Newsletter

WELLINGTON ASTRONOMICAL SOCIETY

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Wednesday, 5th of October,
7:30 PM at Carter Observatory

KiwiSpace Foundation

World Space Week
October 4 - 10

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THIS MONTH'S MEETING

FEATURES
IMAX Hubble 2D

10-2011

IMAX HUBBLE 3D

Wellington Astronomical Society

Presidents Report for October 2011

The sky from Thorndon Wellington - Canon EOS 30D, 23" f4.5, Iso 1000, 26/09/2011 10:06PM

SUBS ARE NOW DUE Please pay early. You should have received a subscription reminder by email or post.

Due to increasing costs of printing and postage subscription fees have been increased but a discount of $20 will be given if you are happy to receive your newsletter by e-mailed links to download from our website.

It is time to start thinking about the WAS AGM and whether you would like to stand on the Council as it is now time for a change.

Forms will be available at the meeting for:
- Paying subscriptions.
- New Membership and
- Nomination to Council.

Membership Survey This coming meeting is going to be one of the largest meetings we have held, we have had a request from Carter Observatory and KiwiSpace to run the Hubble Film as our meeting falls in the middle of 'World Space Week October 4 - 10'. This film is a first for NZ and is not allowed to be shown in public cinemas and the Wellington Astronomical Society is privileged to be able to screen this film which has not been shown anywhere else in NZ. Duration of the films is 44 minutes. We allowed for 40 of our members and 40 general public to attend. However general public will be encouraged to pay a Koha for this privilege and there will still be a general Koha for the supper which will follow the film. Members coming to the meeting will have their names checked off and as will public who are attending. There will be members of WAS running the Front Desk at Carter from 6pm. The October meeting was to have been Professor Matt Visser from Victoria University but a request from Carter and KiwiSpace has seen this talk postponed until next year. Matt is ok with this change.

Last month's DVD entitled 'Journey to the Edge of the Universe' was very good and enjoyed by all the members who attended.

The WAS council has received a nomination for a Life Member we will discuss more about this in the next newsletter as this nomination has to go to a full meeting and will therefore be presented at the AGM in November.

The Research Group is now going from strength to strength with another area of research about to be introduced.

Memorandum of Understanding (MOU) agreement between WAS and Carter Observatory was emailed around the council members as it was required to be signed and returned. It enables WAS to use the rooms for no charge provided that we continue to provide assistants on public viewing nights and that we have a Carter staff member at our meetings to lock up. If we do not have a WAS Carter staff member on hand WAS has to pay for a Carter staff member to be available to lock up.

Next month will be the WAS AGM and we have invited Gary Sparks from President of the Napier Astronomical Society to present to us his fascinating presentation about Space Stamps. This talk will be similar to the talk he presented at the recent RASNZ conference in Napier.

We are still trying to get our 6" dobsonians returned so that they can be checked. So if you have one we would like it returned at the next meeting. I have already have two returned. We have other members waiting for these telescopes. The society has bought two Barlow Lens which are available to go with the WAS Dobby's.

The WAS Library is about to get a makeover with Lesley Hughes who had volunteered to sort out so that we only keep what is necessary. The Old Sky & Telelescope Magazines along with the Old Astronomy magazines with be either given away to members or donated to a school. Older books will also be given away.

We are still requiring members to assist at the Carter Observatory observing on Saturday nights so if you haven't volunteered yet now is your chance to do so. Register your name with Gordon at the next meeting.

The observing at Pauatahanui in September has not been successful and being clouded out on both occasions. Perhaps the sooner we move the observatory to a more accessible spot the better.

The new exhibition at Carter named the Pickering Gallery is now open and this gives you a great in depth look into William Pickering the Kiwi Rocket Man.

NO OBSERVING AT PAUATAHANUI

OBSERVE THE MOON NIGHT

With Saturday 8th October being International Observe the Moon night the society has decided to NOT hold an observing evening at Pauatahanui this month but to join in with the Tawa College Astronomy Group who are holding Observe the Moon Night on the Saturday starting at 7.30pm. Remember with daylight saving it won't get dark till 7.30pm All WAS members are welcome remember we have access to Tea & Coffee and toilets.

Third International Starlight Conference

The Royal Astronomical Society of New Zealand along with the University of Canterbury are organising and hosting the Third International Starlight Conference. This conference will be held in Tekapo from the 11th to the 13th of June 2012.

The conference will be a multi-disciplinary meeting, and contributions will be welcome that not only include scientific and technical aspects of starlight, but also on themes which are educational, cultural, environmental, aesthetic, legal or political. It is hoped to include astro-tourism, Maori astronomy and public outreach through star-gazing. The relationship between stars and the ecology of the nocturnal biosphere will also be discussed.

See **http://starlight2012.org/** and

http://www.starlight2007.net/

for further details.

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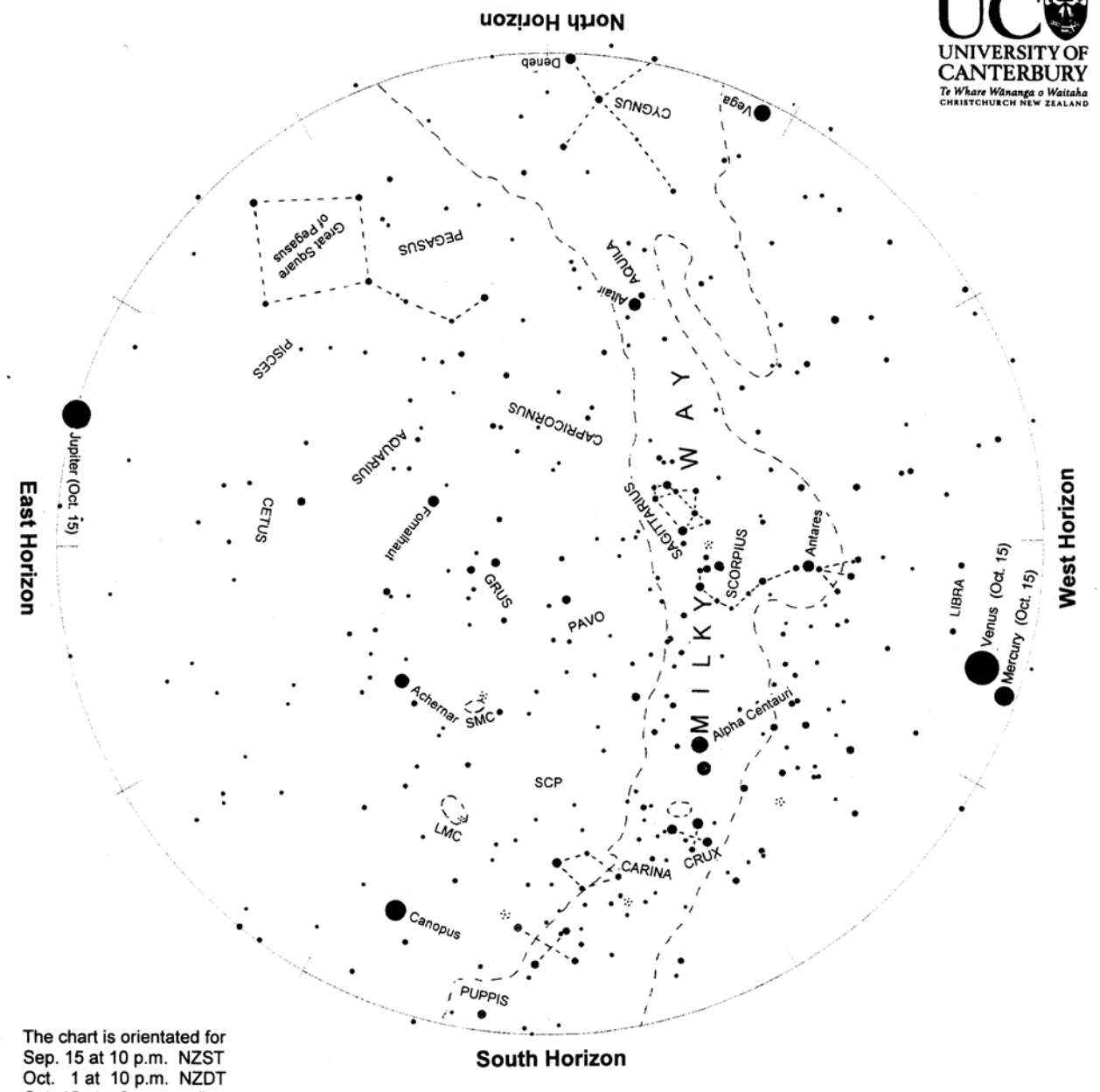
September 2011 Crossword answers

Across

1. SCORPIUS, constellation with a sting; 5. HST, an orbiting telescope; 6. JEWELBOX, Kappa Crucis Cluster; 8. ICE, frozen liquid; 9. KUIPERBELT, Pluto is the largest known member of this region of the solar system; 10. POLAR, … bear; 12. SUN, closest star; 13. MASS, I weight 6 times less on the Moon, but still have the same ???; 15. COLLIMATION, to align optics accurately; 19. NASA, space agency; 21. UFO, flying saucer; 22. VULPECULA, northern constellation of the fox; 24. DENEB, alpha Cygnus; 25. SETI, BEM search; 26. GEMINI, one of the twins; 27. NADIR, opposite to zenith; 29. LOKI, volcano on Io; 33. KIRKWOOD, … gaps in the asteriod belt; 36. ANDROMEDA, Largest galaxy in the Local Group; 37. NOVA, a new star; 38. GAS, solid, liquid or …; 40. ORIONIDS, October meteor shower; 42. ALTAIR, Alpha Aquilae; 44. BLUEGIANT, O or B type star that has left the main sequence; 45. BAR, some spiral galaxies have one; 46. RETROGRADE, when a planet appears to move 'backwards' from its normal motion across the sky; 50. DAY, 24 hours; 52. EUGENIA, asteriod with its own moon; 53. STAR, rats (anagram); 54. PLANETARIUM, sky simulator; 56. OPPOSITION, when a planet and the Sun are in disagreement about the Earth; 58. SMC, satellite galaxy to the Milky Way; 59. PARSEC, spacer (anagram);

Down

1. SAGAN, astronomy popularizer; 2. SEVEN, sisters in M45; 3. DEIMOS, A satellite of Mars; 4. SOHO, satellite observatory studying the Sun; 5. HOUR, unit of time; 6. JULIANDATE, the number of days since January 1, 4713 BC; 7. VENUS, a very cloudy planet; 11. ARCSECOND, cored cans (anagram); 14. AQUARIUS, The water constellation; 15. CHAOS, Maxwell Smart's nemesis; 16. LMC, could be mistaken for a cloud; 17. METEORITE, a shooting star that reaches the ground; 18. TIDE, "… and time wait for no man"; 20. JUPITER, largest planet in the solar system; 23. PELE, volcano on Io; 28. PLASMA, fully ionised gaseous state of matter; 30. YEAR, Period of Earth's revolutionn about the Sun; 31. POLARLANDER, roll a red pan (anagram); 32. AMATEUR, unpaid astronomer; 34. INFRARED, just beyond the red end of the spectrum; 35. MARS, God of war; 39. HALO, angels and galaxies both have one; 41. DINOSAURS, an asteroid may have done them in; 43. LEO, A lion circling the Earth; 47. ORION, the hunter; 48. COSMIC, "… censorship" - why Black Holes can't be naked; 49. NEAP, tide; 51. NOON, mid-day; 55. LGM, acronym for aliens; 57. IO, One of the Galilean satellites;



The chart is orientated for
Sep. 15 at 10 p.m. NZST
Oct. 1 at 10 p.m. NZDT
Oct. 15 at 9 p.m. "

Evening sky in October 2011

To use the chart, hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge. As the earth turns the sky appears to rotate clockwise around the south celestial pole (SCP on the chart). Stars rise in the east and set in the west, just like the sun. The sky makes a small extra clockwise rotation each night as we orbit the sun.

Venus is low in the west at dusk. It is joined later in the month by Mercury. On the opposite side of the sky Jupiter shines with a steady golden light. It is due north by midnight and sets in the west at dawn. Canopus is in the southeast moving up into the eastern sky. Vega sets on the opposite horizon. Crux, the Southern Cross, and the Pointers are in the south-west. Midway down the western sky is orange Antares at the heart of Scorpius. The Scorpion's tail, a.k.a. the fish-hook of Maui, curls up the sky. The Milky Way spans the sky from north through west and into the south. The Magellanic Clouds, nearby galaxies marked as LMC and SMC on the chart, are misty glows above Canopus.

Chart produced by Guide 8 software; www.projectpluto.com. Labels and text added by Alan Gilmore,
Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo 7945, New Zealand. www.canterbury.ac.nz

The Evening Sky in October 2011

Bright planets enliven the early evening sky. Venus and Mercury are low in the west. They set later as the month progresses. On the opposite side of the sky Jupiter rises around 9 pm in early October. By the end of the month it will be in the east as the sky darkens.

At the beginning of October brilliant Venus sets an hour after the sun. Mercury, much fainter, climbs into view in mid October. It is swinging out from the far side of the sun. Mercury moves slowly toward Venus, passing it near the end of the month. The two planets will make an eye-catching pair in the twilight. Their closeness is a line-of-sight illusion, of course. Venus is on the far side of the sun 240 million km from us. In mid October Mercury is 210 million km away but rapidly approaching. Both are small in a telescope.

Jupiter rivals Venus for the title of 'Evening star'. It is the brightest 'star' in the late night sky, shining with a steady golden light. Binoculars and small telescopes show Jupiter's brightest moons close to the planet, swapping sides from night to night. Jupiter is around 600 million km away from us now.

Canopus, the second brightest star, is in the southeast at dusk. It swings up into the eastern sky during the night. Canopus is a truly bright star: 13 000 times the sun's brightness and 300 light years* away. On the opposite skyline is Vega, setting in the late evening. Vega is the 5th brightest star. It is 50 times brighter than the sun but dimmed by its distance of 25 light years.

In the southwest are 'The Pointers ', Beta and Alpha Centauri, making a vertical pair. They point down to Crux the Southern Cross. Alpha Centauri, the top Pointer and the brightest star in that area, is the closest naked eye star. It is 4.3 light years away. A telescope magnifying 50x shows it as two stars. Beta Centauri, like most of the stars in Crux, is a blue-giant star, very hot and very luminous, hundreds of light years away.

Midway down the western sky is the orange star Antares, marking the heart of the Scorpion. The Scorpion's tail loops up the sky , making a back-to-front question mark with Antares being the dot. The curved tail is the 'fish-hook of Maui' in Maori star lore. Above and right of the Scorpion's tail is 'the teapot' made by the brightest stars of Sagittarius. It is upside down in our southern hemisphere view.

The Milky Way is brightest and broadest in Scorpius and Sagittarius. In a dark sky it can be traced down past the Pointers and Crux into the south. In the north it tracks down the north sky to the right of Vega. From northern parts of New Zealand the star Deneb can be seen near the north skyline. It is in a broad part of the Milky Way and is the brightest star in Cygnus the swan.

The Milky Way is our edgewise view of the galaxy, the pancake of billions of stars of which the sun is just one. The thick hub of the galaxy, 30 000 light years away, is in Sagittarius but is mostly hidden by dust clouds in space. These 'interstellar' dust clouds appear as gaps and slots in the Milky Way. Binoculars shows many clusters of new stars and some glowing clouds of left-over gas scattered along the Milky Way.

The Large and Small Clouds of Magellan, LMC and SMC, look like two misty patches of light in the southeast sky. They are easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The LMC is around 160 000 light years way; the SMC around 200 000 l.y away.

After twilight ends on moonless evenings in a dark rural sky the Zodiacal Light is visible in the west. It is seen as a faint broad column of light. It is sunlight reflecting off meteoric dust in the plane of the solar system. In very dark skies a pale glow called the Zodiacal Band can be traced across the sky.

Mars (not shown) remains low in the northeast dawn sky; a medium bright orange 'star'. At the beginning of the month it will be sitting in the Praesepe star cluster, a hazy patch of light to the eye. It moves steadily eastward (rightward) through the month. It is 260 million km away and tiny in a telescope.

**A light year (l.y.)is the distance that light travels in one year: nearly 10 million million km or 10^{13} km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes four years to reach the nearest star, Alpha Centauri.*

Notes by Alan Gilmore,
University of Canterbury's
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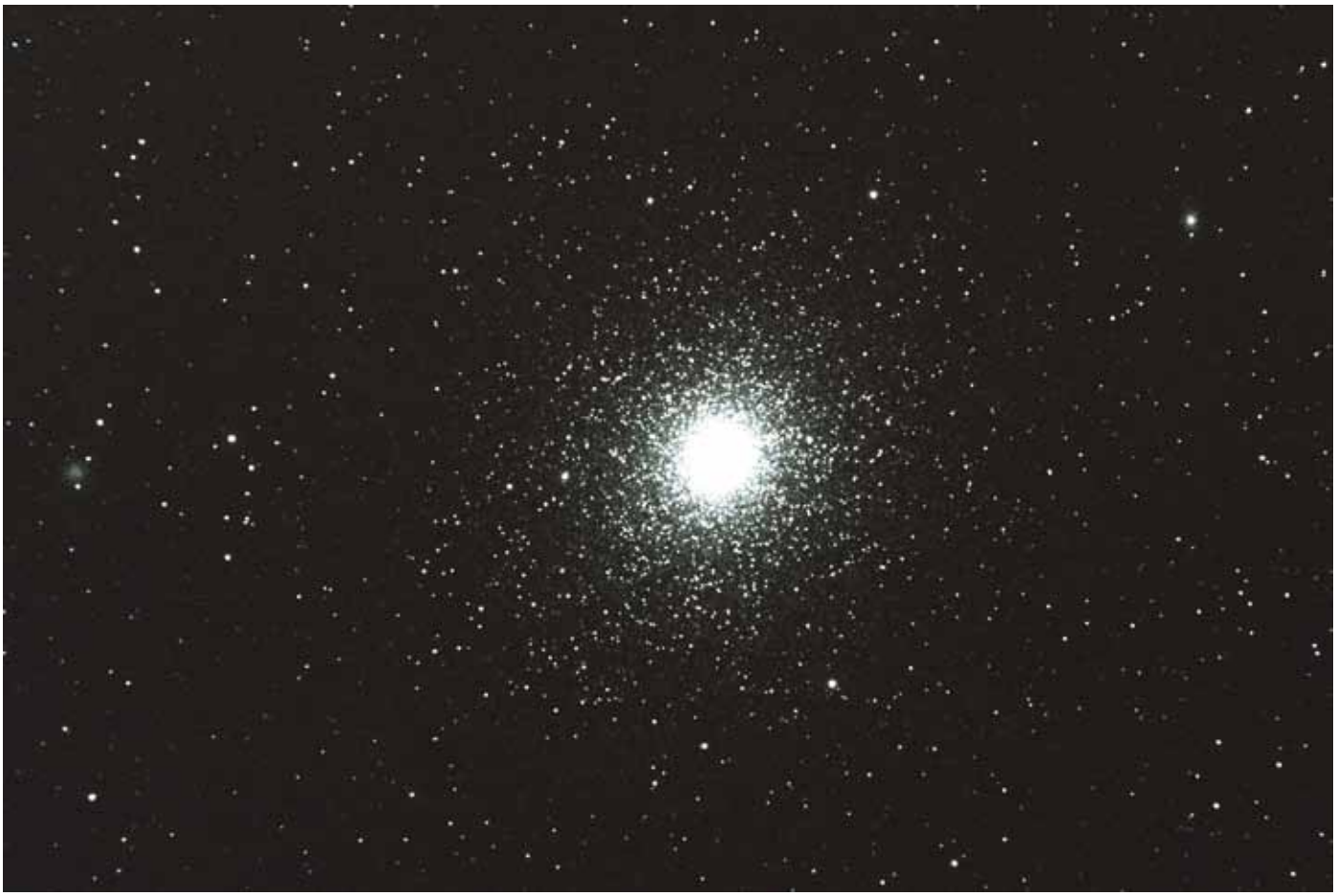
John Field's astrophotography page



47 Tucanae (NGC 104) Image and text by John Field

The second brightest globular cluster in the night sky is surpassed only by Omega Centauri. Covering the same area as the full Moon this cluster is visible to the unaided eye as a fuzzy star near the Small Magellanic Cloud in the constellation of Tucana. This cluster has the an estimated mass of 10 million times that of our Sun and there is some evidence that a Black Hole 1500 times the mass of Sun may reside at the core of this cluster that may explain its unusually high density compared to other Globular Clusters. 47 Tucanae is estimated to be 16,000 light years away making it amongst the closest globular clusters to us. On the left side of this image can be seen the globular cluster NGC 121 and to the upper right NGC 291, both are background globular clusters belonging to the SMC.

This image was taken using a Canon 1000D camera at ISO 800. 20 two-minute images were taken using a Skywatcher 80 mm f-5 refractor and BackyardEOS. The images were then stacked, flat fielded, and dark subtracted using Deep Sky Stacker and processed in Adobe Photoshop 6.0

The lights will be on each evening from 10 September until 23 October."

Light Pollution in Wellington and Christchurch

"And Wellington is into this as well. The Carter Observatory has had a clear sky ruined by a searchlight at the waterfront pointing its light over the observatory. And worse has followed if the promise in this press release from Victoria University has been fulfilled:

"This Saturday the night sky over Wellington will come alive with lights being beamed across the city. Victoria University has teamed up with key supporters to present 'Lights over Victoria', a project designed to shine lights over Wellington during the months of September and October.

High-powered beams will be projected from a building at each of Victoria's Kelburn, Te Aro and Pipitea campuses and will converge over the CBD.

Christchurch's White Lights of Hope have not met with universal acclamation. This copy-cat idea -- see New York -- was instigated by Janine Morell-Gunn, of Whitebait-TV. The following paragraphs are a compilation of opinions posted to the nzastronomers Yahoo! group.

"Semi-permanent xenon lights will range around Christchurch's sky every night till 23 February. So any attempt to do astrophotography near Christchurch is now out of the question. Surprisingly there is no push to have them turned off at midnight, or have them on once a week, etc."

"This type of thing has set a precedent for much more light pollution in NZ. How many other centres will think something like this is a good idea and have lights on all the time? (Well, Wellington for a start. See below.)"

"There are complaints about green lasers being pointed at aircraft, yet these lights are allowed to go over all the sky. One would expect that the glare seen from the air would be as dangerous as a laser. Christchurch was quick to adopt Earth Hour as a symbol to save power. All these lights do is waste power and cause massive light pollution. The government has TV adverts asking people to save energy. Meanwhile the Christchurch council allowing it to be wasted on projects like this."

"Westpac is said to be paying for the energy wasted by the lights. But who really pays? You and I do indirectly through higher bank fees, etc. Nothing like this is free. You pay for it one way or another."

A lighthouse for Canopus (aka the Argo Navis' Navigator)

We are proud of our capital city location and this light show will contribute to the amazing atmosphere that will grip the city during the exciting sporting and cultural events planned for that time, says Andrew Simpson, Chief Operating Officer."

Fuji Xerox, Dimension Data, EMC, Mainzeal, Downer and NEC Business Solutions have come on board to sponsor what they regard as a unique chance to work with a key client Victoria University to shine a light on the city of Wellington.

Research Astronomy Group's Page

The main areas we have decided to focus on are Variable Stars and Occultations. Many of the group already observe one or both.

Murray Forbes is leading the Variables group and set us home work to map and locate a known eclipsing binary variable star RS Cha (Chameleon) also known s Tycho 9403-1987-1 at RA 8:43:12, Dec -79:04. This should be visible above 0 deg altitude year round so is not season dependant. John Talbot is leading the Occultation group and is publishing predictions for the Wellington area on our web site at http://was.org.nz/01Occs.html.

These include both Lunar events that should be visible in a 6 inch telescope and Minor Planet events that may be a bit dimmer but which have high probability of being seen. Even if you do not have recording equipment it can be fun in the evening to observe a star disappearing behind the dark edge of the moon during the first half. Or if you like getting up real early and want a harder challenge try for some bright reappearances during the second half of the cycle.

The Research group meets each month at 6:30pm before the main meeting.

Please feel free to come along and join in if you are interested. This is also a good time to bring along that telescope or observing problem you may have for discussion.

OBSERVING AT THOMAS KING

All public observing evenings will be held at the Thomas King Observatory run by our Observatory Director Ross Powell. from 8:00 pm. **Ring Ross on 389 9765 t**o check if there are public observing evenings on most FRIDAYS, starting as soon as it gets dark depending on the weather and Ross's availability.

Lunar Occultation of Mercury

We note that there is a daytime occultation of Mercury coming up on Friday

28 Oct (also New Moon).

day Time P Object Sp Mag Mag % Elon Sun Moon y m d h m s No D v r V ill Alt Alt Az 11 Oct 28 2 9 22 Disappear Mercury -0.3 -0.3 2+ 18 51 66 325

Duration of planetary disk occultation: predicted time ±7.5 secs 11 Oct 28 3 29 14 Reappear Mercury -0.3 -0.3 2+ 18 37 54 295

The event map shows it covering all of Australia and NZ.

As this will be close to sun at same time any observation should be done with great care Not to point your eye, binoculars, telescope etc at the sun itself. This will make this for a challenging observation. Filters or aperture stop will be required if you are using your normal occultation set up.

Formation of a Digital SLR Variable Star Observers Group:

John Field

The introduction of DSLR cameras has been a boon to astrophotographers but recently there has been a number of observers experimenting with DSLRs to conduct observation of variable stars.

The equipment needed to do this is a Canon DSLR camera and normal lesnses, tracking is optional as it appears there are a number of bright variables visible in 30 second exposures.

A tutorial and information is on this type of imaging can be found at: http://www.variablestarssouth.org . I am interested in creating a local group to share ideas, efforts and hopefully results! If you are interested in joining this programme please contact me at john.field@paradise.net.nz.

Comet Elinin C/2010 X1 Breaks Up

For some reason internet cranks latched onto Comet Elenin C/2010 X1 and made dire predictions of its effect on Earth when it passed by in October. Among other claims were that it was a brown dwarf star and that it would block out the sun for three days. For a selection of fearful questions, and answers by people at the Jet Propulsion Laboratory, see http://www.jpl.nasa.gov/news/news.cfm?release=2011-255

(*continued in page 9*)

(*continued from page 8*)

Ironically the comet has broken up so is unlikely to even be visible in October. On August 31 Dan Green of the IAU's Central Bureau reported in CBET 2801 that observations by Michael Mattiazzo of Castlemaine, Victoria, showed the comet to be disintegrating. This followed a notable fading of the comet from August 17 to 22 and the comet becoming dispersed in CCD images. An image taken by Mattiazzo on August 27.37 UT showed the nuclear condensation spread out into an elongated, diffuse smudge, reminiscent of comet C/1999 S4. Robert McNaught confirmed this appearance on images taken with the Uppsala Schmidt telescope at Siding Spring, noting that there is absolutely no condensation visible, making astrometry very difficult.

Many comets have been seen to disintegrate in this way. The 'dirty snowball' that is the solid part of the comet simply breaks into pieces that evaporate away. From its faintness it was apparent that Comet Elinin had a small nucleus in the first place, estimated at 3-5 km across.

L. Elenin of Lyubertsy, Russia, has since discovered periodic comet P/2011 NO1. It was initially filed as an asteroid before a slight fuzz around it was noticed. P/2011 NO1 circles the sun in 13 years. It was discovered remotely with 0.45-m f/2.8 astrograph at the ISON-NM Observatory, Mayhill, USA.

As well as the late Comet Elenin something called Nobiru is headed our way intent on our doom. As if the Mayan calendar and the global economy weren't enough to worry about...

The medical effects of light pollution

Excessive light is a problem for everyone, not just amateur astronomers. Sky and Telescope readers are well aware of the many problems associated with light pollution, such as energy waste, sky glow, and environmental impact. But not many people know about the burgeoning growth of research that demonstrates direct human-health issues related to excess light. In fact, health effects might ultimately be the most important reason to control light pollution.

The energy wasted by excessive lighting is produced mainly by burning fossil fuels, leading directly to air pollution that causes higher asthma rates and increased respiratory problems for people with lung disease and other medical is sues. Glare is the most common health safety problem resulting from poorly designed outdoor lighting. You have probably noticed poor vision stemming from glare on a dirty windshield. Over time, calcifications build up in the lenses of our eyes, which eventually develop into a cataract. These calcifications and other lens and eye imperfections scatter light in a similar fashion to a dirty windshield.

This effect grows more severe with age, and it's the primary reason why elderly people have a difficult time driving at night near poorly designed streetlights. Most people with this problem are not even aware that glare is the main cause of their poor night vis ion, and that they could drive more safely if streetlights were properly designed. Recognizing this fact, the American Medical Association (AMA) adopted a resolution in 2009 urging full shielding for all public street lighting.

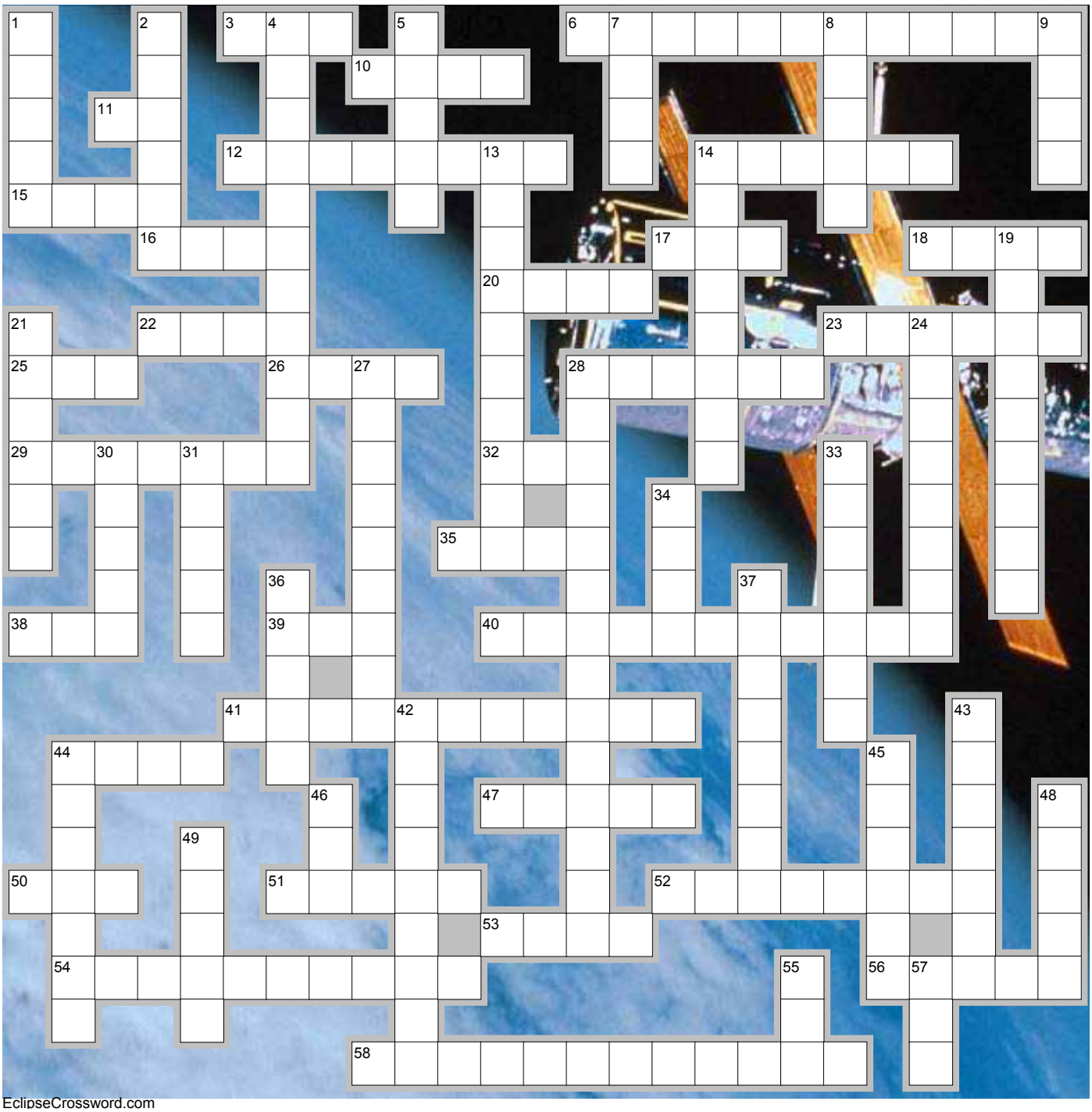
A hot new area of research is how night light disrupts our circadian rhythm. Numerous papers over the past 15 years have led medical researchers to conclude that night light increases the incidence of certain cancers, most notably breast cancer. In fact, researchers now estimate that up to 30% of breast cancers may be due to light at night suppressing circadian rhythm. The research basis for this conclusion has become so compelling that the World Health Organization recently declared circadian-rhythm disruption to be a class 2A carcinogen - placing it on the same level of severity as the effects of tobacco smoke on lung cancer. The biochemical mechanism for this problem has been thoroughly researched and is thought to result from the suppression of melatonin production by the pineal gland in the center of OUI brain. This gland produces melatonin while we sleep. Repeated exposure to light at night markedly suppresses melatonin production. Previous research has shown that this hormone helps the immune system suppress the development of several types of cancers.

As an elected member of the AMA's Council of Science and Public Health, I have asked the world's five foremost researchers on this subject to help me draft a review paper to summarize these important studies. This report should be available to the public within a year, and I hope it will help governments adopt sensible and rational lighting policies .

Article taken from the September 2011 number of SKY & TELESCOPE, p 86

Mario Motta, M.D. , is a cardiologist at the North Shore Medical Center in Salem, Massachusetts, and a recent president of the Massachusetts Medical Society. A devoted amateur astronomer, he authored the article about building his dream observatory in the May 2011 issue (page 32). To watch a video oj Dr. Motta discusing light pollution, visit SkyandTelescope.com/Motta.

Cross Word with Murray Forbes



EclipseCrossword.com

Across

3. could be mistaken for a cloud; 6. an omen leading to the Battle of Hastings (1066); 10. mid-day; 11. One of the Galilean satellites; 12. the longest day; 14. Andromeda is one; 15. angels and galaxies both have one; 16. tide; 17. satellite galaxy to the Milky Way; 18. satellite observatory studying the Sun; 20. I weight 6 times less on the Moon, but still have the same ???; 22. alpha Lyr; 23. a double star; 25. acronym for aliens; 26. space agency; 28. Pluto's Moon; 29. A darker patch on the Sun's surface; 32. an arrested atom; 35. the Sun sets in this direction; 38. some spiral galaxies have one; 39. A lion circling the Earth; 40. to align optics accurately; 41. cosmological theory proposed by Fred Hoyle; 44. God of war; 47. the hunter; 50. frozen liquid; 51. Encke is one; 52. some is in (anagram); 53. obscures centre of our galaxy; 54. a mirror will do this to light; 56. Maxwell Smart's nemesis; 58. radio source at the centre of the Milky Way;

Down

1. Tellus; 2. light particle; 4. asteroid; 5. shout (anagram); 7. smallest indivisible piece of a element; 8. astronomy popularizer; 9. "... and time wait for no man"; 13. recent lunar surveyor; 14. very high energy particle; 19. a nebula; 21. fully ionised gaseous state of matter; 24. a wobble in a planet's polar axis; 27. can be used to indicate distance to a galaxy; 28. lions act stolen (anagram); 30. opposite to zenith; 31. ... bear; 33. caused by mass (Newtonian viewpoint); 34. New Zealander; 36. a Disney character; 37. signals it's time to start spring planting of kumera; 42. small satellite of Uranus, also one of Shakespeare's characters; 43. asteriod with its own moon; 44. quick-silver planet; 45. also a small inflated rubber boat; 46. flying saucer; 48. a very cloudy planet; 49. predicted the neutrino; 55. solid, liquid or ...; 57. an orbiting telescope;