Ordinary Meeting, 2002 April 27
held at the University of Wales, Newport Road, Cardiff

Guy Hurst, President

Ron Johnson and Nick James, Secretaries

The President opened the sixth meeting of the 112th session with the sad announcement of the loss of Rossie Atwell, who had been an active member of the Society for many years. Members stood as a sign of respect. The President then asked Dr. Hewitt to read the minutes of the previous meeting, which were approved and signed. Mr. Johnson reported that the following presents had been received:

Astro and Lunar Views compiled by G.T. Davis of Reading 1882-1896, donated by Dr. T.J. Richards
Photograph of Vera Reade and some biographical information, donated by Ms. Hinde-Smith
Three copies of a pamphlet on *Igneous and Volcanic Origin of Lunar and Planetary Craters: supplement to the first publication*, donated by Prof. P. Devadas

The President announced that 17 new members had been proposed for election, and the members present approved the 30 new members proposed at the previous meeting. Mr. Hurst invited new members to meet him during the tea break. Mr. James reported that two papers had been approved by Council for the Journal:

Eclipsing Dwarf Novae, by Bill Worraker and Nick James
Variability of Saturn, by Colin Henshaw

The President urged members to consider writing papers about their work, and Mr. James echoed this call, advising members to contact him for advice beforehand. Mr. Hurst went on to announce that the next meeting would feature *Monsters at Work - Watch This Space* in place of Peter Hingley's previously advertised talk, which had been postponed. It would also feature Martin Mobberley's *Sky Notes* and a talk by Sir Patrick Moore about *J.S.Franks*. The President proceeded to invite the afternoon's first speaker, Prof. Mike Edmunds, who was involved with the Astronomy Advisory Council, as well as research at the University of Wales.

Astronomy in the next ten years

Prof. Edmunds opened by welcoming members to his department. It was stated that a number of sources worldwide had recently been in broad agreement when producing lists of key themes in astronomical research for the next decade, and it was this list which would be outlined in the talk. As an example, the speaker suggested that most astrophysicists believed that the major puzzles of cosmology would be resolved within a decade.

The speaker first outlined the progress he anticipated in physics. One of the most significant developments was in particle physics - the discovery of the Higgs boson, for which the LEP experiment at CERN had shown tantalising but inconclusive evidence in 2001. Prof. Edmunds believed that the Large Hadron Collider at CERN would resolve this issue when it commenced operation in 2005, if another experiment had not already done so.

The speaker went on to show an image of gravitational lensing of galaxy cluster Abell 2218. He pointed out that we still have little idea of the nature of the dark matter responsible for this phenomenon, and believed this enigma would be somewhat better understood in a decade. One experiment which might aid this cause is the Boulby particle detector – consisting of a large crystal in a deep mine. The well shielded location allows it to search for previously unidentified particles which penetrate the rock, without interference from cosmic rays.

Moving on to the work of the Sudbury Neutrino Observatory, experiments observing the three flavours of neutrino had recorded anomalies in the relative proportions in solar emission. This was suggestive of neutrino mixing, a theory that neutrinos can change flavour whilst in transit from the Sun. Such behaviour is observed in other fundamental particles, but requires the mixing particles to have mass. Thus there is evidence that neutrinos may have mass, and may therefore play a part in the dark matter problem.

The speaker also believed that the "gravity-waves" which Einstein's general relativity predict binary star systems should radiate would be detected in the next decade using arrangements of masses similar to the Michelson interferometers which supported Einstein's special relativity for light. Prof. Edmunds went on to discuss what astronomers might achieve, pointing out how far astronomy had come in the 1990s, and showed an image of a Gamma Ray Burst as an example. These newly observed phenomena are little understood, but

emit such intense gamma radiation that they would sterilise an area of space for many light years around, making life impossible in that region.

Prof. Edmunds showed a galaxy which had been placed at redshift 6.56 by its Hα line. Such a redshift is suggestive of a very newly born galaxy, and the speaker viewed the next decade as an unprecedented opportunity to view the whole of galactic history. To illustrate this further, a cluster of galaxies were shown at redshift 4.1, with the early signs of structure clearly visible.

Moving onto the instrumentation of the next decade, the speaker identified the Gaia satellite as one to watch. This will measure stellar parallaxes from the Lagrange point - a solar orbit which closely follows that of the Earth. It hopes to improve the resolution with which these parallaxes can be determined to 4 microarcseconds, which compares well with the Hipparcos satellite, whose 10 milliarcsecond resolution is currently the best available. To illustrate how fine this resolution is, the speaker pointed out that relativistic aberrations due to the solar gravitational field have to be considered on microarcsecond scales.

Moving onto ground-based telescopes, the speaker anticipated that the square kilometre array would be a vital tool in studying stellar formation processes by probing galaxies up to redshift 3. Computational models have proved unsatisfactory since the density difference between the interstellar medium and stellar material is 22 orders of magnitude and not easily simulated. For example, it is observed that protostars emit jets similar to those seen at the poles of quasars. This phenomenon is therefore seen in two different objects with many orders of magnitude difference in size, yet still it remains unexplained. There are still many proposed designs for the square kilometre array, and construction is not due to commence until 2010.

Prof. Edmunds also keenly awaited data from the Very Large Telescope Interferometer (VLTI), which could achieve sufficient resolution in the infrared to resolve surface features on Betelgeuse. Looking further ahead, he believed the OWL 100 metre instrument might reach fruition in around 15 years, using adaptive optics with a laser guide star to achieve optimum resolution in the visible/infrared.

Finally, the speaker speculated that developments in the search for extrasolar planets might be the most exciting. Such studies to date have produced most surprising results, finding a number of large gas giants in very close orbits to their parent stars. The studies have also found that many planetary systems have very eccentric orbits. This contrasts with our own solar system in which the planetary orbits are near-circular, with the gas giants in the outer regions. Prof. Edmunds concluded that there was much to be done in the next decade.

After much applause, the President added that it was interesting to think how much amateurs might contribute in the future as well. The meeting was adjourned for tea, after which Mr. Jonathan Shanklin was invited to give Sky Notes.

Sky Notes

Mr. Shanklin opened by commenting on the increase in solar activity in recent weeks, with numerous solar flares and opportunities to observe aurora. These are frequently visible across the UK, but are often faint and low in the northern sky, and so obscured by light pollution.

The speaker went on to show an image by Maurice Gavin of the conjugation of Jupiter, Saturn, Mars, Venus and Mercury. A computer simulation was used to illustrate how the conjugation would develop in the following month, highlighting in particular an opportunity on May 4th to capture Comet 2002 F1 and Mercury in the same field of view. May 14th was also highlighted as a good photographic opportunity, when the Moon would join the planetary conjugation.

The speaker encouraged members to observe Jupiter, showing the recent passage of a white oval past the Great Red Spot. It had been anticipated that there would be some interaction, whereas in fact the two passed each other peacefully. The speaker commented that you can never predict what Jupiter will do. He also encouraged observation of Saturn, but warned that the surface is generally more bland and its low altitude in the current sky gives poor seeing.

Mr. Shanklin moved on to report on the comet scene, displaying a number of images of Ikeya-Zhang which at mag. 4.5 remained a naked eye object for dark skies. A link to the Hevelius 1661 comet had been proposed, which could also be extrapolated back further to a 1273 comet. The speaker expressed the opinion that Ikeya-Zhang could be a fragment of the 1661 comet, which would reconcile a comparison of that comet to Altair with the somewhat fainter Ikeya-Zhang. For the more adventurous, Snyder-Murakami (2002 E2) and Utsunomiya (2002 F1) were recommended at around magnitude 11. The speaker showed an image of the latter by Bjørn Granslo with a broad tail visible. It was commented that amateurs still have a good chance of discovering comets in the area of the sky away from opposition, where LINEAR concentrates its observation.

Finally, the speaker mentioned the main meteor event of the following month would be the Aquarids, peaking on May 4th. They were not, however, expected to produce a spectacular rate, although the occasional fireball was possible.

Following the applause for Mr. Shanklin's informative talk, the President introduced Dr. Martin Griffiths of the University of Glamorgan, who teaches a science fiction degree.

RoCCoTo Telescope and lifelong learning in astronomy

Dr. Griffiths explained that the RoCCoTo telescope was an acronym for Robotic Cyberspace Community Telescope and Observatory, and was a project at the University of Glamorgan to provide observing time to schools over the Internet. The speaker was grateful to British Telecom for making an award which helped fund the purchase of a 16 inch Meade LX200 with CCD. The telescope is a part of the National Schools' Observatory, which has a network of such instruments around the world. This means that when it's cloudy in Liverpool, observers trying to make use of RoCCoTo can make their observations at other sites with better conditions. The speaker jested that observers in Japan might consider Liverpool an exotic and exciting place to make observations.

Dr. Griffiths envisaged schools might use the observatory to make lunar and planetary observations, as well as to study objects such as comet Ikeya-Zhang. Supernova and comet hunting were also possibilities for the future. The speaker explained that whilst there had been some interest in optical SETI, he was unsure of how realistic such projects would be. The speaker commented that it is the experience of most astrophotographers that they spend many cloudy nights unable to take images. He hoped that such a network of observatories would allow astronomers to admire the heavens even when the weather was not favourable.

Dr. Griffiths went on to discuss a course he ran in astronomy at the University of Glamorgan. The course focussed on presenting material in a non-mathematical way, with more difficult material explained by philosophical means. He believed this was an important step in furthering the public understanding of astronomy. The speaker said that the course had attracted an age range from 14 through to 88, and had something to offer for everyone. Even professional astronomers often don't know their way around the sky.

In response to questions, the speaker explained that RoCCoTo would be sited on the roof of his office to avoid vandalism, and hence it would not be possible to give observers access to such a cramped site. Copyright and licensing arrangements for the images were still to be decided, but the speaker hoped to make all images from the telescope public domain. Amateur observers would be able to observe for free, whilst schools would pay a small annual subscription for the service.

Following much applause for Dr. Griffiths' entertaining talk, the President proceeded to deliver a talk himself on the value of historical records in astronomy.

The value of historical records in astronomy

Mr. Hurst opened by outlining a problem which many astronomical archivists face - that of an accumulation of photographic observations which are deteriorating as time passes. An effective solution is to scan the images to digital format before they fade, although this is itself often a substantial undertaking. To emphasise the value of maintaining such archives, the speaker referred to Richard Stevenson's talk at the January meeting, where the geographic locations of historical eclipses had been used to monitor changes in the Earth's rotation rate. Furthermore, Jonathan Shanklin's Sky Notes had illustrated the value of matching historical comet observations to the comets we see today to find their orbital elements.

The speaker commented that we have Chinese astronomical records dating back over 3000 years and that these often record supernovae as "guest stars". Their nature was never investigated by the observers, however. It was not until 1974 that a sky patrol was formed to create a survey of the sky which could be used to verify supernova discoveries. This was followed in 1976 by the formation of the UK nova/supernova patrol which benefits from the support of many BAA members. The speaker referred to the light curve of β Herculis, which showed an unexpected minimum in 1934. The speaker commented that despite three millennia of supernova observation, the distinction between nova and supernova had still not been made at this stage.

Mr. Hurst observed that the Central Bureau lists only four confirmed supernovae prior to modern times, in 1006, 1054, 1572 and 1604 AD. Earlier supernova reports include those of 386, 393 and 1181 AD, but the positions were only recorded by asterism, and have not been successfully linked to remnants. All of these were recorded by Chinese observatories, but scarcely noted at all in Europe. The event of 1006 was a mere three degrees above the European horizon, but was observed at St. Gaulle in Switzerland. It seems surprising, then, that there are no known records of observation of the 1054 event from Europe. This event was recorded

by the Chinese as a mag. -4 guest star in Taurus for 18 months, and so must have caught the attention of European observers.

The event of 1572 in Cassiopeia was studied by Tycho Brahe and represented a significant advance in understanding of such occurrences. Prior to this, it was believed that guest stars were at similar distance to the Moon, in accordance with belief in unchanging heavens. Tycho disproved this by failing to observe any parallax on the guest star.

The speaker stressed the value of maintaining archive material with the example of an image by D.Jones which the sky patrol filed in 1974. This apparently uninspiring image was only found to be of use when a professional discovered the spectrum of a nova well past maximum at mag. 11. The earlier image was used to construct a light curve from historical records.

As a closing point, the speaker commented that astronomy is one of the few fields where we can not only speculate about the past, but also view it. As an example, the Veil Nebula tells of a 30,000 year old supernova event.

The President then invited Dr. Nick Hewitt, director of the Deep Sky Section, to address the meeting.

The deep sky scene of late spring

Dr. Hewitt opened by expressing his gratitude to the University of Wales and Cardiff Astronomical Society for hosting the meeting. He stated that in the summer months there was less time for observation, but more exciting objects. In this talk he would discuss the "Main Corridor" which stretches from Ursa Major to Leo.

The speaker opened his discussion with Mizar and Alcor - the middle stars of the bear's tail in Ursa Major - which was discovered to be a binary of separation 11.8' by Riciolli in 1650. This was not only the first binary to be discovered telescopically, but later the first spectroscopic binary to be found. Pickering showed in 1889 that it was composed of 6 stars. Dr. Hewitt commented that Ursa Major is our nearest star cluster, and that Dubhe (123ly) and Alkaid (106ly) move in the opposite direction to the other five members of the cluster.

In Coma Berenices, the speaker recommended the open cluster (Melotte 111) and described the Coma-Virgo cluster of galaxies (Abell 1656) as possibly the greatest of the Abell galactic clusters. The speaker also suggested the two contrasting globular clusters M53 and NGC5053 as prime observing targets. The latter was described by Walter Scott Houston as "a little gem of woven fairy fire".

Dr. Hewitt commented that the local supercluster is best viewed in spring, since we are close to one side of the cluster, and it is spring when we can see into it. Whereas the autumn sky offers only the Andromeda and Fornax galaxies, the spring sky offers a much richer view. The sedate spiral of M81 is one of the best known, and M109 is also well worth a look. The former is an active star forming region, in the aftermath of a close encounter which stirred up its dust content.

The speaker showed a superbly illustrated tour of many of the most interesting observing targets in Canes Venatici, which includes the whirlpool (M51) and M94, which appears elliptical but has a faint halo and is in fact spiral. Of particular interest were 19th century photographs by Welsh astronomer Dr. Isaac Roberts, who had taken a number of excellent images, often exposing for up to 4 hours using his Cooke.

Dr. Hewitt made brief reference to the work of the supernova patrol, commenting that Tom Boles' recent discovery of three supernovae within a week had brought him to a total of 22 discoveries, whilst Mark Armstrong had 37 supernovae and Ron Arbour 6. To close, the speaker extended "deep sky" to the limit with a Ratledge photograph of the Twin Quasar, which is 5 billion light years distant.

Following much applause for Dr. Hewitt's superb slideshow, the President thanked Cardiff Astronomical Society for hosting the afternoon, and adjourned the meeting until May 28th at Savile Row.

Dominic Ford