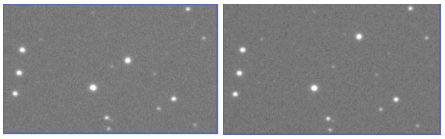
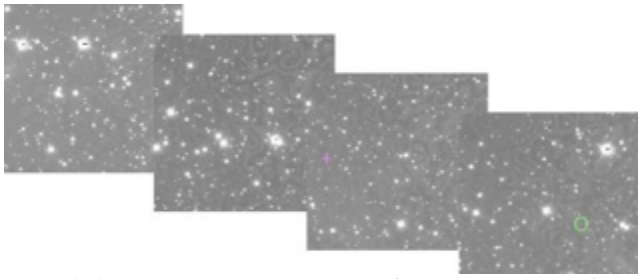
ARC Linkage SPACE TO GROW Project Newsletter Edition 4 – April 2010

RESEARCHING TARGETS, APPLYING for TELESCOPE TIME

When implementing the project, students will learn useful ICT skills and how to research 'targets' to observe. Through the exciting and vital component of writing an Application for Telescope Time, research and proposal-writing skills will be further developed. The proposal provides an opportunity to undertake 'real' science through critical analysis of the retrieved new data. Students may then share their discoveries worldwide, as in the following examples taken on the Faulkes Telescopes, owned by LCOGT.net (our 'Star partner' this issue). To help students with their research, our revised *Telescope Proposal* module has a host of ideas, definitions and web addresses.



Two FT S images side be side of 169P. Note the tracked changes to the object position in the top right hand quadrant.



Series of four FT N images to locate Asteroid 2007 UR2 just captured in the final image circled in green, bottom right quadrant. A few hundred metres across with a 'horseshoe orbit', it is a companion to Mars.

New Space to Grow PhD student

Astronomy research is a very familiar area to our new team member Michael Fitzgerald. Michael was drawn to the Space to Grow project due to its combination of astronomy and education research. He will add a PhD thesis on Teacher Professional Development from Macquarie University to his Bachelor of Arts in Philosophy and Politics, Bachelor of Science with Honours in Astrophysics and Masters in Education from Monash University. He has been heavily involved in undergraduate astronomy with tutoring, course co-ordinating and lecturing, as well as undertaking educational research and development. Previous studies in education focused on the undergraduate physics problem of student retention and how social and psychological aspects pertain to student motivation in science. His astronomy interests include rapidly evolving and unstable stellar systems.

Features this issue:

Star Project Partner – LCOGT.net

Where can a passion for astronomy and telescopes take you? One path would be to study physics, maths and computer programming, then become Vice President of Engineering at Google, Inc. After that you could return to your 'previous life' and establish a global telescope network.

Wayne Rosing took this road, and established Las Cumbres Observatory Global Telescope Network (LCOGT.net) for scientific research and research-based education near his home in Santa Barbara USA in 2005. Faulkes Telescope South (FT S) and Faulkes Telescopes North (FT N) became part of the network in 2006. One network aim is to create an awareness of science and technology in young people, fostering the ability to think critically. Through astronomy, other sciences - physics, chemistry, biology, geology, engineering are also introduced.

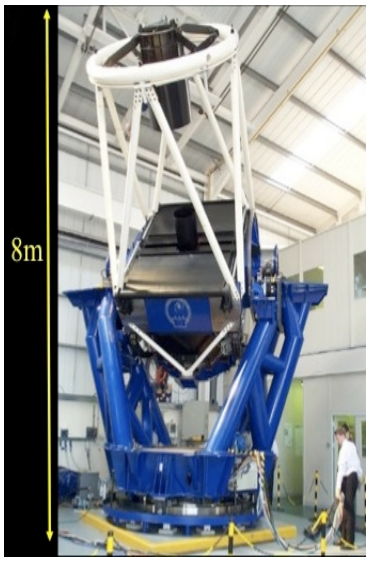
Astronomers advise on the science program and astronomy outreach specialists advise on the education program. Keeping the network running smoothly at a global level are electrical, computing, mechanical and optical engineers plus an operations team. The network of robotic telescopes is expanding to 'keep astronomers in the dark'. Photographs taken by A/Prof. David McKinnon of 40-cm and 1-metre telescopes under development at LCOGT in Santa Barbara can be seen in our Edition 1, December 2009.

LCOGT.net has been commissioning a new camera over the last few months, called Spectral (although it is an imaging camera not a spectrograph). One science intern interested in finding the mass of stars in open clusters has been following an open cluster-monitoring program. As a result, he has been among the first people to use the spectral camera on FT N.

Image right - Closeup from FT N webcam, courtesy LCOGT.net

The Faulkes Telescopes

The two Faulkes telescopes available to participants in the Space to Grow project are located at Siding Spring Observatory near Coonabarabran NSW (FT S) and Mt. Haleakala on the island of Maui in Hawaii (FT N).



Named after Dr. Martin 'Dill' Faulkes, these professional-grade telescopes are approximately 8 metres high and encased in a 'clamshell' structure. This minimises the time taken to dissipate the normal heat build-up with traditional domes prior to viewing. Designed to operate robotically, website commands are sent to the telescope, 'seeing' conditions are checked, the clamshell opened (weather permitting) and objects tracked. The computer then closes the clamshell at the end of the night, or earlier if the weather deteriorates. Each has a 4.5 arcminute field of view and 2048 x 2048 pixel CCD camera. Taking over one year to manufacture, the total weight of each Faulkes Telescope is over 25 tonnes, including the 2-metre diameter primary mirror. Movies and images of the Faulkes Telescopes, plus animations on the mirror light path and how a CCD camera works can be viewed on our Space to Grow website.

The two main axes of motion are the *azimuth axis which allows 1.5 full rotations, and the altitude axis which moves the telescope from 20° above the horizon to the zenith position.
**Azimuth* is used to define an object's position on the celestial sphere in the horizontal coordinate system. It is a measure of the angular distance of an object measured east from north and parallel to the horizon - 0° for objects located due North, 90° due East, 180° due South, 270° due West of the observer. Cosmos

Image right: Opening 'clamshell' of FT N, courtesy LCOGT.net

Feature Teacher – Implementation in Action

Sandra Woodward, self-confessed astronomy 'nut' from Oakhill College in Castle Hill, read about Space to Grow in our first Newsletter and quickly signed up on Ning. Special Principal's permission to participate was required, as Oakhill did not come under the usual CEO Parramatta 'umbrella' ethics permission. Sandra and Andrew Millar, Assistant Principal of Pastoral Care at Oakhill, then attended the February PD training day at Macquarie University.

The remaining Oakhill science faculty members were introduced to the project history and aims, a brief website tour and a training module by Dr. David Frew in March. The 240 Year 10 science students and their 3 teachers then completed pre-Questionnaires.

Sandra's focus with the project is to 'inspire these students to enjoy science and see what it links to once they leave school. Seeing an application to their knowledge has always been a great way to enthuse students, particularly those who need extending beyond the syllabus. Offering something real rather than more activities gives a better completion rate'.

Sandra was also keen to witness how the different levels of student ability all took in the information.

Students were eager, so the EM Spectrum was introduced and then the Making Colour Images module, from which teacher interactive data was submitted. Student interest has been diverse - keener students want to find out how and where they can obtain more images. Natural curiosity and analytical thinking are being actively encouraged!

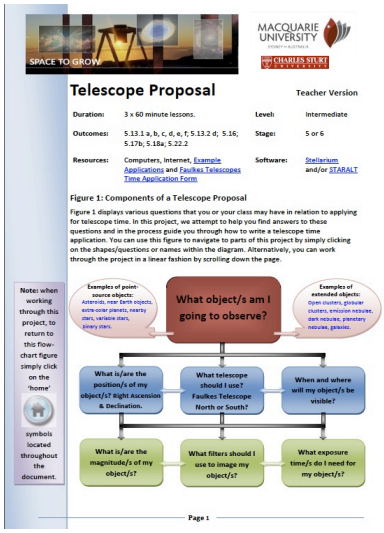
Be In it to Win It - Update

We have extended the deadline for entry to the draw of the **major prize of $2000 contribution** towards the Hawaii conference 24 September – 3 October 2010 until the end of May. To be eligible, submission of data via training modules online is required. At the time of going to press, student pre-Questionnaires have been completed by the following year numbers: **9** x Year 10, **2** x Year 11, **2** x Year 12. Schools to be forwarded astronomy related posters are: Denison College Bathurst, Blayney High, Denison College Kelso, La Salle College, Molong High, Oakhill College, Nagel College, Orange High, St. Andrews College. MacKillop College will enter data from 17 May 2010.

Quick Quiz (answers back page)

1) Which image on LCOGT.net/education was taken on FT N by Thomas Mills High School, UK? **2)** What type of object is it? **3)** Which object was taken by students at Armagh Observatory on FT S 25 January 2010? **4)** Which object type was it previously classified as? **5)** What is the best month to observe the alpha Capricornid meteor shower? **6)** Why is it best observed from the southern hemisphere? *Image courtesy LCOGT.net*

Project choices



When pre-survey questionnaires are complete for your school in Years 10-12 and some training modules worked through, your students should be gathering information on 'target' object/s they want to research and analyse using a Faulkes Telescope.

Potential targets range from the physically tiny (asteroid) to huge (galaxy or nebula). Students could select their own objects individually, or alternatively work in small groups or teams. The class could also choose one type of object with different targets, or study various object types from the table. To assist your class in formulating topics, we have reconfigured the *Telescope proposal* module to incorporate *Ideas for possible telescope projects* and a flowchart.

Check out the website of Star Partner LCOGT.net for interesting discoveries made by students around the globe. Review the news in the links to read more on how 169P and Asteroid 2007 UR2 were tracked and recorded using the Faulkes Telescopes.

Another link from LCOGT.net is the Faulkes Telescope UK project where students can look at more target research ideas. Students can also search the web for names of meteor showers expected in a given month or the latest discoveries in science through popular media items, such as exoplanets, 2 of which have recently been discovered by LCOGT.net scientists, images taken on FT N of Comet Siding Spring (C2007 Q3), and updates on recent near earth asteroids (2010 GA6, 2010 AL30).

Teacher training

Teachers wanting to **register for the next training day at Macquarie University on 5 May 2010** should do so urgently! At the last two PD days on 10 and 24 February 2010, Dr. David Frew introduced the *Astronomy Basics* required to apply for telescope time. Mini-tutorials of them by David and Michael will be posted on our website.

Dr. Lena Danaia has been working on the *Curriculum Map Overviews for Stage 5* and *Stage 6* showing how the project works with the curriculum rather than additionally to it. These will be available on our website shortly.

Ning hints

Ning http://space2grow.ning.com social Network

* You can add to a discussion – read more about each discussion in ***Forums*** with the View All icon on the main page, scroll to the end and make your comments in *Reply to this* and then press *Save*.

* Send a **comment** to a group or individual - open individual or relevant group page: *Comment Wall* or *Start a Discussion* and *Save*.

Quick Quiz answers

1) NGC6302 aka Bug or Butterfly Nebula, pictured on page 3 **2)** Supernova **3)** Comet 169P **4)** Asteroid 2002 EX12 **5)** August **6)** The meteor shower is almost at the zenith in the southern hemisphere and very low in the north

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http://www.astronomy.mq.edu.au/space2grow http://space2grow.ning.com