

Janus



Ewell Astronomical Society Newsletter – Summer 2009

Serving skywatchers in SW London and north Surrey

Ewell AS homepage www.ewell-as.co.uk

Ewell Astro Soc c/o David Fishwick, Nonsuch HS for Girls, Ewell Road, Cheam, Surrey SM3 8AB

YOUR COMMITTEE for 2009 elected at AGM on 2008 Dec 12 – contact them with any queries.

Chairman: David Cooper: 01737 351184 Deputy Chairman/Speakers Organiser: David Fishwick

Secretary: Anita King: 01372 722097 Treasurer: Valerie May

Other elected committee members: Louis Barman [Librarian]; Mike Wright [Registrar], Richard Gledhill

Janus Editor + Webmaster: Maurice Gavin mgavin@ntlworld.com Janus deadline Jan/Mar/May/ Sep/Nov main meeting

JANUS-ON-LINE-IN-COLOUR: For a full colour version of any recent Janus log-on to www.ewell-as.co.uk/ Janus / Janus pdf file. Cut + paste web addresses [URLs] therein direct to your Internet Browser and save typing errors!

MEMBERS EMAIL LIST: email mgavin@ntlworld.com to receive rapid news of astro events or programme changes.



Above: **Solar prominences** via 40mm PST x44EP+Nikon Coolpix 4500-Ron Johnson Ewell Court Observatory

<<**Mercury, Moon & Pleiades conjunction 2009 Apr 26**
@ 21:21 BST taken from Horsley station car park - no western horizon at home! Panasonic DMC-FZ-18 2 sec at F3.6 ISO 100 = 350 mm equivalent focal length (28 -504 zoom - Mercury was just less than 8 degrees above the horizon. Mike Fantham.

Overpage: Conjunction by Brian Taylor [upper] and Maurice Gavin via Meade ETX-70+Fuji E550 cam [lower]

EAS Meeting dates for your 2009 diary – see www.ewell-as.co.uk

All held at Nonsuch HS for Girls-Ewell Road - Cheam [unless noted] and start at 8pm. **Ordinary Monthly Meetings [in bold]** in Common Room start at 7.40pm. Headley Heath meetings *phone 01252 382940 from 7pm on evening to check observing is 'on'. Moon's phase at Users' Group meeting shown [$>Q3$] = after 3rd quarter [$<Q1$] = earlier than 1st quarter.

Door subscriptions £1 and £3 for visitors - Arriving at meetings with small change in your pocket and not tendering £10 and £20 notes is greatly appreciated.

Mon-Thu May 18-21 @ 9pm Observing Session Headley Heath*

Fri Jun 12 - Bob Mizon - *Fourteen Pioneers of Astronomy*

Wed Jun 17 @ 8pm – Users Group Meeting – NSHS Observatory Deck [$>Q3$]

*Sat June 27 all day EAS at BAA Exhibition Meet – Greenwich Naval College

Fri Jul 10 – Dr Mike Leggett - *Astronomy in the Medieval World*

August – no main meeting

Wed Aug 19 @ 8pm–Users Gp Meeting – NSHS Observatory Deck [new moon]

Sat Aug 22 – Horton Country Club – EAS Dinner & Social Evening

Fri Sept 11 – John Bance - *Exoplanets*

Sat Sep 12 – Ewell AS Headley Heath Picnic & Star-Party

Mon-Thu Sep 21-24 @ 8.30pm Observing Session Headley Heath*

Fri Oct 9 – Alan Drummond - *Andromeda Galaxy*

Mon-Thu Oct 19-22 @ 8pm Observing Session Headley Heath*

Wed Oct 21 @ 8pm – Users Group Meeting – NSHS Observatory Deck [$<Q1$]

Fri Nov 13 - Jack Martin – *Astronomical Stellar Spectroscopy*

Mon-Thu Nov 16-19 @ 8pm Observing Session Headley Heath*

Fri Dec 11 – AGM + talks TBA

Mon-Thu Dec 14 -17 @ 8pm Observing Session Headley Heath*

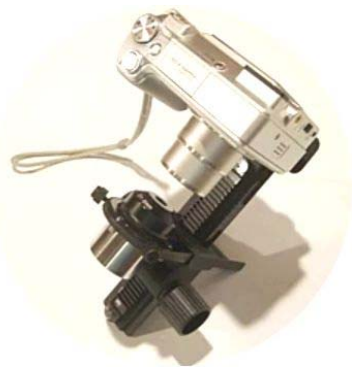
Wed Dec 16 @ 8pm –Users Group Meeting– NSHS Observatory Deck [new moon]

MEMBERS EVENING APRIL 17 – due to the cancellation of Dr Ian Kenyon's talk on the *Large Hadron Collider* members Maurice Gavin and David Cooper stood-in.

YOUTUBE ASTRO-VIDEOS - Maurice Gavin said he'd recently discovered the merits of video with results posted on *YouTube* using Microsoft's free *MovieMaker* programme to compose and title his efforts. He used his regular Fuji digital camera in 'movie-mode' with a camera handheld to the eyepiece. Steadier results were obtained by using a special clamp http://www.youtube.com/watch?v=-JhMxk47u_g for attaching the camera to the telescope [right]. The moon and the planets were bright enough to record directly in video.

A video slideshow can be made of deepsky galaxies and star cluster taken with long CCD exposures. A commentary can be added by simply talking-to-the-digital-camera in 'movie-mode' in quiet surroundings - the images during these recordings being discarded. All of these could be interlaced, perhaps with a still shot of a dusk sky or your telescope in daylight, in the final video which can as simple or 'epic' as desired.

YouTube has a 'Science & Technology' area to post to if you feel intimidated by the vast amount of video graffiti this forum attracts. Signing-up to *YouTube* is simple and safe and of course it can be used for any video clips you make to share with family and friends and so makes sending a video DVD through the post redundant! The huge scale of *YouTube* provides a large measure anonymity to any user. It is said that "a picture's worth a 1000 words" and maybe video does even better. Certainly a video of only a minute or so duration can pack a vast amount of information and entertainment. One of his video clips got 4000 hits in 48 hours! Maurice then showed a number of his video-shorts projected onto the big screen made with modest telescopes – these can be found at www.astroman.fsnet.co.uk/myvids.htm



MY ASTRONOMICAL HIGHLIGHTS - David Cooper reminisced on the following events he witnessed...

August 1964: my first Total Lunar Eclipse !!
February 1966 : Luna 9 first soft lander & trans pictures – where were you?
May 23rd 1966 : my first Partial Solar Eclipse
August 1966: my first 'Fireball' mag -10 left train for a few minutes !
October 14th 1966: line-up of Winter constellations in a perfectly dark sky
1966 to 1969: satellites Echo 1 and Echo 2
December 1968: Apollo 8 stage & gas cloud
March 1969: Apollo 9: separate sightings of Lunar Rover and Command Module in Earth orbit
July 20th 1969: Apollo 11 Moon landing—where were you?
November 1969: Apollo 12 gas cloud
1970: Bennett's Comet my first cometary sighting.
February 25th 1971: 70% Partial Solar Eclipse
January 31st 1972: my minimum temperature -15deg C or 5deg F
May 15th 1972: Mars occulted by the Moon
August 05th 1972: spectacular colourless Aurora Borealis, my first auroral sighting from Surrey !
October 1973: Mars at perihelic opposition mag -2
September 29th 1974: long lasting Lunar Parasalene with Jupiter (photographed)
October 1974: Saturn's daylight occultation by the Moon
Winter 1974/5: Aurora Borealis in Shetland-coronal streamers converging
January 29th 1975: two 'Fireballs', one green reflecting on sea, other bluish
February 02nd 1975: conspicuous Zodiacal Light from Shetland
April 08th 1976: Mars occults star Eta Geminorum mag +3.2
October 05th 1980: Venus in appulse with the Moon in Leo. Regulus previously occulted.
1983: Comet Iras-Araki-Alcock rapid daily movement close to M44
March 13th 1989 : Spectacular colourful Aurora Borealis (all sky directions)
October 1991: east-Venus & Jupiter rising across sea. Venus's shadow.
December 09th 1992: red Total Lunar Eclipse-Moon disappeared in volcanic dust follows Mt Pinatubo eruption in 1991.
June 1993: extensive, very conspicuous, Noctiluscent Cloud
August 1993: 3 Fireballs in clouded twilight from Dorset ! All Persiads.
June 23rd 1994: spectacular clouded evening sky-Cirrus Spissatus etc
July 1994: Comet Shoemaker-Levy impacts visible on Jupiter thro Ron's garden 80mm refr.
July 28th 1995: complete Parhelic Circle observed – Sun altitude about 50 degrees.
1996 Winter or Autumn ? : Comet Hyakutake bright naked eye near Polaris
1997: Comet Hale-Bopp: arguably the brightest comet since the Great Comet of the 19th Century!
August 11th 1999: Total Solar Eclipse from Champagne area northern France
2001 November ? : Venus. Mercury and Lunar conjunction about 0600hrs
2002 November: Leonid storm some 2/3 meteors per minute in fog
June 04th 2004: the Transit of Venus observed from Rome
October 03rd 2005: Annular Eclipse , Sun 96% covered from Madrid
June 2006: widespread optical display 545pm: pc,sh22&44,2xms etc
March 12th 2009: Discovery & ISS separately viewed passing into eclipse in Leo in a dark sky.

THE USERS GROUP MEETING is held on Wednesdays from 8pm sharp on alternate months on dates noted on the EAS Diary in the School's Geography Room via Main School Entrance facing playing field -map www.ewell-as.co.uk

OBSERVING SESSIONS ON HEADLEY HEATH will be held monthly [Sept to May] on dates noted on the EAS Diary at the 'dark of the moon' at NT carpark adj cricket pitch. Phone 01252 382940 from 7pm to check meeting is on. **Note** – if Headley Heath OS clash with the Users Gp meeting at NSHS [Feb/Oct/Dec] then observing held at NSHS.

EWELL AS SUBSCRIPTIONS The Society annual subscriptions are due in January. Please forward your sub [member £15; family £18; junior £5 made payable to Ewell Astro Soc] to...
EAS Treasurer - Valerie May, 41 The Green, Burgh Heath, Tadworth, Surrey KT205NP; phone: 01737361486

EWELL AS PLANS FOR INTERNATIONAL YEAR OF ASTRONOMY 2009 (IYA)

This year is IYA and societies like Ewell are planning events. Watch this space for further announcements.

JODRELL BANK VISIT: This has been cancelled due to lack of interest.

SOCIETY NOTICES - POST CHANGES : David Cooper **Chairman** is reminding everybody that he will be standing down at the end of this year, at the next AGM. David would wish to continue on Committee at the next AGM if elected. Mike Fantham **EAS Observing Sessions Organiser at Headley Heath** would like a replacement to run these sessions.

EWELL AS @ BAA EXHIBITION MEETING – OLD ROYAL NAVAL COLLEGE - GREENWICH PARK
on Saturday June 27 from 10AM. Full info/map at <http://www.britastro.org/exhibition/> Enjoy a day-out in the Park!

NEIL BONE [1959-2009] - popular Ewell speaker died on April 23 following a long battle with cancer –see last Janus.

NIGHTLIFE SUMMER ASTRO-EVENT - PORTSMOUTH - JULY 4TH top speakers www.nightlife.demon.co.uk

ASTRO-SOUTH E-MAGAZINE new issue now available online at <http://www.hantsastro.org/astrosouth.html>

SOLAR WIND ON THE GAS GIANTS – society talk by Emily Hall of ULC on May 8th *reported by Alan Lane*
This meeting was addressed by Emily Hall from the Centre for Planetary Sciences at ULC. Her subject was the effects of the Solar wind on the Gas Giants. She began by describing the cause of aurorae on Earth before going on to those on Jupiter and Saturn.

The Solar Wind is made up of charged particles explosively driven from the Sun and those that come in the direction of Earth are captured by the Earth's magnetic field. The particles spiral down the magnetic lines colliding with atoms and molecules in the atmosphere. The collisions produce light and create the aurorae.

The principle gases in the atmosphere, nitrogen (80%) and oxygen (20%) emit red and green light, molecular oxygen glowing red. The strength of the activity is measured by the Lorenz Force, $F=qVxB$, where q is the charge, V velocity and B the magnetic field strength. Moving to Jupiter Miss Hall described the planets size in relation to Earth. Jupiter was over 300 times as massive as Earth and more than 1000 times greater in volume. The greater part of Jovian aurorae were self generated with material from satellite Io, which orbits within the planets magnetosphere, pouring into the massive magnetic field which is 14 times stronger than Earth's. Jupiter produces it's own plasma disk which rotates more slowly than the planet creating an electric current. Because most of the aurorae are self generated they are continuous with only occasional input from the solar wind. These inputs can be distinguished because they produce a magnetic tail beyond Jupiter similar to that on Earth.

Saturn with a mass 90 times Earth and a volume 800 times greater differs in having a magnetic field no stronger than Earth. This creates a problem for modelling a theory as the observed aurorae seem too strong for the magnetic field. As with Jupiter Saturn has plasma disks and one possibility is that part of the disk breaks off and moves independently through the magnetic field creating an additional charge. In reply to a question Miss Hall said that for charged particles magnetic fields were much stronger than gravity and this is why those particles move towards the poles. The meeting concluded with the Sky @ Night with slides by Chairman David Cooper.

BUY A ZILLION, ZILLION ZILLION ZILLION AND GET ONE FREE (OF SOME PROBLEMS)

That's universes, but before that you have to buy string to tie it up. Now I admit I don't understand much about string theory, except that it says all particles are made of strings that inhabit 10 or 11 dimensions and each particle has a big brother, as yet undiscovered. Now at this point I ought to shut up and get a cosmologist but unless there is one in the Society I will carry on because I find the subject fascinating, I hope you do! If you don't, just go on to the next item.

It seems that the problems with string are eased by assuming that there are a lot of universes out there. A ancient philosophical question, but now being asked by science is " how come we are here ". The we in this case being all of life. The obvious but rather circular answer is that if we were not we would not be asking the question . That's not good enough. The problem is that the fundamentals of our universe, things like the strong force that holds the protons and neutrons together in atoms, the weak force, gravity and so on are all just right for our universe to exist and to support life.

You might say, Why shouldn't they be? Well, it seems that there is no reason why they should, they cannot be calculated from first principles, and no overall formula insist they be as they are. Yet if they were different our universe could not exist in the form it does, At the extremes atoms would be unbreakable or would fall apart, radiation would have little effect or would destroy everything it encountered. Life as we know it would be impossible. We are familiar with the location of Earth being just right for life, the right distance from the right sort of star and having other features that help to sustain it. Even if this is rather rare, it does not seem unlikely in a galaxy with billions of stars most of which seem to have planets that it could happen by chance.

You may think that with all the diseases, disorders and disasters to which life is subject that it is not that ideal, but the evidence is that we are lucky it is as good as it is. What if our universe was also just right by chance. According to New Scientist magazine (May 2nd 09) some cosmologists calculate that string theory allows for 10 to the power of 500 universes to exist. This is more than all the atoms in the universe we inhabit !. I have no idea how they work that out and couldn't possibly understand the maths or those of string theory for that matter, but such a huge number would seem to easily allow one and probably more to be "just right" by chance. It looks as if evolution steps into physics so that some "mutations" create the fittest universes just as some locations and composition of elements make for the fittest planets.

The recently launched ESA satellite Planck is to chart the Cosmic Background Radiation with 15 times more detail than the previous best, the NASA WMAP. The CBR is the radiation released by matter in our universe 380,000 years after the Big Bang. This will help determine the "flatness" of our universe as a very tiny curve in space- time would indicate the influence of other universes. (New Scientist May 9th 09). So if you buy String and buy the Multiverse it solves the problem of why our universe was planned for life because it wasn't, But it means there is even more, much more, yet to be discovered. *Alan Lane*

EWELL AS DINNER & SOCIAL EVENING Saturday 22nd August 2009 at Horton Country Club
6.00pm to 11.30pm [dinner from 700pm to 800pm]

We have arranged a social evening with dinner and guest speaker (Dr Ian Morrison). Those of you that attended our 40th Anniversary evening in October 2006 will recall that we had a very enjoyable evening with good food, and relaxation with an excellent talk. We would request that you arrive from 600pm for a 700pm start to the dinner. I think an hour should suffice for the meal and would expect our guest speaker to talk for about an hour until around 900pm. This should allow ample time for circulating and meeting old friends.

You will see find **separate sheets to register and pay and your menu selection**, again what we had before ,with a map. If you have any vegetarian requirements , (V's on the menu obviously denote this) or other needs; eg nut allergies please state on the return slip.

You should know that the Society has subsidised the cost of this event by paying for the hire of the room , bar and tea facilities. You will however also need to pay for your drinks and beverages , during the evening. I would expect to firm up numbers and collect all payments **by the end of July** please. You are welcome to bring guests and I would expect payment of a **non-refundable deposit of £5-00** per person , or payment in full of **£19-95 per person** please, in cash or by cheque payable to me **by June 12th** to David Cooper, at EAS meetings or to my address at :-

David Cooper

8 Ballards Green

Burgh Heath

TADWORTH - KT20 6DA

Telephone: 01737 351184

This year's subject has been finalised and the speaker has been booked – see below. So be warned your astronomical taste buds and scientifically enquiring minds should be satiated with an engrossing topic, last time it was about SETI- this time it's "**A GREAT TIME TO BE AN ASTRONOMER**".

Our thanks go to Anita and her husband for providing the overnight accommodation, for our guest speaker .

It should be a convivial evening with some old faces and new faces , ready to sample the excellent food and bar facilities in the upstairs Derby Suite. I think you will agree that we did not want to wait until our 50th anniversary particularly as the last occasion was such a splendid evening. Do come along I have booked the room which we used before to include tea/coffee facilities in addition to drinks at the bar. David Cooper –Chairman



Dr Morison's address will be on "A GREAT TIME TO BE AN ASTRONOMER!"

Time is one of the most mysterious concepts of the Universe and the talk will look at how we measure it, the possibilities of time travel and show that we are living at the best time in the life of the Universe at which to learn of its secrets.



EWELL AS OBSERVING SESSION HEADLEY HEATH MAY 19 - four member, Mike, Jeff, James and myself, turned up about 9PM for the last session before the summer break. It proved cold on the Heath under crisp and clear skies but took a full hour for the twilight to fade sufficiently to observe some deepsky galaxies and star clusters.



Earlier we observed the International Space Station [ISS] satellite [below] like a brilliant slow-moving star low in the west that soon passed directly overhead and set in the east a few minutes later. 90 minutes later the ISS made a second and spectacular pass across the sky from the west this time through the centre of Leo and down to the northeast and fading into the earth's shadow. Numerous fainter polar satellites were seen passing both north and south through Corona Borealis and Ursa Major east of the zenith. A couple of Iridium satellites were seen to 'flash' briefly on-cue low in the northwest.



Saturn in Leo 'disturbed' the familiar outline of constellation but proved dynamic in the telescopes – Mike's 8-inch Celestron on an equatorial mount and James' 12-inch Dobsonian nearby. The views through each were excellent. Saturn's rings were near edge-on as a thin line with satellite Titan and Rhea easily seen all in-line.



Mike then set about finding Ceres [minor planet #1] on the 'back' of Leo just above Saturn at a binocular faint mag 8.3. It took awhile, by reference to his stargazing chart, to confirm but each then had a spy as it formed a neat equilateral triangle with two neighbouring stars. Centring his scope on Vindemiatrix [epsilon Virginis] a little west of southern meridian Mike then set the coordinates for Irene [MP#14] nearby. As Irene proved to be slightly east of the meridian the 'scope did a slow track of almost a full circle of the sky to find it - but centred it was! Amazing and proof of Mike's careful initial setup of the telescope mount early on. Irene was listed as mag 10.3.

James, with his encyclopaedic deepsky knowledge, proved a wizard aiming his Dobsonian – someone would call out 'How about the globular M13 in Hercules?' and usually within a few seconds James would call back "Yes – here it is". He rattled off a whole sequence of DSOs for our perusal – globular M92 in Hercules, Ring Nebula [M57] in Lyra, Owl Nebula [M97] plus nearby galaxy M108 in Ursa Major, M81 again in Ursa Major, the Whirlpool galaxy [M51] Canes Venatici, the Leo Trio [M65/66/NGC3628] etc and many others that I couldn't keep up! Mike, with his Celestron, also bagged many galaxies.

After a couple of hours, with winter Procyon setting in the west and summer Altair rising in the east, I called it an early night for my fellow observers to continued their quest for more summer skies delights. Perhaps you should join them for the next autumn session on the Heath and feel the photons from far away fall on your face! - *Maurice Gavin*

Above images via Meade ETX-70 +SX CCD on 2009 May 23 and ISS images below all from Worcester Park by Maurice Gavin





LOOKING UP IN THE SUMMER SKIES

– summer, with those warm twilight evenings, probably means even keen astronomers put the telescopes away until the autumn. But it's still worth look up.

The summer months of May through to July favour the elusive **Noctilucent Cloud** [left] hugging the northern horizon on the last hint of twilight from about 10.00PM to 10.30PM. These 'clouds', at 80kms high, are illuminated by sunlight streaming over the north pole and can remain visible for about 30 minutes or so.

A similar event can occur again before dawn. Their appearance is unpredictable from night to night but a beautiful sight that can take various forms – the entangled blue tracery is magical and well worth recording with a camera and don't forget to send your pictures to Janus!

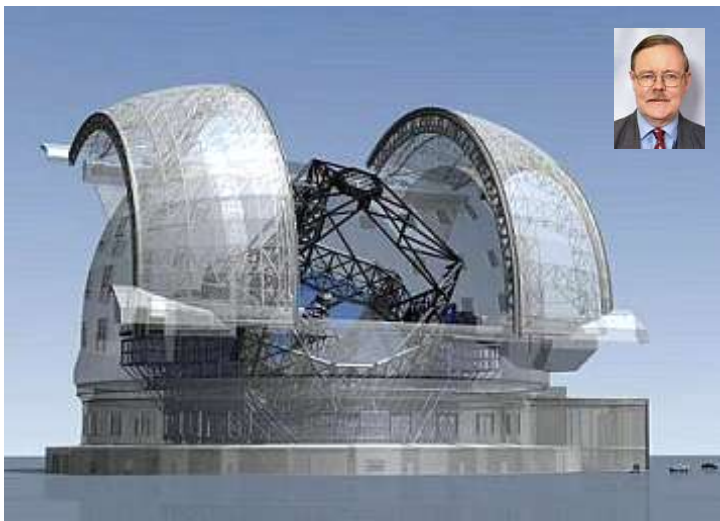
Artificial satellite watching is another agreeable summer pursuit. The **International Space Station** [ISS] has been upgraded recently and is now larger than ever and approaching a football field size and hence can be unmistakably bright [see opposite page]. It passes across the sky from west to east and can be mistaken for high and silent jet but binoculars will reveal no give-away flashing red lights and the satellite can fade in the east into the earth's shadow.

Iridium 'flash' satellites [right] – these are relatively small communication satellites in polar orbit with a solar panel about the size of a domestic door with a mirror-like surface which catches sunlight and briefly reflects a 'flash' of light onto the ground from where the appearance can be quite startling! The area of ground 'illumination' can be quite small and an accurate timepiece and some knowledge of your horizon bearings and altitude in the sky help immensely. The flash may last only a second or two at most so you need to be clued up to avoid missing it! It's quite a coup to see one and amaze family and friends with your 'prediction' as you point a finger to the sky where it will magically appear moments later.



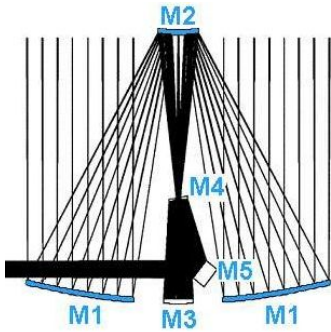
Polar satellites can be very numerous as they pass across the sky from north to south or the reverse fairly close to the zenith [overhead]. They tend to be quite faint and keen sight and a dark sky ups the chances of spying them. Due to their relative faintness they tend not to be listed in satellite programs on the internet. See the report from Headley Heath herein.

The essential guide for finding the times and position of all popular satellites is www.heavens-above.com and these obviously include ISS and Iridium. The website lists villages around towns, like Epsom for example, and this precision is needed for the Iridium 'flashes'. Good luck with your summer viewing – Editor.



EUROPEAN EXTREMELY LARGE TELESCOPE [E-ELT] by Dr David Walker - BAA Meeting**

Dr David Walker of UCL and Zeeko Ltd gave the BAA Meeting on 2009 May 27 at Burlington House - Piccadilly the first presentation of the mirror making techniques for 42m European Extremely Large Telescope [E-ELT] which on completion in 2018 will be 100 times more sensitive than any current world-class telescope. Dr Walker noted that the probable limit had been reached with single monolithic mirrors of 8.4m diameter moulded in a spinning furnace. The primary mirror is only one element of the overall design. The logistics of



transport and road system to get the mirror to the mountaintop, the massive aluminising plant to regularly recoat it and the downtime wasted when this happens add enormously to the cost of the project.

The modern approach is more manageable mosaic mirrors made of smaller hexagonal elements that fit together like ‘cells’ in a giant beehive. The technique is proven with the dual Keck telescopes on Mauna Kea Hawaii. To give some sort of perspective to the ESO project, the Keck mirrors are each 10m [33ft] diameter made from 36 hexagonal segments that work together as a single piece of reflective glass of Zerodur glass-ceramic.

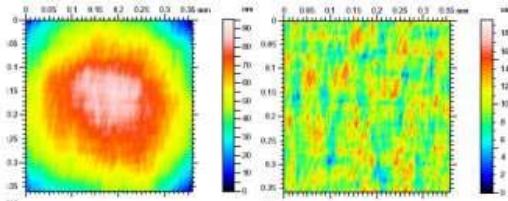
The E-ELT will have 984 hexagonal mirrors each 1.45m across forming a single a mirror 42m [137ft] in diameter!

TWO INITIAL ESO DESIGNS eg the 100m Overwhelming Large [OWL] and 50m ELT telescopes were abandoned as too complex where each hexagonal mirror segment was spherical in form [easy to make] but required complex and large secondary optics to remove errors caused by the primary mirror. The breakthrough came with manufacture of aspheric optics that greatly simplified the basic design to just two mirrors in a classic Cassegrain system eg M1+M2. The primary mirror has an amazingly ‘fast’ f/1 focal ratio with the secondary f/4 focus near M4. Laser light is used to align all 984 mirror segments to form a perfect single image. A smaller third concave mirror M3 and two flat mirrors M4 [perforated] and M5 [with adaptive-optics tweaking the surface 1000 times per second] send the final f/17 beam to the ultra-sensitive CCD detectors. The telescope’s field of view is 10-arc minutes eg 1/3rd the diameter of the moon. However the moon will NOT be a target for E-ELT as its light would damage the sensors! A spare of each mirror shape is set aside and can be swapped-out for mirrors in the telescope that need realuminising - telescope downtime is thus minimised.



TEST MIRRORS: Zeeko in UK and a French consortium are making test mirrors for the project. Each segmented mirror is 1.45m across by just 50mm thick and is prone to astigmatic warping but a steel harness behind each mirror tweaks it back to shape!

Dr Walker described the precision grinding machine that initially shapes each mirror by removing glass to form a shallow 6mm* deep concave surface. Each ring of mirrors, outwards from the centre, will have a slightly different shape to comply with the overall design. Zeeko has developed new polishing techniques using inflatable sub-diameter tools to finally shape and figure each mirror segment to fractions of the wavelength of light. From rough grinding to final precise figuring has been reduced to 31 hours per mirror segment – ‘speed’ is essential if the target for the nearly 1000 mirrors, needed for the complete project, is to be met.



30min polish 90min polish

SITE OF E-ELT: Several sites, either side of the Atlantic, are being considered for the new telescope - Roque de los Muchachos (Canary Islands), Ventarrones (Chile), Aklim (Morocco), and Macon (Argentina) – the latter pair have no major observatories currently. Clearly the Canaries and Morocco are the closest to ESO’s base in Germany with distinct logistic advantages. Small telescopes [typically amateur 11-inch aperture SCT] are used to test stability of the air etc at the projected observatory sites.

TELESCOPE STRUCTURE: The E-ELT is designed as a Nasmyth telescope. It has a footprint of about 80m diameter and is about 60m high. The altitude and azimuth structures weigh together nearly 5000 tons. This structure supports the five mirror optical design and accommodates two Nasmyth platforms - each about the size of a tennis court and can host several instruments. Various designs were considered for the telescope enclosure - the project settled for a classic dome design. Images by ESO/Zeeko *Maurice Gavin*

For E-ELT overview logon to
<http://www.eso.org/sci/facilities/eelt/>
 Zeeko’s polishing techniques at
<http://www.zeeko.co.uk/videos/animationb.wmv>

**Ewell AS members can attend BAA meetings.
 *6mm=mirror sagitta /dip=42-sq root [42² - 0.725²] Ed.

Unless otherwise acknowledged -
 all images in *Janus* supplied/prepared by the Editor.

