MACQUARIE UNIVERSITY
SYDNEY ~ AUSTRALIA

CHARLES STURT UNIVERSITY

ARC Linkage SPACE TO GROW Project Newsletter 8 – January/February 2011

Working towards project goals

The Space to Grow project aims to use the Faulkes Telescopes as a hook to research how astronomy and technology can improve student science engagement in schools. A key focus to facilitate this is the associated teacher professional development (PD). The project addresses key science curriculum areas and develops generic skills using unique, innovative, cutting-edge technology. Students undertake and own actual research projects. We have developed exciting interactive materials to integrate this facility into the science curriculum. A vital legacy will be enhanced science pedagogy.

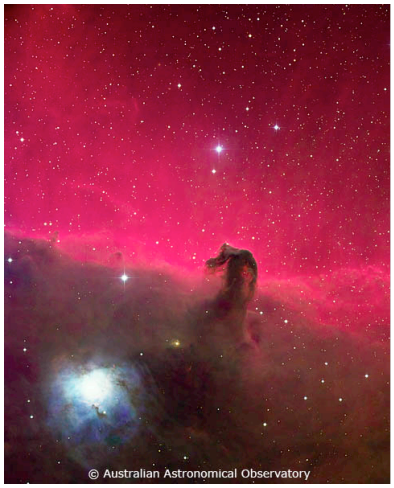


Image credit: *David Malin photograph, Australian Astronomical Observatory*

What's in it for me? … A Bigger Bang!

Students

Year 9 student inclusion ✔

Year 9 ***or*** 10 science, as well as Year 11 and 12 Physics students, who are learning astronomy in their relevant class, can join the *Space to Grow* project.

Incentives for data ✔

Automatic entry into draw for $50, $30 or $20 iTunes for the entry of vital ADT and SSSQ data for 80% + class completions - see 'marking' opposite. This will be incorporated into the new *Introduction to the Faulkes Telescopes* module.

Games and demonstrations ✔

Short videos enthuse, which sparks curiosity and engagement in the classroom. Games and simple practical demonstrations maintain interest for depth of understanding.

Persuasive writing skills ✔

The *'Image Request'* is a practical exercise to improve vocabulary and persuasive writing skills. Individuals or groups research 'target' objects to write a short (200 word) proposal on why their targets have scientific merit.

'Real' Science application ✔

Group and teamwork practices are incorporated into the project sessions. Use of analytical thinking and problem-solving techniques provides opportunities for enquiry-based, evidence-driven research investigations.

Teachers

Fewer IT issues ✔

Freeware and Shareware for the project has been trialled in various schools to reduce IT issues. *Makali'i* is used for the new modules posted to the website.

Automatic 'marking' ✔

Online post-data completion provides key information to generate a comparative assessable analysis for each student in 1-2 working days (if all student 'pre' tests are fully entered *prior to implementation* and 'post' tests completed).

Scheduled and mapped lessons ✔

A flowchart shows the depth of learning from introductory to extension activity to assist timetabling. Stage 5 and 6 curriculum mapping shows related topic coverage.

Accreditation for PD underway ✔

Modules for the project are currently being evaluated for the NSW Institute of Accreditation for Professional Learning for instructors and teachers. PD will be more local to teachers, and attendees will receive a Certificate of Participation.

Team and 'networking' support ✔

Team members are always available to provide support in person or remotely. PD provides opportunities to learn and network with other teachers, and modules can be taken straight into the classroom (see *In-House Test*, page 2).

Australian Government Australian Research Council
LCOGT.net
CatholicEducation
NEW SOUTH WALES DEPARTMENT OF EDUCATION AND TRAINING
Catholic Education Office

‘In-house’ Test groups for Star Clusters module

A/Prof. David McKinnon took the new *Star Cluster Photometry* (SCP) module for a ‘test drive’ with some Year 10 students after the 2010 School Certificate. While the group was small in number, the interest generated was large. Some participants were inspired to study Physics in 2011 and requested ‘totally unstudied’ raw data to be available for research. The latest version of this module, which includes interstellar reddening and the inverse square law, will be available for upload during March.

David has also received very positive feedback from Robin (Rob) Edwards at the West Kildonan Collegiate Institute, Winnipeg, Canada. Rob is a geologist who has been teaching science for 20 years.

‘Several kids made the comment it was really cool and the class as a whole was completely on task.’

As a teacher of Chemistry and Geology to grades 9-12, and now Physics, he trialled the SCP module without any PD, and enjoyed the learning process himself – see his comments opposite.

Several kids made the comment it was really cool and the class as a whole was completely on task…… They caught on quickly (faster than me!) and produced some good work.

I’m really hoping I will get this group to the point where they are requesting telescope time..... then I will be satisfied that I have accomplished something very significant with them.

I have thoroughly enjoyed working through the project and am amazed that I can now read stuff on the Internet that refers to things like E(B-V) and I have some idea as to the content!

Kathryn Gray, 10, discovers *Supernova 2010lt*

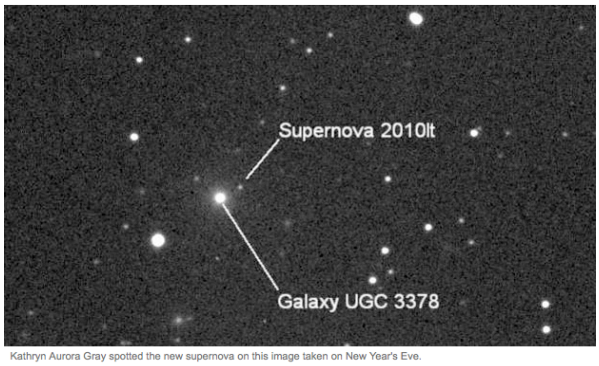
Supernova 2010lt, magnitude 17, was discovered on January 2 by 10-year-old Canadian Kathryn Gray. Previous apparent magnitudes recorded for the brightest stars in this group were around 4. She compared new CCD images to previous images of the Camelopardalis constellation, in Galaxy UGC3378, which contains several ‘double’ and variable stars (estimated distance of 240 million light years). To verify the discovery Kathryn, with her father Paul, first ruled out asteroids and then checked the supernovas currently known.

A supernova is a stellar explosion, outshining the other millions of ordinary stars, that indicates the violent death of massive stars. Most of the chemical elements for the creation of the Earth and other planets came from supernovas.

C*ore-collapse supernovae* tell us about the deaths of stars and births of black holes.

Type Ia supernovae are used to map the universe expansion, revealing that the universe is expanding at an ever-accelerating rate due to the presence of a mysterious source of energy.

To determine the nature of this dark energy, *Space to Grow* partner, LCOGT.net, has a major focus of studying and analysing nearby to distant supernovae and gamma–ray bursts with



Kathryn Aurora Gray spotted the new supernova on this image taken on New Year's Eve.

collaborative partners, using data on the 2000 targets obtained by the Supernova Legacy Survey (SNLS).

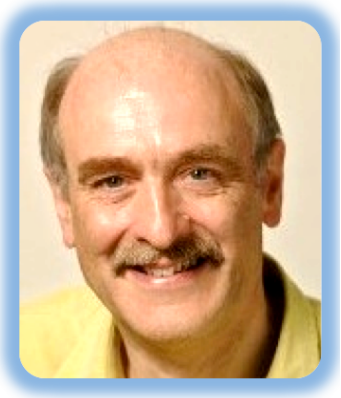
Credits: http://www.astronomynovascotia.ca/index.php/news-a-media/1-news/335-suoernova-2010lt-discovered-in-galaxy-ugc-3378 and LCOGT.net

Quick Quiz (answers back page)

1) What object, clearly visible from Earth, has lots of ‘seas’, but only recently has water been discovered? **2)** How were these features formed? **3)** Does this occur now? **4)** What class of rock is found here? **5)** What is the other easily-identifiable feature on its surface? **6)** Is this object a suitable study target using a Faulkes Telescope?

Professional astronomical 'celebrities' lend their expertise

Leading astronomers Prof. Fred Watson and Prof. David Malin have supported science education via lectures and outreach for many years. These eminent astronomers have now contributed their knowledge via short films to engage students' learning and interest with *Space to Grow.* Other film clips by the educators, research and technology experts on the team, plus experts in other related fields, will add to the valuable learning resources available in modules and on the website.



Fred has been the Astronomer-in-Charge of the Australian Astronomical Observatory (AAO, previously titled the Anglo-Australian Observatory), since 1995. A pioneer of fibre optics use in astronomy, he now heads the RAdial Velocity Experiment (RAVE) project to measure the radial velocities and metallicities of up to 1 million Milky Way stars. He is a regular ABC radio and television guest, popular for promoting space science in the wider public domain and leads astronomical tours internationally. Other interests lay in writing books such as *Stargazer – the life and times of the telescope (Allen & Unwin, 2004)* and music. Fred's *Space to Grow* video can be viewed at https://www.sugarsync.com/pf/D822186_247583_7237380

David's large-scale astronomical images appear in art galleries as well as science museums (see Horsehead Nebula front page). *The man who colours stars (www.yorkfilms.com)* began at the AAO after 18 years as a chemist specializing in optical and electronic microscopy, and x-ray diffraction. David evolved new techniques to extract more information from astronomical photographs, which led to numerous discoveries. He continues his enjoyment and collaboration with astronomy through lecturing worldwide and book writing, such as *Hartung's Astronomical Objects for Southern Telescopes: A Handbook for Amateur Observers* with team member, David Frew.

Feature Teacher

Jennifer Wickham from Orange High has enthusiastically involved herself with the *Space to Grow* project at professional development sessions and afterwards, seeking information and providing valuable feedback to the team. Jennifer viewed it as an opportunity for her students to make use of exciting technology in a 'real' science application. Implementing with both Year 10 Science and Year 11 physics groups in 2010, her students became the first recipients of iTunes vouchers for their completed data entry (see *What's in it for me?* front page).

Feature Teacher followup

Two of **Sandra Woodward's** 2010 Year 12 Oakhill College students worked on the RR Lyrae distance to the globular cluster NGC6101 using 7 variable stars. Sandra was very impressed with their methodical approach to complete it to such a high standard. The students' calculated distance was well within the original limit of error from the paper that they were working from, and it is expected they will write a paper on their own research results. Sandra thanked *Space to Grow* team members for the encouraging emails, support materials and visits, which helped her students with the research process, particularly Michael Fitzgerald and David Frew. Her plan is to follow up on the 2010 Year 10 group and introduce it to her Year 9 students, as they undertake the bulk of the 'space' topic.

Star Project Partner – MACICT

The Macquarie ICT Innovations Centre is located at Macquarie University. It has a collaborative agreement between the NSW Department of Education (DET) and Macquarie University, which provides the opportunity for NSW DET schools access to the use of innovative technologies in teaching and learning. Deb Evans is the Centre Director and consultant for the *Space to Grow* project.

The DET Connected Classroom program delivers virtual access to international academic expertise visiting Macquarie University in science, computing science and education faculties. Prof. Stephen Heppell, actual and virtual learning space specialist, is one such guest during March.

The MacICT uses virtual field trips and mobile technologies (left) in a wide range of disciplines, as well as interactive whiteboards (IWB), use of robotics such as 'ED_E' (below left), virtual worlds (below centre and right), video conferencing suites and desktop sharing applications. 3D and multi-touch IWB technologies are currently being explored.

The Centre's focus reflects a project-based approach to working with teachers and their students. A comprehensive teacher professional learning and support program where MacICT staff and school teachers develop projects that are curriculum-based and meet the individual needs of the teachers and their classes, ensures services remain relevant to all NSW DET schools state-wide.

View their website http://web1.macquarieict.schools.nsw.edu.au for projects being developed, opportunities and services for schools and teachers, plus courses available.

Diary reminders

2011: Year of Chemistry – search for activities in your area at http://iyc2011.org.au/

***Astrophysics for Physics teachers* one-day workshop, CSIRO Marsfield, 25 March 2011** - for details and registration, visit http://outreach.atnf.csiro.au/education/teachers/workshops/apt.html

Quick Quiz answers

1) Earth's moon - smooth areas are called seas (*mare* in Latin) as early observers thought they were seas. **2)** Volcanic lava activity. **3)** No, the moon has cooled down to such a degree, it is now cold, dead and geologically inactive. **4)** Igneous. **5)** Impact craters from early bombardment. **6)** Unless a neutral-density filter, no, as the Faulkes Telescopes are too sensitive to capture images of the moon (or other targets easily visible with the naked eye) without overexposing.

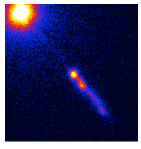


***Image**: 3C273 HL Marshall et al. NASA, MIT (http://www.cosmosportal.org/articles/view/138735/?topic=9652)*

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