New Zenith

The Monthly Magazine of the Vectis Astronomical Society

Vol 19 Issue 9 — October 2011

When Printed, this Newsletter costs VAS at least £1

Society News

2011/12 Committee Members

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Others *(Positions to be decided)*	**Barry Bates** **Catherine Bachelor** **David Kitching**

Camera fixed to telescope

The CCTV camera descibed on page 5 of the August NZ is now installed on the SkyWatcher refractor telescope (*mounted on the main Meade*) in the dome.

The camera is wired back to the large monitor and computer in the classroom and will enable us to stream live sky views. Initial tests (Thursday 15 Aug) were successful with a good picture of the moon displayed on the monitor.

The cabling is temporary (*please be careful when operating the Meade*) but it is intended to make the installation permanent in the very near future

Of course further refinement of the system is required but it is hoped this system will make better use of our facility and enable easier access to the night sky for observatory visitors and members alike.

Clear Skies!
Brian Curd
Observatory Director

VAS Website: www.wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

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Material for the next issue by the 6th of the month please.

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Observatory Diary

Monday, 19.30hrs	**Members Only.** Telescope and night sky training.
Thursday, 19.30hrs	**Members and Public.** Informal meeting and observing.

Contents this Month

Monthly Meeting Calendar 2011

Check the website for up to the minute information.

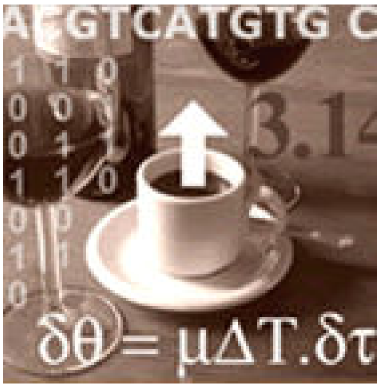
Travel for our monthly speakers is sponsored by:

WIGHTLINK
PART OF ISLAND LIFE

Date	Subject	Speaker
23 Sep	Discs round Stars and Galaxies	James Fradgley
28 Oct	Glow Bows and Haloes	Richard Fleet
25 Nov	An introduction to visual observing and equipment	John Slinn

All details correct at time of publication.

Café Scientifique



Café Scientifique starts its regular meetings again this month after a Summer break.

The first meeting is on Monday 26th September at 7.0 p.m. at The Fighting Cocks.

The speaker will be Professor Chris Rhodes who, after an academic career in chemistry, set up his own consultancy in 2003 dealing with energy problems and aspects of environmental issues. He will be coming down from Reading to talk to us about "What Happens when the Oil Runs Out" . Think about plastics and pharmaceuticals? He is a recommended speaker and it should be a very interesting talk.

Pam Ash

New Members

A very warm welcome to VAS for our new members:

- Dr John Smith
- Darth Vader (*see next below!*)

The Scale of the Universe

If you are continually boggled by the size of the Universe, this may help...

http://primaxstudio.com/stuff/scale_of_universe/

David Kitching

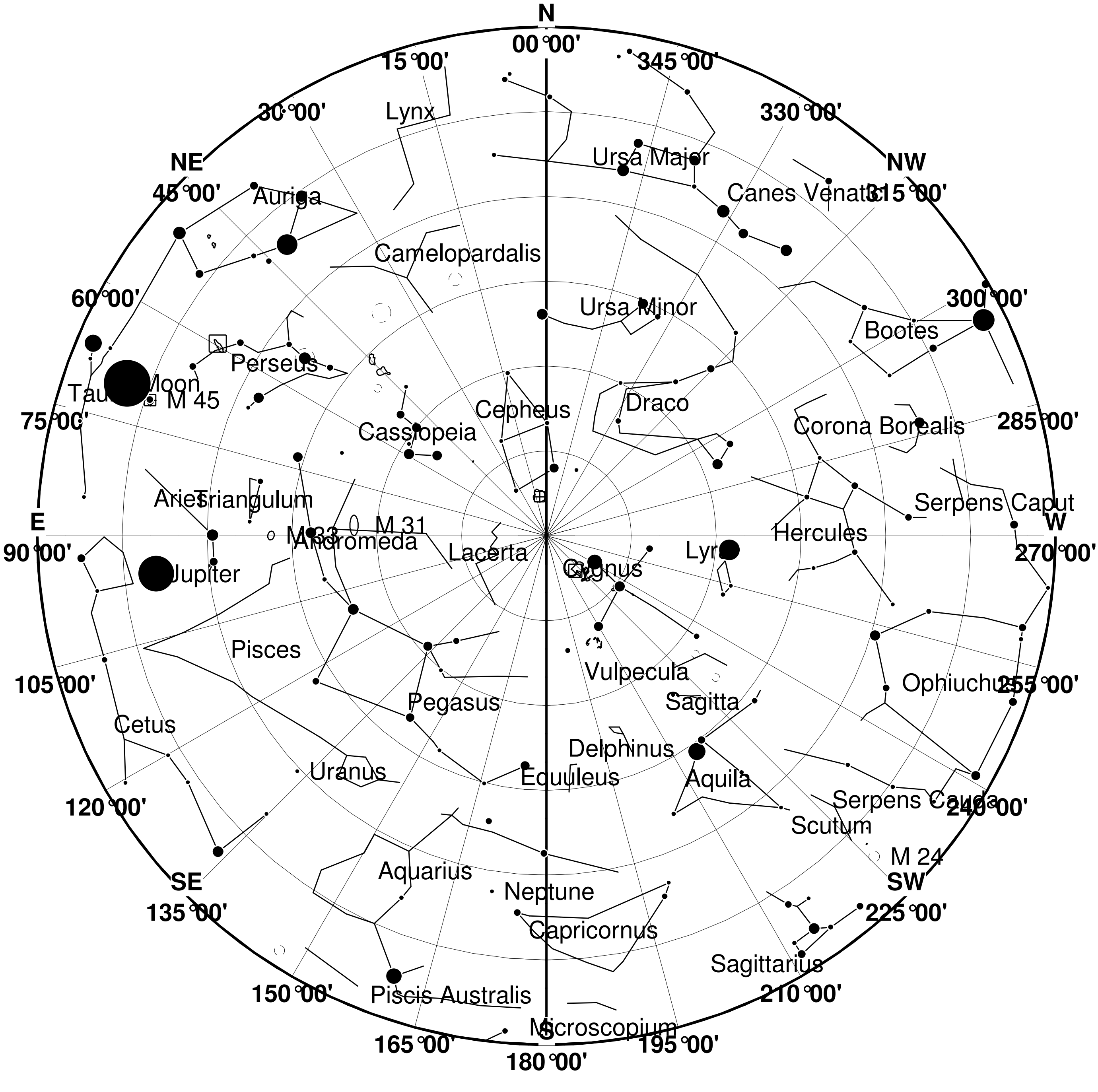
Chile is an Astronomer's Paradise

With its crystal clear skies and bone dry air, the Atacama Desert in northern Chile has long drawn astronomers. Some of the most powerful telescopes in the world are housed here. But now, work is about to begin on a telescope that will dwarf them all - not a VLT (Very Large Telescope) but an ELT (Extremely Large Telescope).

And the man in charge is Mr Boffin!

More at: ***http://goo.gl/rwvN7***

This Month's Sky Map



View from Newchurch Isle of Wight UK - 2100hrs - 15 October 2011

The North America Nebula (NGC 7000 or Caldwell 20) is an emission nebula in the constellation Cygnus, close to Deneb (the tail of the swan and its brightest star).

The remarkable shape of the emission nebula resembles that of the continent of North America, complete with a prominent Gulf of Mexico. It is sometimes incorrectly called the "North American Nebula

This Month's Night Sky

Moon Phases

New	1st Qtr	Full	Last Qtr
26th	4th	12th	20th

Planets

Mercury

Mercury is too close to the Sun this month to be visible. For those who can watch the Sun set over the sea there may be a chance at the end of the month when Mercury is just under 2° below Venus at sunset.

Venus

Venus has spent most of this year hiding behind the Sun, slowly catching up with us in our orbit. It is still hiding, only 5° above the horizon at sunset at the end of the month and may be visible in the sunset glare. The next few months should see it back in our skies as the evening star

Mars

On the 1st & 2nd Mars passes through M44, the beehive cluster in Cancer. This is a good photo opportunity; the red colour of Mars will contrast nicely with the bright blue cluster stars. In recent years other planets have passed through but they have all been so much brighter than the cluster that they have overwhelmed it. Mars' brightness will be much more in keeping with the neighbourhood. For the rest of the month it leaves the bees behind and heads towards Regulus, the brightest star in Leo.

Jupiter

Jupiter is at opposition towards the end of the month so is available for observation throughout the night against the stars of Aires and outshining everything around.

Saturn

Saturn is at superior conjunction, on the other side of the Sun from us, and so is not visible this month.

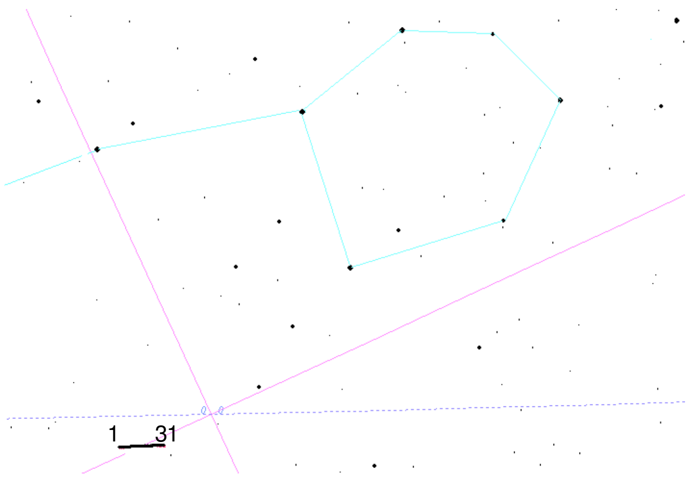
Uranus & Neptune

Both are past opposition but are still reasonably well placed for viewing during the early to mid evening period.

Neptune is in Aquarius, near the border with Capricornus. It can be found about one third the way from Iota Aquari to Mu Capricorni, and a little above both. The finder chart shows stars down to maginitude 10 this is about 2 magnitudes fainter than Neptune and around the limit for 10x50 binoculars under an average sky.

Uranus is in the constellation of Pisces, and this month lies very close to the first point of Aries, the point in the sky through which the Sun passes at the moment of the spring equinox. The finder chart shows the circlet of Pisces and stars down to about magnitude 8, which is significantly fainter than Uranus at magnitude 5.7; just visible to the unaided eye under good skies.

Finder Chart For Neptune



Finder Chart For Uranus

Deep Sky objects

NGC7000 North America Nebula RA 20h 59m Dec 44° 28' mag 4.0 - Located 3° to the east of Deneb in Cygnus is this large misty patch in the Milky Way that can be seen with the naked eye. Unless the sky is very dark this nebulosity is the light from the myriad of background stars, if conditions are suitable the darker rift of the 'Gulf of Mexico' can be seen. Large aperture binoculars or a rich field telescope will help reveal the nebulosity. Most of the light emitted is the deep red of hydrogen alpha, to which our eyes lack sensitivity. A nebula filter can help to increase the contrast with the background sky glow. This is a rewarding area for long exposure photography.

NGC6910 Open Cluster RA 20h 23m Dec 40° 48' mag 7.4 - NGC6910 is a small cluster located about 0.5° north of Sadr the central star of Cygnus. The brighter members make a cluster of three short spokes.

M39 Open Cluster RA 21h 32m Dec 48° 26' mag 4.6 - An open cluster with an apparent diameter equal to that of the full moon, it is rather sparsely populated triangular shaped grouping with around 30 magnitude 7 to 9 stars. This like many galactic clusters is an object best enjoyed through binoculars or a low powered telescope.

Peter Burgess

Image Processing Techniques for the Amateur Astronomer

26 August 2011 Lecture report

Dr. Jon Whitehurst (VAS member)

Do you remember your first trip in an airliner, feeling the acceleration propel you along the runway, seeing aircraft hangers flash past the other way, then high in the sky, looking out the window and having no sense of speed? Likewise in this lecture, after take-off, just the reassuring sound of the engines reminded us that we were travelling at great speed between stratified layers of electronics, shooting in and out of clouds of technical detail, and far below, dark banks of mathematics rolled gently past as we climbed into the night sky of high altitude astroimaging.

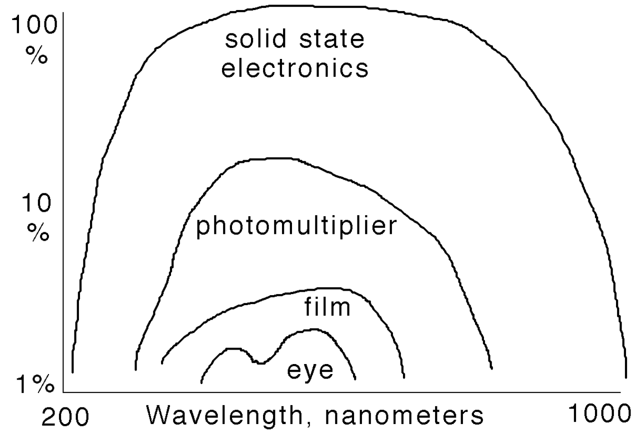
This lecture, in which your reporter has no experience, was really for experienced users - doubtless they will recall the deep parts of this lecture, which I cannot reproduce. I suspect that beginners, eager to study fascinating visual targets, found themselves captured by the prospect of easily learnt imaging packages under mouse control. Others will have learnt more about how such packages work and what can be achieved. Sometimes the most telling illustration in Jon's lecture was a large plain black rectangle with a striation, a whitish corner or margin, some speckling or other type of correctable feature. A stimulating way to start is visit www.Autostarsuite.net/photos/jonw - see details of Jon's equipment, image processing details and excellent results from an IoW location.

Interestingly, a practical aspect is that Jon, who built his first telescope when aged 9, followed later with a PhD in astrophysics and who specializes professionally in electronics, says you can spend more time on tracking than image processing. Apologies here for only hinting at the advanced aspects. Two discussions at the VAS Observatory with Dudley Johnson, who has known and worked with the lecturer over many years and has experience in radar imaging, have helped me to gather the momentum to tackle this lecture report - if it's good, then thanks to Dudley - otherwise blame me!

The subject matter included:

1. Image devices.
2. Removing systematic errors.
3. Revealing detail.
4. Colour reproduction LRGB.
5. False colour methods, HαRGB and SIIHαOIII. (see the Reference List.)

Approximate sketch



The spectral responses of various light detectors are compared in the *Approximate sketch*. CCD electronics can be near 100% quantum efficient, so each incident photon activates one electron in the device, but like water pouring into a jug, when it's full, it overflows or saturates - hence the need to read the image, reset the electronics and make the next image, involving a mechanical or electrical shutter depending on the type of CCD. With one-to-one production of detectable electrons from photons, linearity is near perfect. A CCD can cope with a 'dynamic range' of 40 dB in image brightness. Of course this gives a problem with presenting such a vast brightness range within the same picture, or preventing deep sky galaxies from being obliterated by foreground stars or revealing details concealed within tiny brightness differences all at the same time. The eye has a logarithmic response to brightness - hence the star magnitude scale - whereas after calibration, the signals from a CCD are not logarithmic but directly proportional to numbers of captured photons. The requirement for image processing to make features visible is inevitable (see 'visibility' in the Reference List).

The sketch given is approximate because CCDs come in various qualities, some of them are more sensitive in the red than in the blue, so exposure or 'integration time' needs to be bigger at the blue end of the spectrum.

We travelled quickly past CMOS webcam technology, about 10% quantum efficient with a dynamic range of 30 dB and good linearity, and we flew past film with its roughly 1% efficiency and poor linearity. We jetted into all the details of CCD imaging.

Sources of **Systematic errors** are:

- bias errors, every pixel site is biased
- cross talk
- spurious photons from the circuitry
- readout noise
- dark current gradient
- bias error frame
- the way the pixels are read out - white to black, 5000 units top to bottom.

My notes consist of lists of items covered. I like to understand things slowly, and there was so much here. By the time I was thinking about cross-talk - which refers historically to the first users of telephones overhearing each others' conversations, caused by wires inducing currents in adjacent telephone circuits, remedied by wire-rigging procedures and twisting wire-pairs at different rates to reduce magnetic coupling - not easily done on a CCD wafer - we had travelled into a different area. For me, this lecture would necessitate getting the maps out later to see where we have been.

With the lens cap on, the CCD still registers a signal, some of it caused by thermal photons emitted from the circuit board itself, and being sensitive to IR, the remedy is to cool the camera electronically, using the Peltier effect - perhaps consuming several watts? - as well as calibrate it out. A remedy for the effect of hot pixels and dead pixels (CCDs come in different qualities) is to assign the average of the surrounding pixels to the faulty pixel, easily done mathematically, but telling me that every photosite must be identifiable, and with millions of them, that's a computer job, also requiring flat-field light-boxes or twilight sky shots to get the necessary data.

While this lecture sped ahead, I wondered - why not do things very differently? - why not allow the image to scan across the CCD and use computer algorithms to reconstruct the image, thus compensating for variations in photosites across the chip? - I will need to check this out in books... oh! - now what have I just missed?

The journey continued, covering correctable optical defects, dust rings, vignetting, generating uniform white frames, flat frame correction, random noise, histogram control, deconvolution, brightness rescaling, boosting the lower end of images, sharpness filters can introduce artifacts, planets have low contrast boundaries, local adaptive sharpening, Fourier filtering and something called an 'unsharp mask', then to iterative deconvolution and wavelet spatial filtering which can deal with high contrast images. The Universe is not black and white. RGB filters are used additively, CMY filters, subtractively.

The eye is like one-shot-colour near the centre, and monochrome high resolution off-axis. A very narrow band Hα long exposure image can be taken and the colours added afterwards. Some colours can be real, some not - see 'Hubble palette' in the Reference List where Hα is green!

This lecture came in to a very smooth landing --- upon alighting, I ordered the recommended '***Handbook of Astronomical Image processing***' **Richard Berry & James Burnell**, and thanks to the NZ editor, arranged a later target date for this report. I started digesting imaging articles in the *Sky & Telescope* fed to me by my brother. Then we got a first edition of the book minus software but enough to get this report shifted "...and this picture of a brightness profile of M101 is important to us!" - why is another story.

In conclusion, Jon has enabled us to peer into the depths of a deep subject - a rich area for development and exploration by amateurs as a means of discovery of real things hidden in imaging data, discussions and discoveries by amateurs are obviously ongoing...

Reference List: of terms and interpretations made during a week of studying this subject.

ADU: Analogue to Digital Unit, the readout value of the signal stored in a photosite, proportional to the total number of free electrons stored.

Airy disc: the image of a star brought to the sharpest theoretical focus by an instrument at its diffraction limit.

Binning: joining pixels into groups, in pairs, 2 x 2, or 3 x 3, so they behave like bigger pixels.

Blooming: a distorting effect seen on a computer screen, when stars make trails.

Blurring: usual meaning, plus a deliberate method of getting rid of high frequency image noise, prior to image reconstruction.

Calibration: correcting for unwanted signals such as dark current, and so on, until the signal obtained is directly proportional to the photons received from the required image source.

CCD: charge-coupled device, monochrome for astronomy, tricolour for off-the-shelf cameras. Invented in 1969 at AT&T Bell Labs, by Willard Boyle and George E.Smith.

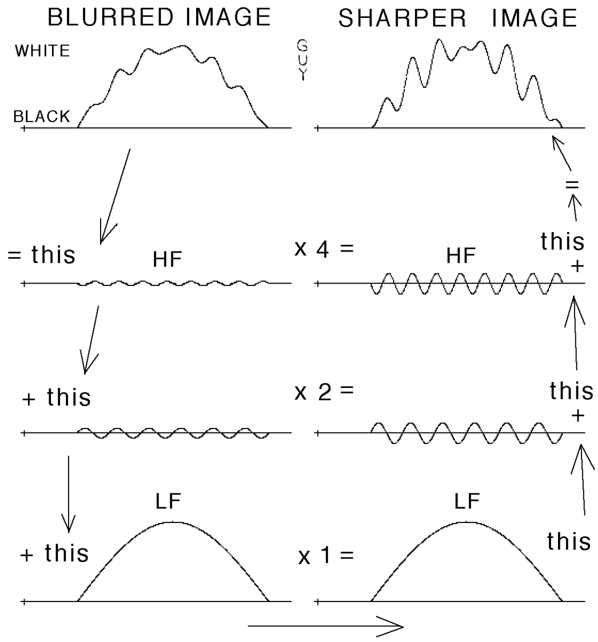
CFZ: critical focus zone, the movement to and fro where no difference in focus sharpness is noticed.

CMY filter: Cyan, Magenta, Yellow. Has the advantage of not blocking the green emission line of planetary nebulae, which can be blocked by some RGB filters. To get back to RGB, use: Red=M+Y-C, Green=C+Y-M, Blue=C+M-Y, CMY signals are generally larger than RGB.

Convolution: The process whereby an original signal becomes modified in a physical process, like the point image of a star or edge of the Moon becomes spread by atmospheric blurring over a range of pixels. A string of calibrated ADU numbers from the pixels, can be 'operated on' by a mathematical procedure specified as a 'kernel', or 'mask', giving a new set of ADU values. When the kernel averages out local large variations in image brightness, leaving slowly changing brightness levels unaffected then the 'kernel' is acting as a 'low pass filter', or 'unsharp mask'. A 'high pass filter' allows high frequencies to pass, attenuating the low frequency components. The high frequencies can be amplified, then recombined with the low frequencies to give sharper edges, see the illustration (done by analogue maths), digitally this would be done by a 'sharpening kernel'.

Dark current: within the silicon wafer, both in the dark and in the light, a base rate of free electrons production occurs, doubling for each 6 degree centigrade rise, varying from one photosite to another, a hot pixel has a high dark current, due to a crystal defect.

Deconvolution: The inverse procedure of using the known characteristics of a physically corrupting process, like random wobbles of atmospheric turbulence, to make a kernal capable of reconstructing a close approximation to the original signal before corruption. The Gaussian kernel is suitable for countering the effects of randomization.



DSLR camera: digital single lens reflex.

Flat field: The signal obtained from a CCD when exposed to a uniform light from a light box or twilight portion of sky, referred to as a 'frame' and not as an 'image'.

Dust rings or doughnuts: caused by tiny specks in the optical system, the size of the doughnut gives the range of the dust from the CCD, indicating which optical part needs cleaning. The rings can be calibrated out by flat-fielding.

Extreme value operator: enhances contrast in low contrast areas by measuring max and min ADU for the pixels within the area, and flipping each pixel up or down to these values, whichever is closer.

Focal length F: is the distance from a lens to the focussed image, units of length.

Focal-ratio f: no units, ratio of the diameter of the lens to its focal length, written as a fraction with f as numerator in place of 1. A 5 cm diameter lens with focal length 80 cm, has focal ratio 5/80=1/16 written as f/16. A thicker lens, same diameter, might have focal length 20 cm and thus a focal ratio f/4, which is less than f/16, although as a fraction it is four times bigger.

Fourier transform: a graph of frequencies versus amplitudes as a point scans spatially through an image. See very basic info in NZ March 2008. By blocking out the low frequencies, the remaining high frequencies can be amplified, reapplied to the low frequencies and a sharper image made - see illustration.

FWHM: full width at half maximum, the width of an image of a star measured across the central peak between the half amplitude points. For imperfect optics, it is bigger than the Airy disc.

Gaussian kernel or mask: Good for sharpening or deconvolving images blurred by random processes. Needs the correct scale relative to the blurring.

HαRGB: False colour image made by replacing the luminance (L) picture of LRGB by a black and white Hα picture.

Histogram: Statistical graph of calibrated ADU value of each pixel, plotted along the x-axis, with numbers of pixels possessing these values up the y-axis. The dark sky background is on the left, saturated images of stars, appear on the right. A brightness scaling comparison between an original image and the modified image can be seen in a 'cross-histogram'.

Histogram shaping: alters the brightness levels in a picture to reveal objects of interest in greater contrast, for each old ADU, a new value is assigned, having no effect on adjacent pixels.

Hubble palette: assigns OIII to blue, Hα to green, and SII to red.

Integration time: same as exposure time for film.

Isophote: image contour of equal brightness.

Kernel: The mathematical operator, also called a 'mask', for processing calibrated image data, operating on regions of pixels according to rules specified by the mask. Linear kernels done in any sequence give the same result, or they can be combined into a single larger kernal. Non-linear masks must be done in a specified order, the original picture is not recoverable by the reverse procedure.

Local adaptive sharpening: a non-linear kernel giving stronger enhancement in low contrast areas, and clearer detail over a whole picture.

LRGB: the method of obtaining a high resolution Luminance image in black and white, which provides the eye with much detail, with colours added from lower resolution pictures in the red, green and blue.

Oversampled: image doesn't need so many pixels to record it.

Photosite: each light-sensitive area on a silicon CCD wafer.

Pixel: a single photosite or combination of photosites to make one pixel. A near perfect optical system would be designed so that one pixel is half the size of the Airy disc.

PSF: Point spread function, how much the image of a star has departed from a point.

SIIHαOIII: images formed using three filters for the spectral lines of ionized sulphur, hydrogen and oxygen.

Stretch: altering some function into another function along the line of sight of the observer, no geometric distortion occurs in 'image stretching'.

Undersampled: not enough pixels to record detail of the image.

Unsharp mask: used with sharpening kernels for planetary and lunar imaging.

Vignetting: Some light is blocked around the image edges, reducing the rate of photon collection. A multiplicative, not subtractive effect, compensation requires dividing by a factor less than unity to obtain what the pixel would have received over the integration time.

Wavelet processing: short trains of oscillations, when convolved with the signal, reveal local information, enabling good processing of high contrast features, mathematically very intense. It took off after Zweig's discovery in 1975 of the 'cochlear transform' when studying how the ear processes aperiodic sound - see Wikipedia.

Visibility: image processing enhances the visibility of information, whereas the unprocessed data actually contains more information before processing, see Berry & Burnell.

Zero point bias: think of a long-jumper, the zero point is marked by a plasticine edge, from which the length of the jump, equivalent to the charge stored in a photosite, is measured, so some of the jump has not been measured at the start. A more accurate measurement would be obtained by measuring from the jumper's true take-off point, which varies. This is done on a CCD, but the zero point varies from one photosite to another, requiring calibration.

Some Sky & Telescope references

"Color CCD Imaging with Luminance Layering", Robert Gendler, Jul 2001. CCDs are sensitive in the IR so a filter is needed, see www.robgendlerastropics.com/LRGB.html

"Digging Out the Details", Ken Crawford, May 2010. 'Multi-strength deconvolution layer blend' (MSDLB) is done in Adobe Photoshop, using CCD software of your choice.

"In Perfect Focus", Don S.Goldman and Barry B.Megdal, Aug 2010. Explains focussing characteristics and a better formula to give the CFZ and how to get nearer to a system's full potential.

"SBIG's ST-8300M CCD Camera", Dennis di Cicco, Oct 2010. The chip has small pixels, for optimum imaging at longer focal lengths, binning can make 2 x 2 or 3 x 3 pixels, 10.8 or 16.2 microns square.

"Narrow band Imaging" Neil Fleming, Dec 2010. Emission line filters yield good images of nebulae from poor locations, plus how to get better true colour.

"Demystifying Flat Fields" Peter Kalajian, S&T, Mar 2011. Describes a formula and practical procedures.

"Photometry" Brian Kloppenborg & Tom Pearson, S & T, Apr 2011. Using off the shelf digital cameras plus a software tutorial on IRIS, AIP4WIN and MaxIm DL.

Dr.Guy Moore

Trivia

- *On Mercury a day (the time it takes for it to spin round once) is 59 Earth-days. Its year (the time it takes to orbit the sun) is 88 days- that means there are fewer than 2 days in a year!*
- *On modern star charts the entire sky is divided into 88 constellations. The constellations appear to have changed position since they were first identified by the Greeks some 2500 years ago. That is, for the time of year, the constellations that we see are not exactly in the same place as they were for ancient people. This raises interesting questions in Astrology, because the signs (certain constellations) are not in the same places in the sky as they used to be. Therefore, if you place any superstitious faith in the pseudo science of astrology, you would either have to be ignorant of the shift in constellation positions, or you would have to pretend real hard that there was no change in position.*

For Sale

305mm (12") f/5 wooden Dobsonian reflector. Genuine reason for sale - I have bought a larger scope! The mirror looks a bit tarnished but still perfectly useable, hence only **£300**

102mm (4") f/10 Meade Schmidt-Cassegrain (telescope only, no mount - fits on photo tripod) with 2" diagonal. In fair condition with a few scratches on the tube and on tripod attachment but optically fine. Suited to viewing bright DSOs, the Moon and planets and also a good scope for travelling or as a terrestrial spotting scope. **£100**

40mm Televue Plossl eyepiece. 1.25" barrel. In good condition apart from some dust and a few cosmetic scratches on the barrel where it goes into the focuser. **£50**

35mm Televue Panoptic eyepiece. 2" barrel. In good condition, apart from some cosmetic scratches on barrel where it goes into the focuser. Boxed. **£250.**

5mm Vixen Lanthanum eyepiece. 1.25" barrel. In fair condition (rubber armour on the body has faded a bit and looks blotchy) but optically fine. Boxed. **£40**

Contact Faith - **chairman@wightastronomy.org** or **07867 747780**

NASA's Webb Telescope Completes Mirror Coating Milestone

GREENBELT, Md. -- NASA's James Webb Space Telescope has reached a major milestone in its development. The mirrors that will fly aboard the telescope have completed the coating process at Quantum Coating Inc. in Moorestown, N.J.

The telescope's mirrors have been coated with a microscopically thin layer of gold, selected for its ability to properly reflect infrared light from the mirrors into the observatory's science instruments.

The coating allows the Webb telescope's "infrared eyes" to observe extremely faint objects in infrared light. Webb's mission is to observe the most distant objects in the universe.

"Finishing all mirror coatings on schedule is another major success story for the Webb telescope mirrors," said Lee Feinberg, NASA Optical Telescope Element manager for the Webb telescope at the agency's Goddard Space Flight Center in Greenbelt, Md. "These coatings easily meet their specifications, ensuring even more scientific discovery potential for the Webb telescope."

The Webb telescope has 21 mirrors, with 18 mirror segments working together as one large 21.3-foot (6.5-meter) primary mirror. The mirror segments are made of beryllium, which was selected for its stiffness, light weight and stability at cryogenic temperatures. Bare beryllium is not very reflective of near-infrared light, so each mirror is coated with about 0.12 ounce of gold.

The last full size (4.9-foot /1.5-meter) hexagonal beryllium primary mirror segment that will fly aboard the observatory recently was coated, completing this stage of mirror production.

The Webb telescope is the world's next-generation space observatory and successor to the Hubble Space Telescope. The most powerful space telescope ever built, the Webb telescope will provide images of the first galaxies ever formed, and explore planets around distant stars.

It is a joint project of NASA, the European Space Agency and the Canadian Space Agency.

Mirror manufacturing began eight years ago with blanks made out of beryllium, an extremely hard metal that holds its shape in the extreme cold of space where the telescope will orbit. Mirror coating began in June 2010. Several of the smaller mirrors in the telescope, the tertiary mirror and the fine steering mirror, were coated in 2010. The secondary mirror was finished earlier this year.

Quantum Coating Inc. (QCI) is under contract to Ball Aerospace and Northrop Grumman. QCI constructed a new coating facility and clean room to coat the large mirror segments. QCI developed the gold coating for performance in certain areas, such as uniformity, cryogenic cycling, durability, stress and reflectance, in a two-year effort prior to coating the first flight mirror.

In the process, gold is heated to its liquid point, more than 2,500 Fahrenheit (1,371 degrees Celsius), and evaporates onto the mirror's optical surface. The coatings are 120 nanometers, a thickness of about a millionth of an inch or 200 times thinner than a human hair.

"We faced many technical challenges on the Webb mirror coating program," said Ian Stevenson, director of coating at Quantum Coating.

"One of the most daunting was that all flight hardware runs had to be executed without a single failure."

The mirror segments recently were shipped to Ball Aerospace in Boulder, Colo., where actuators are attached that help move the mirror. From there, the segments travel to the X-ray and Calibration Facility at NASA's Marshall Space Flight Center in Huntsville, Ala., to undergo a final test when they will be chilled to -400 Fahrenheit (-240 degrees Celsius). The last batch of six flight mirrors should complete the test by the end of this year.

NASA Release : 11-298

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

NASA announces design for new deep space exploration system

The new heavy-lift rocket will take humans far beyond Earth.

NASA Headquarters, Washington, D.C. (Sept 15, 2011) — NASA has selected the design of a new Space Launch System (SLS) that will take the agency's astronauts farther into space than ever before, create high-quality jobs here at home, and provide the cornerstone for America's future human space exploration efforts.

This new heavy-lift rocket — in combination with a crew capsule already under development, increased support for the commercialization of astronaut travel to low Earth orbit, an extension of activities on the International Space Station until at least 2020, and a fresh focus on new technologies — is key to implementing the plan laid out by President Obama and Congress. The booster will be America's most powerful since the Saturn V rocket that carried Apollo astronauts to the Moon and will launch humans to places no one has gone before.

More at: ***http://goo.gl/bku3k***

Small Distant Galaxies Host Supermassive Black Holes, Astronomers Find

ScienceDaily (Sep. 16, 2011) — Using the Hubble Space Telescope to probe the distant universe, astronomers have found supermassive black holes growing in surprisingly small galaxies. The findings suggest that central black holes formed at an early stage in galaxy evolution.

"It's kind of a chicken or egg problem: Which came first, the supermassive black hole or the massive galaxy? This study shows that even low-mass galaxies have supermassive black holes," said Jonathan Trump, a postdoctoral researcher at the University of California, Santa Cruz. Trump is first author of the study, which has been accepted for publication in the Astrophysical Journal and is currently available online.

All massive galaxies host a central supermassive black hole, which may shine brightly as an active galactic nucleus if the black hole is pulling in nearby gas clouds. In the local universe, however, active black holes are rarely seen in small "dwarf" galaxies. The galaxies studied by Trump and his coauthors are about 10 billion light-years away, giving astronomers a view of galaxies as they appeared when the universe was less than a quarter of its current age.

More at: ***http://goo.gl/hxOW0***

VAS 35th Anniversary Dinner

Thursday 3rd November 2011

The Isle of Wight College, Medina Way,
Newport, Isle of Wight, PO30 5TA
Further details as we get closer to the event

Observatory

For your own safety, when visiting the VAS observatory, please bring a torch. Also, please make sure you close and lock the car park gate if you are the last to leave - if you need the combination to the lock, please contact a member of the committee.

Articles Needed

New Zenith welcomes letters, articles or pictures related to all aspects of astronomy. Contributions to the Editor at the email or postal address on the front page.

"Interestingly, according to modern astronomers, space is finite. This is a very comforting thought-particularly for people who can never remember where they have left things"

Woody Allen

Quotations

"Prediction is very difficult, especially about the future."
Niels Bohr

"Never worry about the future. It comes soon enough."
Albert Einstein

"You should never bet against anything in science at odds of more than about 10^{12} to 1 against."
Ernest Rutherford