new DSI and DSI Pro. These world class camera can produce images comparable with cameras costing many times as much and is a very low noise high sensitivity device.

Colour Imaging

To obtain colour images with monochrome cameras requires the use of a colour filter wheel or filter drawer and taking separate images through Red, Green and Blue filters. These images are then combined in software to form an RGB true Colour image.

Although this technique may seem a little cumbersome it offers the advantages of superb quality with the option of using narrow band filters (such as a Hydrogen Alpha filter) to produce images at more select wavelengths. Such images can be very dramatic and spectacular and narrow band filters offer the advantage of being impervious to light pollution and moonlight.

Good choice of camera

Another great entry level camera is the Starlight Xpress MX7-C. This is the "sister" camera to the MX716 but is a "single shot" colour camera and does not require the use of separate filters to obtain colour images. This technique can certainly be a little more convenient during image acquisition and does give great results, but is less flexible in the

use of narrow band filters and perhaps involves a small loss of quality compared to the above RGB technique.

Other good CCD cameras include the Starlight Xpress SXV-H9 and its single shot sister the SXV-H9C. these cameras feature large high resolution CCD's which are very sensitive, and are producing some of the very best images of any CCD camera currently available.

A really good intermediate camera is the Starlight MX916. This camera features a large CCD with larger pixels than the SXV-H9 with great sensitivity. The MX916 is a good choice for long focal length telescopes.

The least expensive range of Starlight Xpress cooled CCD cameras are the MX-5 range. These cameras also make a very good entry level choice and are still used by many advanced amateurs as a useful part of their imaging armoury.

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The Spirit and Opportunity Mars Rovers

From Michael Roe

The American Spirit and Opportunity rovers were launched from Cape Canaveral on 10th June and 7th July respectively in 2003. Landing on 04 January 2004, Spirit, and 25 January 2004, Opportunity. Since then they have both become the most successful Robot spacecraft ever to land on another world, Mars.

After a journey through space both spacecraft landed on opposite sides of Mars using a huge sphere of airbags to bounce many times on the surface before rolling to a stop. Then the first lander opened its petal-like shell to allow the Spirit Rover down its ramp onto the Martian surface.

The landing site, 15 degrees south of the Martian equator is in Gusev Crater, a huge flat – floored crater 45 miles in diameter, so wide that its walls cannot be seen from the landing site. It was believed to be an ancient water-filled lake. Spirit was sent to investigate this idea.

Spirit and Opportunity, its twin rover, travel on six wheels, powered by large flat solar panels, they have several experiments, several cameras at human eye level (5ft) and the RAT, a shallow drill. They are also able to analyse the composition of rocks and use a microscope to examine them. They are true robots, able to travel short distances on their own.

At first Spirit moved slowly over a rocky plain, the rocks were volcanic, with no sign of the smooth lake bed deposits as anticipated. So the Rover spent 60 days covering 0.25 miles to Bonneville Crater which is 900 feet across, it was hoped deeper rock layers

would be visible in the crater walls and as debris blasted out of its crater. Only basalt, a volcanic rock, was found. The little Rover, only 4½ feet long went south east, pausing at Missoula and Lahonton craters, smaller and shallower than Bonneville. It took over 100 days to cover a single mile. The two rovers had an expected lifespan of just 90 days but have exceeded that many times now. Another 50 days at top speed took Spirit to the Colombia Hills, 2 miles from the landing site. Then a gruelling climb began. These hills are 300 feet above the plain and are older than the lava flows surrounding them. At last signs of past water were discovered including an iron mineral called Goethite. In the year since Spirit has been climbing and exploring the Colombia Hills, a fascinating rocky area, with amazing views over the Gusev Crater all the way to its crater walls.



Summit Trail – Spirit

Meanwhile Opportunity landed in a small crater named Eagle Crater, just 65 feet wide in a region on the equator of Mars, Meridiani Planum. In Eagle Crater the bright yellow-orange rock layers revealed evidence of past water, possibly a shallow sea existed on the site in Mars' early history. Eagle Crater was so interesting that Opportunity spent two months inside it, discovering intriguing tiny spheres, called blueberries. At last Opportunity climbed out of the shallow crater.



Erebus Highway - Opportunity

Meridiani Planum is one of the dark areas of Mars familiar with observers of the planet for centuries. Once astronomers speculated that such areas were great swathes of vegetation. Now for the first time the truth of the Martian dark patches was revealed, it's a large flat brown expanse of dust, almost totally flat. There are very few rocks and ripples in the dust, some rising into dunes and a few craters.

Opportunity was able to travel at maximum speed eastwards over the featureless plain, pausing at the tiny Fran Crater. The rover took a month to reach Endurance Crater a mile from Eagle Crater. This crater is 400 feet across, Opportunity was able to climb into the crater taking many incredible images, more amazing it managed to climb back out. More layered sedimentary rocks were seen in Endurance Crater. Then after 200 days exploring

the crater the robot craft sped southwards investigating the battered but still shiny heatshield. Also flat outcrops of light rocks have appeared looking rather like the limestone natural pavements in the Pennines.

The two Rovers, Spirit and Opportunity, have now survived for 1 year and 9 months going through a long Martian winter and suffering only a few electrical and mechanical faults which threatened their mission. They are by far the most successful roving vehicles to explore a world beyond Earth and have discovered a range of fascinating landscapes and, recently, evidence for a sea containing sulphuric acid. We still do not know if life ever existed on Mars but these robotic explorers have investigated in more detail than ever before areas where it could possibly have lived.

In future I'm sure more robot rovers will explore Mars. Carl Sagan's book – Cosmos – in 1979 predicted such machines, but until then Spirit and Opportunity will continue to explore the landscapes of Mars for some time. I have awaited for many years to see such a mission, we should be glad we live in times that see such planetary surface exploration.

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Observing Fraunhofer's Lines

From Rob Peeling

In 1666 Isaac Newton demonstrated that the white light from the Sun is white because it is made up of light from all the colours in the rainbow. In 1804, William Wollaston and then in 1811 Joseph von Fraunhofer discovered that the rainbow (or spectrum) formed by splitting the white light of the Sun using a prism contained hundreds of dark lines splitting the spectrum into segments. Fraunhofer mapped the lines in detail, which is why they now carry his name. He was also a noted telescope builder of his time. Only later in the 1850's did the work of Gustav Kirchoff and Robert Bunsen start to explain the significance of the dark lines as indicating the chemical composition of the Sun's atmosphere. Here then are the foundations of spectroscopy, which is one of the most powerful tools available to astronomers seeking to understand the Universe. I have never had the Fraunhofer lines demonstrated to me at school or elsewhere and so I decided to build myself a simple spectroscope to see them for myself.

I first tried looking at sunlight reflected from a CD as is often suggested in magazines and books. The very narrow lines on a CD act as a diffraction grating to give the rainbow effects you see when one catches the light. I could certainly see rainbows but I couldn't see any lines. I decided that I would find and buy a cheap diffraction grating to see if that would work better. On the Internet I found a site selling equipment for science education that sold transparent plastic strip ruled at 1000 lines/mm to make it a diffraction grating. They supplied enough strip to make gratings out of four 35mm slide frames for only £12. 1000 lines/mm is actually a very respectable specification for such a grating. All I

needed now was the rest of the spectroscope, which consists of a very narrow slit at the front to let the sunlight in as a narrow beam, the grating itself and a tube around it all to keep stray light out.

My first attempt was a short (100mm x 35mm diameter) cardboard tube with plastic end caps that previously contained a new bearing for my bike. I taped the grating to one end and cut the narrowest slit I could in the cap off the other end using a Stanley knife. Holding this up to the sky (any bright bit will do) and peering from well off to one side I could see a spectrum with dark lines! A qualified success since the lines were very fuzzy and it was difficult to keep the spectrum in view. I decided a Mark II spectroscope was necessary.

Two things were wrong with Mark 1; the slit was too wide and rough which caused the fuzzy lines, and the angle of grating couldn't be varied which made it difficult to view the spectrum all the way out to the violet and red ends. I found another, much larger cardboard tube. This time with metal ends and previously containing a well-known brand of malt whiskey (very pleasant). I cut a wide slot into the closed end of the tube and then taped two Stanley knife blades opposite each other over the hole to make a very narrow and straight slot. The grating was mounted onto an axle with some bits of meccano and fitted into the other end of tube allowing it to be rotated to either side.



Figure 1: Mark II spectroscope showing the slot



Figure 1: Mark II spectroscope from the viewing end showing the diffraction grating inside

The second spectroscope could be taped onto my telescope to hold it steady and allow me to view the lines in the Sun's spectrum to my heart's content. I even found I could set up my digital camera on a tripod and at least partly capture what I saw.

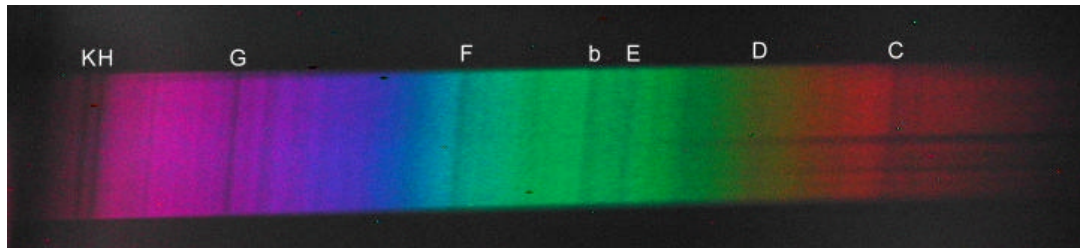


Figure 2: Solar spectrum with 8 lines identified representing 6 elements present in the Sun's atmosphere

I have marked up my photo to show the different Fraunhofer lines that can be easily identified. The lines identified indicate the presence of 6 different elements within the Sun's atmosphere. Here is a key to the lines.

Fraunhofer Lines

Visible light only

Wavelength	Intensity	Name	Origin
3934	10K		Ionized Calcium (Ca II)
3968	10H		Ionized Calcium (Ca II)
4102	10h		H delta
4227	10g		Neutral Calcium (Ca I)
4300	10G		CH band
4384	10d		Neutral Iron (Fe I)
4861	10F		H beta
5167	10b		Neutral Magnesium (Mg I)
5173	10b		Neutral Magnesium (Mg I)
5184	10b		Neutral Magnesium (Mg I)
5270	10E		Neutral Iron (Fe I)
5890	10D2		Neutral Sodium (Na I)
5896	10D1		Neutral Sodium (Na I)
6563	10C		H alpha
6867	10B		Terrestrial oxygen
7165	10a		Terrestrial water vapour
7594	10A		Terrestrial oxygen (O2)

Apart from daylight, I've also looked at the full moon using the same spectroscope and (very faintly) been able to see the same patterns of lines. It is also fun to look various types of lamps e.g. sodium lamps, neon lamps and fluorescent lamps. Sodium lights aren't just yellow; you will find there are a handful of other coloured lines also including blue, green and red. Computer screens are worth looking at too. Fraunhofer mapped between 500-600 different lines during his investigation. My spectroscope doesn't come anywhere close but that's not the point. The fun is in having a go and getting any result at all.

The Curse of Mars

From Alex Menarry

The three-out-of-four successful Mars missions recently prompted a look at how successful previous missions have been. This list of past Mars missions demonstrates how difficult it is at that distance. Successful missions are in bold. Are the odds big enough to attempt a manned mission yet?

4 Unmanned	USSR	1960-62	Fly-by
Mars 1	USSR	1962	Fly-by
Mariner 3	USA	1964	Fly-by
<u>Mariner 4</u>	USA	1964	Fly-by
Zond 2	USSR	1964	Fly-by
<u>Mariner 6</u>	USA	1969	Fly-by
<u>Mariner 7</u>	USA	1969	Fly-by
Mariner 8	USA	1971	Orbiter
Kosmos 419	USSR	1971	Lander
Mars 2	USSR	1971	Orbiter and lander
Mars 3	USSR	1971	Orbiter and lander
<u>Mariner 9</u>	USA	1971	Orbiter
Mars 4	USSR	1973	Orbiter
Mars 5	USSR	1973	Orbiter
Mars 6	USSR	1973	Fly-by and lander
Mars 7	USSR	1973	Fly-by and lander
<u>Viking 1</u>	USA	1975	Orbiter and lander
<u>Viking 2</u>	USA	1975	Orbiter and lander
Phobos 1	USSR	1988	Orbiter and lander
Phobos 2	USSR	1988	Orbiter and lander
Mars Observer	USA	1992	Orbiter
Mars Global Surveyor	USA	1996	Orbiter
Mars 96	Russia	1996	Orbiter and lander
<u>Mars Pathfinder</u>	USA	1996	Lander and rover
Nozomi	Japan	1998	Orbiter
Mars Climate Orbiter	USA	1998	Orbiter
Mars Polar Lander	USA	1998	Lander and probe
<u>Mars Odyssey</u>	USA	2001	Orbiter
<u>Mars Express</u>	Europe	2003	Orbiter
Beagle 2	Europe	2003	Lander
<u>Spirit</u>	USA	2003/4	Lander
Opportunity	USA	2003/4	Lander

So the statistics are USA, 16 attempts, 11 successes, 5 failures

USSR, 13 attempts, no successes

Japan, 1 attempt, not successful

Europe, 50% success of one launch

Well! how does this strike you?

Letters to the Editor

A new section in which we hope writing 'A Letter to the Editor' may encourage correspondents to eventually elevate to the status of article contributor after discovering they can write coherently, we need all the home grown articles we can get.

From Mike Gregory with reference to John Crowther's article of last month in Transit Tailpieces where the signals from the Crab Nebula can be observed on an empty TV channel.

Dear Ed.

A Health and Safety warning.

The article about radio emissions from the Crab Nebula should have a Health and Safety warning attached to it! As the article intrigued me I spent some minutes this morning watching an unused channel 7 on our antiquated TV. There was no sign of any celestial show. Just general splurge between sets of zigzag lines that would appear to emanate from here on Earth. No signs of any transmissions from the Crab Nebularians as far as I could see. So after ten minutes I gave up and made some lunch but soon felt very tired although I had only been up for two hours!

I thought the Crab Nebularians might have been about to abduct me for trying to search for their transmissions. Apparently no such luck.! Viewing all the zigzagging lines must have caused it. Perhaps the next time I will have to use my nebula filter. Better still, stay clear of radio astronomy (or in this case television astronomy?) altogether. I much prefer the Sorcerer and his Apprentice's principles of observing. That of actually viewing through an eyepiece even if you can't see anything!

Anyway, one advantage of a letter like this is that you will have to be seriously short of material to publish it!

Mike Gregory

Thanks Mike, we certainly are short of material. I also tried this experiment at home. By introducing a low pass filter and using a few more radio tricks I could see the noisy trace of a signal appearing on the screen. By tweaking the processing package I could just make out images from an old "I love Lucy" programme with Nebularian sub-titles, this definitely proves there is no intelligence of any kind in the Crab Nebula. Ed.

How quickly do we grow accustomed to wonders. I am reminded of the Isaac Asimov story "Nightfall," about the planet where the stars were visible only once in a thousand years. So awesome was the sight that it drove men mad. We who can see the stars every night glance up casually at the cosmos and then quickly down again, searching for a supermarket.

- Roger Ebert, from a movie review in the "Chicago Sun Times"

Telescopes are in some ways like time machines. They reveal galaxies so far away that their light has taken billions of years to reach us. We in astronomy have an advantage in studying the universe, in that we can actually see the past. We owe our existence to stars, because they make the atoms of which we are formed. So if you are romantic you can say we are literally starstuff. If you're less romantic you can say we're the nuclear waste from the fuel that makes stars shine. We've made so many advances in our understanding. A few centuries ago, the pioneer navigators learnt the size and shape of our Earth, and the layout of the continents. We are now just learning the dimensions and ingredients of our entire cosmos, and can at last make some sense of our cosmic habitat.

- Sir Martin Rees, Astronomer Royal of Great Britain

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Venus Express successfully launched 11 November 2005

From Ray Worthy

The European spacecraft Venus Express was successfully launched at 04:33 CET by a Soyuz-Fregat rocket, from the Baikonur Cosmodrome in Kazakhstan. It has been successfully placed into a trajectory that will take it on its journey from Earth towards its destination of the planet Venus, which it will reach next April. The Venus Express mission is planned to last at least two Venusian days (486 Earth days) and may be extended, depending on the spacecraft's operational state of health.

A virtual twin sister of the Mars Express spacecraft which has been orbiting the Red Planet since December 2003, Venus Express is the second planet-bound probe to be launched by the European Space Agency. Venus Express largely re-uses the architecture developed for Mars Express. This has reduced manufacturing cycles and halved the mission cost, while still targeting the same scientific goals. Finally approved in late 2002, Venus Express was thereby developed fast, indeed in record time, to be ready for its 2005 launch window

Venus Express will eventually manoeuvre itself into orbit around Venus in order to perform a detailed study of the structure, chemistry and dynamics of the planet's atmosphere, which is characterised by extremely high temperatures, very high atmospheric pressure, a huge 'greenhouse effect' and as-yet inexplicable 'super-rotation' which means that it speeds around the planet in just four days. The Venus Express mission is planned to last at least two Venusian days (486 Earth days) and may be extended, depending on the spacecraft's operational state of health.

The European spacecraft will also be the first orbiter to probe the planet's surface while exploiting the 'visibility windows' recently discovered in the infrared waveband.

Venus Express is currently distancing itself from Earth at full speed, heading on its five-month, 350 million kilometre journey inside our Solar System. After check-outs to ensure that its on-board equipment and instrument payload are in proper working order, the spacecraft will be 'mothballed', with contact with Earth being reduced to once daily. If needed, trajectory correction manoeuvres can go ahead at the half-way stage in January. When making its closest approach, Venus Express will face far tougher conditions than those encountered by Mars Express on nearing the Red Planet. For while Venus's size is indeed similar to that of Earth, its mass is 7.6 times that of Mars, with gravitational attraction to match. To resist this greater gravitational pull, the spacecraft will have to ignite its main engine for 53 minutes in order to achieve 1.3 km/second deceleration and place itself into a highly elliptical orbit around the planet.

Whereas Mars Express sought to retain heat to enable its electronics to function properly, Venus Express will in contrast be aiming for maximum heat dissipation in order to stay cool. The solar arrays on Venus Express have been completely redesigned. They are shorter and are interspersed with aluminium strips to help reject some solar flux to protect the spacecraft from temperatures topping 250°C. It has even been necessary to protect the rear of the solar arrays – which normally remain in shadow – in order to counter heat from solar radiation reflected by the planet's atmosphere.

Venus Express carries seven instruments that include a magnetometer, a number of spectrometers and sensing equipment in the radio, IR, UV and visible wavelengths.

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We have your satellite if you want it back send 20 billion in Martian money. No funny business or you will never see it again.

- Seen on a hall wall at NASA's Jet Propulsion Labs

After I give lectures - on almost any subject - I am often asked, "Do you believe in UFOs?". I'm always struck by how the question is phrased, the suggestion that this is a matter of belief and not evidence. I'm almost never asked, "How good is the evidence that UFOs are alien spaceships?".

- Carl Sagan, "The Demon Haunted World", p.78

Transit Tailpieces

Free to a telescope builder :- a length of plastic tube, 7 inch diameter, 5ft 4inches long, weakened at 3 inch intervals for easy cutting. To collect ring John Crowther on 01642 – 471156

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 www.goliver.freemove.co.uk. 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.

For sale – Helios 240mm reflector with tripod, eyepieces, Barlow etc. Sensible offers considered. Please contact Graham Johnson at the Carlton Outdoor Centre on 01642 712229

Articles Please send contributions for the newsletter to Bob Mullen, 18 Chandlers Ridge, Nunthorpe, Middlesbrough, TS7 0JL, 01642 324939 (b2mullen@hotmail.com) or to Dr John McCue (john.mccue@ntlworld.com). Copy deadline date is the 25th of each month.



Rob Peeling, “Observing Fraunhofer’s Lines”



Michael Roe, “The Spirit and Opportunity Mars Rovers”



Don Martin, Website - “Teesside Weather”
<http://homepage.ntlworld.com/d.e.martin/>