



ARC Linkage *Space To Grow* Project Newsletter Edition 10, October 2011

## Brian Schmidt, 2011 Nobel Laureate, on Science

Canberra-based astrophysicist Professor Brian Schmidt has shared the 2011 Nobel Prize for Physics with Adam Riess and Saul Perlmutter. Using observations of Type 1a supernovae, the two independent research teams concluded that the universe is expanding at an ever-accelerating rate in 1998\*.

The following excerpts are from an interview with Marian Heard in 2001 for the Australian Academy of Science and relate to his thoughts on science education and thinking from <http://www.science.org.au>

I always had pretty good teachers, very supportive of me in wanting to learn and teaching me very well. As I moved into my high school years it was always 'how much better can you do?'

***Science is not just for geniuses.***

***Doing good science is now largely based on having a good set of skills (maths, an understanding of physics or biology) and imagination...***



The quality of life for the world has increased dramatically over the last century, almost entirely due to technology, which is based on science. Science is the first step in taking knowledge and converting it to things that make our life better. Science research is doing something for us tomorrow, not today, and you need to integrate the science we're doing today. Science is not just for geniuses. Doing good science is now based largely on having a good set of skills (maths, an understanding of physics or biology) and having imagination, then being able to put together different things and bits of knowledge.

There's an intermediate level where people use quantum mechanics, physics, chemistry or biology to develop things - that's applied science. And then there's the technology, where you convert that applied science into products. Certainly technological people need to have science backgrounds. All of it requires scientists, but trained in different areas.

I hope my research will eventually be converted into things that will benefit mankind and people will find it interesting and be interested in doing science themselves. You need to have common sense to ask: Is this interesting?

Is anyone going to care about this?

What should the answer be?

What makes sense?

How do I go about solving this?

How can I work with my friends in the most constructive way to get things done?

Science is not a job where one individual goes and does something great - it's actually a collection of 20 or 30 people, all working together to come to an end.

The communication of science is paramount to be able to effectively convince your fellow scientists what you have done is correct and be able to go out and tell people in the community what you have done is important and why they should be interested. Such communication is something we're all being trained in more and more. It's becoming very important to our lives.

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be able to look back and say that Australia  
turned the corner and never looked back;  
it has become a great nation on the science front.***

Science gives you a chance to do something which people are interested in. It's important to what our nation is doing as a whole. In ten years' time I fully expect to be actively working on science which is unlocking the fundamental mysteries of our universe. I hope to still go and talk to Australians about what's going on in science. Certainly I hope I'll be able to look back and say that in about 2000 Australia turned the corner and never looked back; it has become a great nation on the science front. If we do that and continue on where we're going, in 2010 I will be able to point to all the things that have happened to Australia - this great thing, this great thing, this great thing - since people started supporting science. That's what I expect if we continue heading as we are starting to go now, really supporting science.

**\* Read more about the research behind the Nobel Laureate award, and an update on the effect Brian hopes it will have on science education on page 4.**

*Image: An undated handout picture of U.S. born Australian, Brian Schmidt, Australian National University, released to Reuters 4 October 2011*

## Meet a *Space to Grow* Team Member

Professor Quentin Parker, Chief Investigator of *Space to Grow*, began a joint appointment at Macquarie University in 2002 with the Australian Astronomical Observatory (AAO), then known as the Anglo-Australian Observatory. He was a senior astronomy research scientist at the Royal Observatory in Edinburgh previously, working in large-scale astronomical surveys, particularly planetary nebulae.

While still in the UK a talk by Dr Paul Roche, from the Faulkes Telescope Project, caught Quentin's interest in science education at high school level. He believed these professional-grade telescopes could help address the poor engagement of students in science and physics, common across the western world. This interest continued when he moved to Australia through heading the pilot Faulkes Telescope program *Bringing Deep Space into the Classroom* under the ASISTM scheme. That led to directorship of the 3-year *Space to Grow* project through the Australian Research Council (ARC) to continue to study professional learning, student science engagement and educational research, using the hook of astronomy.



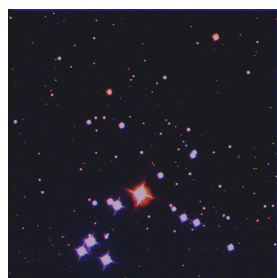
Speaking about the *Space to Grow* project in its final year, Quentin advised we are making much progress. The team has continued to evolve the resources available to teachers and students and this is shown in recent results that are beginning to deliver the effective research quanta that we need. We have enjoyed strong support from our network of partners - the Las Cumbres Observatory Global Telescope Network, Catholic Education Offices in Parramatta and Bathurst, Department of Education and Communities Western Region, Macquarie University and the MacICT Innovations Centre. We have adapted our programme as we have learnt important lessons during the first two years. Our training model has been significantly upgraded, particularly via adoption of a regionally focussed 'clusters' model seeking out 'alpha' teachers who then motivate the early adopters using our improved resources. Levels of engagement continue to increase, with real science and useful data to write up - several research papers are already published or in train.

As Director of the newly established Macquarie Astronomy Astrophysics and Astrophotonics Research Centre, he is determined to ensure this important science education pedagogy research project remains an important, integral part of its activities to develop synergies across departments and faculties. *Space to Grow* is further promoted via his AAO links through public outreach and science education activities.

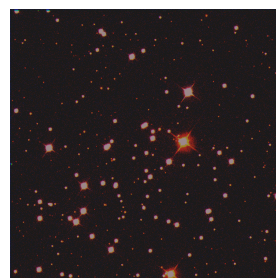
## Students Research for Scientific Papers



Sandra Woodward organised a Science Fair at Oakhill College during Science Week (13-21 August) with guest scientists giving talks and demonstrations, together with a *Space to Grow* 'rolling' presentation. Two of her Physics students presented a display board (left) on their research. The scientific paper *RR Lyrae Stars in the Globular Cluster NGC6101* on their conclusions is in the final stages of acceptance for publishing by the Publications of the Astronomical Society of Australia (PASA), co-authored by four *Space to Grow* team members, plus Sandra.



Nagle College's Year 11 group is also very excited to undertake a study of star clusters NGC 7031 (left) and NGC 7086 (right). A preliminary study in 2008 'neglected' one cluster and only used blue and visual (green) filters on the other cluster. Thus findings were inconclusive as to whether they form a binary cluster. Nagle College students are gathering data on the brightness of the stars to determine the distance, age,



size, and the amount of reddening. They will be the first to study these clusters using additional ultra-violet, red and infra-red filters to provide more conclusive information early in 2012. Should they find similar reddening, age and distances for the two clusters, it will prove they were formed from the same Giant Nebula and should be classified as a binary cluster.

## Feature Teacher



**Tim Byrne moved to Xavier College to teach Science, Physics and Maths from St Clare's College this year. His interest in science sprang out of curiosity through his 'previous life' in aviation, initially as a commercial pilot and then more in the role of an instructor.**

Having attended a number of training sessions with various styles and content, Tim views the *Space to Grow* CEO Parramatta 'Clusters' model of learning as a student, while thinking as a teacher, as very good. It provides the opportunity to become involved with the interactive resources and practice the theory in a logical and interesting way, making the classroom introduction quick and comfortable.

Tim and his Physics students are enthusiastic about the in-depth learning, as the 'normal' teaching pattern does not usually allow for further exploration. News of the *Space to Grow* project has spread in the school, as students out of his own class have approached him specifically to discuss the 'real' and 'proper' science that is being learned. Tim will take the project to the weekly science workshop and implement to Year 9 students in 2012.

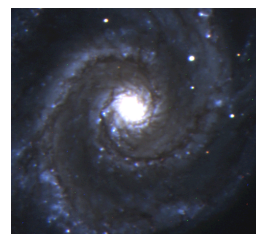
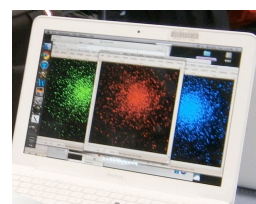
The training has inspired an interest in astronomy and he continues to increase his subject knowledge, as well as wanting to discover a very young, or very old, star cluster himself.

## Science Week Activity makes local Headline



Terra Sancta College in the CEO Parramatta region invited team support for a series of four sessions learning about telescopes and colourising images. Of particular fascination to the students was using software to colourise three images that initially appear as black and white into green, red and blue (top right) then overlaying them to create a full colour image of a galaxy or cluster, such as M51 by one of the students (right). Students researched targets and requested new, raw data from the Faulkes Telescopes. News of their activities was featured in the local paper, titled *Teens find Star Attraction*.

Image credit left: <http://www.blacktownsun.com.au/news/local/news/general/teens-find-star-attraction/2296580.aspx?src>



## Professional Learning

**Teacher training has continued during Term 3 in all partner jurisdictions, using a variety of training methods in a range of environments.**



CEO Parramatta 'Clusters' training feedback was positive to the professional learning format, content and style, engaging new attendees and enhancing keen teachers' enthusiasm. Attending Blessed John XXIII College to introduce *Star Cluster Photometry* to the 5 groups of unknown Year 9 students was a highlight for all teachers. After a short overview of the project and introduction of the team members by Paul Stenning, teachers paired up to lead a student group. The open classroom situation allowed all teachers to observe other groups

and learn from both students and other teachers, further enhancing their teaching skills, knowledge of the software and the science involved. The team also used this 'real life' situation for research study, which will help to further evolve the project resources and training methods.

Ongoing Video Conference training sessions are also programmed for the remainder of 2011. Hosted and linked remotely through the DEC Western region, teachers from the DEC Western and CEO Bathurst regions engage with each other and team members located in Bathurst and Sydney.

# Prof. Brian Schmidt, Nobel Prize Winner, 2011

Australian National University (ANU) astronomer Brian Schmidt<sup>1</sup>, on his team's discovery that the universe was speeding up, advised 'I was shocked by my discovery - I just assumed we made a mistake. That didn't make sense. We knew the universe was full of gravity; it should be slowing it down. What it means for the future is the universe is getting larger, faster and faster, and implies that almost everything that we now see in the universe, will eventually be pushed so far away that we won't be able to see it. So, a cosmologist like myself who studies galaxies, for example, to understand the universe we live in, will in the future look on into an empty universe full of nothing.'

Scientists have known since the 1920s that the universe is expanding as a result of the Big Bang some 10 billion years ago. However the discovery that this process is accelerating, not slowing, rocked the research community. The acceleration is thought to be driven by dark energy, although cosmologists have little idea what that is. They estimate that dark energy - a kind of inverse gravity, repelling matter that comes close to it - accounts for around three-quarters of the universe. Looking at Type 1a supernovae, the astronomers discovered a benchmark for the movement of light. Their work confirms Albert Einstein's theory, which he dubbed the 'cosmological constant'.

**....great ideas don't need billions of dollars, they need moderate support, and you need to have a lot of people with moderate support to get the good ideas.**

In his telephone interview with Adam Smith, Editorial Director of Nobel Media<sup>2</sup>, after the announcement of the Nobel Laureate award, Brian further advised: '... great ideas don't need billions of dollars, they need moderate support, and you need to have a lot of people with moderate support to get the good ideas.'

He hopes his award '... will remind people of how exciting astronomy is, and how trying to understand the universe is something that really helps us understand our place in the universe. And it's certainly my hope that children in Australia but also around the world will go through and say "Ah, I'd kind of like to figure out how to do that myself".'

Excerpt credits: <sup>1</sup> <http://www.abc.net.au/news/2011-10-04/australian-astrophysicist-wins-nobel-prize/3209216>

<sup>2</sup> [http://www.nobelprize.org/nobel\\_prizes/physics/laureates/2011/schmidt-telephone.html](http://www.nobelprize.org/nobel_prizes/physics/laureates/2011/schmidt-telephone.html)

## Supernova SN2011fe in M101 Pinwheel Galaxy



Newly discovered supernova SN2011fe in the Pinwheel Galaxy is the same type (1a) of supernova as those studied which revealed that the universe expansion rate is accelerating. Learn more about Type 1a and Type II supernova from Brian Schmidt's website: <http://msowwww.anu.edu.au/~brian/PUBLIC/public.html>

The Pinwheel Galaxy (M101/NGC5457) is also shown on our [Outputs](#) webpage, colour imaged by Phil Owen from CEO Bathurst. Search for it using *Stellarium* and the link <http://www.youtube.com/watch?v=V94hr-tQ7XA&feature=related>

**Images above:** Left<sup>1</sup> - Portion of the Pinwheel Galaxy taken prior to the discovery of the supernova, clipped and tilted to match the orientation of the right<sup>2</sup> image of SN2011fe in the lower right quadrant. Taken on Faulkes Telescope North two days after the initial discovery, the 'new' supernova is arrowed and labelled with its temporary name of PTF11kly. NB: Differences in the colour and level of detail between the two images are due to the telescope type and location (atmospheric conditions), telescope filters and imaging techniques employed.

**Image credits:** <sup>1</sup> Hubble Legacy Archive, NASA, ESA <http://apod.nasa.gov/apod/ap110415.html> Robert Gendler Astronomy Photo of the Day (APOD) 15 April 2011 <sup>2</sup> <http://apod.nasa.gov/apod/ap110826.html>, D Andrew Howell BJ Fulton LCOGT et al. APOD 26 September 2011.

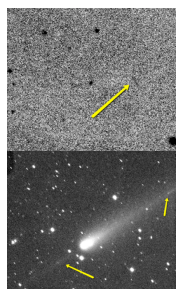
## Schoolgirl's discoveries with the Faulkes Telescopes

Work experience with the Faulkes Telescope Project saw 6<sup>th</sup> Form (Year 12) student Hannah Blyth helping astronomers to discover new asteroids. Besides discovering more than 20 new asteroids, she also remarkably imaged known Comet 213P Van Ness in the actual process of breaking up. The Faulkes Telescope Project coordinator, UK astronomer Nick Howes, advised 'This discovery again shows that amateur astronomers and school students can make a huge contribution to real scientific discovery.'

Initially the team was studying two new asteroids, which were discovered single-handedly by Hannah. While she was not expecting to be involved with asteroids, let alone finding new ones, it was extremely exciting and 'quite a rush' for her. Hannah is very proud to have been part of the project. 'It's amazing to be involved in something like this. I was busy carrying out observations for Nick and almost cut short the sequence of images of this particular comet as he had sent me another target to look at - I'm glad I didn't change my plans!' The comet fragmentation discovery made the team focus on studying this uncommon event.

**Images:** Top - a new asteroid discovery Below - Comet 213P Van Ness breaking up

Excerpts from *The Faulkes Telescope Project*: <http://www.faulkes-telescope.com/news/2406>



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