

## Physics & Astronomy

### FROM THE HOD (ASSOCIATE PROFESSOR ROGER REEVES)

The PBRF exercise continues to pop up with the release this week of a breakdown of scores by Department. My thanks to David Wiltshire for his in-depth analysis of our situation. The initial release of PBRF scores are of course based on average ratings of its staff. When averages of all staff are concerned Otago University came top ahead of Auckland with Canterbury third. However, when one gets down to really small units such as Departments, averages can be misleading. For example the top ranked Physics Department in the 2003 exercise was Lincoln with only one staff member. Everyone would agree you can't run a programme on that basis.

David's analysis shows the impact of considering the breadth of the Department by looking at the aggregate scores that also consider the number of staff in the Department. The numbers are below:

	A	B	C	R	Tot FTE	Aggregated score
Canterbury	3.5	13.08	13.1	1.39	31.07	139.68
Auckland	4.0	14.4	5.0	0.5	23.9	136.4
Otago	4.5	7.0	10.0	1.0	22.5	107.0
Victoria	2.25	7.0	5.5	0.0	14.75	75.5
Massey	1.0	5.0	4.0	0.0	10.0	53.0

The combination of us being the largest Physics Department in New Zealand coupled with our high average brings us to the top of the table. We can be confident that students coming to Canterbury to study in our Department will have the best opportunity.

Yesterday the University announced the purchase of the Blue Gene supercomputer. This came as a bit of a surprise as I left the last Academic Board meeting thinking it only had a 50:50 chance of getting through the business case. Well now that we have it lets all do our best to take advantage of the power this system provides.

This is for the "one that slipped by basket.." At the beginning of last month one of our academic staff members celebrated (quietly, as it turns out) 25 years of employment at the University of Canterbury. I'm sorry that I did not pick this up earlier so we could all celebrate the achievement at the time. Well done Peter!

### TODAY'S SEMINAR: - 11:00AM, FRIDAY 01 JUNE

**Prof. John Hearnshaw**

Department of Physics & Astronomy, University of Canterbury

#### *The 25 greatest discoveries in astronomy and astrophysics of the 20th century*

I present a list of what I consider to be the 25 greatest discoveries in astronomy and astrophysics of the 20th century. My criteria for selection were to exclude planetary exploration of the solar system by spacecraft and to include discoveries which were especially influential in opening up new understanding, or revealing new classes of phenomena. I put these discoveries in my personally estimated order of

importance. I then analyse the papers arising from these discoveries by the area of astrophysics to which they pertain, by the year of publication, by the age of the author(s) and by the country where the authors were working.

I conclude that the most productive years for astronomy in the 20th century were between 1911 and 1920 and again in the 1960s. In spite of the 10-fold increase in publication rate at the end of the century relative to the beginning, the rate of publication of the most seminal papers has actually declined, in spite of the obvious advances in technology. I offer an explanation for this observed phenomenon.

**NEXT WEEKS SEMINAR: - 11:00AM, FRIDAY 8 JUNE**

**Fred Johnson MNZM, FIPENZ, C Eng., MIET**

The New Zealand Association of Radio Transmitters Inc (NZART)

***The Electromagnetic Wave – Introductory Demonstrations for the Classroom***

Electromagnetic waves surround us. They are unseen and their characteristics must be found by exploration. Inexpensive apparatus and “hands on” experiments have been developed to apply radio technology principles to investigate the electromagnetic wave and how it is used in many applications today. Companion experiment sheets are provided to guide the experimenter.

A circuit module using surface-mounted devices, with a battery, switches, and other items are used to generate a radio wave. Various launch methods and the propagation of the wave with the effects of various materials in its path can be observed. A meter and a diode are used to detect our signal. A special licence for this transmitting equipment is not required.

This class-room radio link can illustrate how modulation of the signal can transfer information, how remote-controls work, how a TV aerial works, and how aerial designs can improve signal directivity and extend the working distance. The polarisation of a signal, reflections, standing waves and wavelength measurement can be investigated.

Explanatory booklets can be downloaded from the web and provide theory explanations with many diagrams and full construction details.

The cost of this apparatus is kept small by the innovative use of readily-available materials. There is opportunity for developing further projects and radio links to support other purposes and Science Fair opportunities.

The New Zealand Association of Radio Transmitters Inc (NZART), the radio amateurs’ organisation, promotes interest in the science and technology of wireless communication and formed the NZART Radioscience Education Trust to promote and encourage education in radioscience. The Trust supports Science Fairs with prizes and contributions to school projects and support to the development of the apparatus in this presentation.

For students with the interest and the drive to go a little bit further, details are given of a world-wide-recognised qualification within the reach of any youngster: the *amateur radio examination*. This qualification is an indicator of interest and is useful preparation for a career in the telecommunications and electronics industry. It is independently examined from a public-domain question-bank, which with free study material, is available from the web.

This is a display of the wave generation, propagation and reception apparatus and a PowerPoint presentation.

## MT JOHN'S OPEN NIGHTS (ALAN GILMORE)

Mt John's May Open Nights were very popular and blessed with clear or at least usable skies, unlike those we tried in March. Friday 18th was a superb moonless night augmented by a faint aurora, rare at the solar minimum. Saturn was nicely placed in the northwest and Jupiter in the east. The Milky Way and the Magellanic Clouds shone brightly; well, as brightly as they ever shine...

Variable high cloud made Saturday more dodgy. While we were never without a target object, we were often reduced to just Jupiter or Saturn in the mid evening. Ironically the sky cleared completely, ignoring the approaching front, as everyone was leaving.

Three telescopes were used: Nigel showed globular clusters 47 Tuc and Omega Cen in the One Metre; Pam had Saturn, Jupiter or the Eta Carina Nebula, depending on the clouds, in the OC; and Freidl Hale of Earth and Sky showed Saturn and Jupiter in their 40-cm. Parents from the Tekapo School marshalled the cars, took the money and handed out the sky charts. Special thanks to Rosalie for preparing extra charts on Saturday. Alan was usher and star identifier.

Over the two nights the school made \$1000. With the \$900 they picked up in March despite overcast skies -- we ran telescope tours -- they were very happy with the result.

## HEAVENS ABOVE (PETER COTTRELL)

Next week, June 6 to be precise, sees the culmination of more than 2 years of my interaction with NZ Post. The outcome is the stamp series entitled Southern Skies. There are 5 stamps in the series (see the copy of the brochure below - each featuring an astronomical image and a telescope with a New Zealand connection. The stamps, the first day cover and the miniature booklet all form part of the stamp series release. And even if I do say so myself they look very impressive.



New Zealand's clear night skies are an irresistible magnet for stargazers, offering the perfect backdrop for dazzling displays of the Milky Way and its neighbouring galaxies. With an ever-changing view – whether in a single night or throughout the year – they provide one of the most spectacular natural displays on Earth.

Some stars are visible all year round, while others only come into view as the Earth sweeps around their region of the sky. But whenever and wherever they appear, they guarantee a glorious panorama; a visual treat, free to all who glance skywards once the sun has set and darkness has descended. New Zealand Post is delighted to feature five 'stars of the stars' in our latest stamp issue – each captured on film and supplied for the stamp series by the Royal Astronomical Society of New Zealand.

#### 50c – Southern Cross



The Southern Cross is such an important feature of New Zealand's night sky that it is part of our national flag. Visible all year round and easily identifiable in the Southern Hemisphere's night sky, it has long been a valuable navigation aid. It also appears on the New Zealand Tomb of the Unknown Warrior – the stars being seen to have guided the Warrior back to New Zealand from distant battlefields.

#### \$1.00 – Pleiades



The star cluster Pleiades rises just once a year in June, the month when these beautiful stamps are issued. For Māori it is called Matariki, and its arrival on the dawn horizon heralds the start of a brand new year. According to Greek myth, the Pleiades are the seven daughters of Pleione and Atlas – Electra, Maia, Taygete, Alcyone, Celaeno, Asterope and Merope. A number of ancient temples on Athens' Acropolis face the direction where the Pleiades rise.

#### \$1.50 – Trifid Nebula



The Trifid Nebula (also known as Messier 20) was discovered by Frenchman Charles Messier in 1764. Believed to be about 6,000 light years away from the Earth, its strikingly different colours are caused by effects within its vast clouds of hydrogen gas and dust – which in parts are so dense that they hide the Nebula, producing the three dark lanes that earned it the name 'Trifid' (which means divided into three lobes).

#### \$2.00 – Southern Pinwheel



The Southern Pinwheel (also known as Messier 83) was discovered by Nicolas Louis de Lacaille in 1752 and added to Charles Messier's catalogue in 1781. It is even further than the Trifid Nebula from Earth – 15 million light years away, in the southern constellation of Hydra. Having a similar appearance, shape and size to our own Milky Way galaxy, it contains more than 100,000 million stars and earned its name from the shape of its prominent spiral arms.

#### \$2.50 – Large Magellanic Cloud



The Large Magellanic Cloud and its companion the Small Magellanic Cloud are satellite galaxies of the Milky Way – two of our closest neighbour galaxies. Named after the 16th-century Portuguese circumnavigator Ferdinand Magellan, they are hazy patches of light near the South Celestial Pole containing millions of stars, gas and dust. At 190,000 light years away, the Small Magellanic Cloud is one of the most distant objects visible with the naked eye.

#### Reaching for the stars

All five stamps feature on the *Southern Skies* first day cover. The stunning night-sky images provide a lovely backdrop to a set of astronomical telescopes, all focused on learning more about our magically mysterious universe.



First day cover

Mt John's 1m McLellan telescope appears on the \$1 stamp while the 1.8m MOA telescope features on the \$2 stamp. The Southern African Large Telescope (SALT), in which the University of Canterbury has a share, appears on the \$2.50 stamp.

The astronomical images were taken by members of the Royal Astronomical Society of New Zealand's Astrophotography Section. And to add to the Department's link to this issue, Karen Pollard is the current President of RASNZ.

There is additional information on the Noticeboard outside the Seminar Room, Room 701 in the Rutherford Building, as well as a LARGE postcard to Captain Kirk with a larger-than-life

\$2.50 stamp attached. And of course you can find out more, and purchase the stamps, first day cover and the booklet, by going to the NZ Post web site, <http://stamps.nzpost.co.nz>. I should be getting commission for this!!

## NEWS FROM THE PHYSICAL SCIENCES LIBRARY...

Adam - <http://library.canterbury.ac.nz/people/cath.shtml>

## MAY 2007 SCHOLARSHIPS – WEB SITE

View General Scholarships at:-

<http://www.canterbury.ac.nz/scholarships/resources/currentnoticeboard.shtml>

College of Science Scholarship

<http://www.canterbury.ac.nz/scholarships/noticeboard/may2007sci.shtml>

If you have anything you would like to contribute to the Newsletter, please email Ro on [rosalie.reilly@canterbury.ac.nz](mailto:rosalie.reilly@canterbury.ac.nz): Newsletter, Department of Physics and Astronomy, University of Canterbury, Private Bag 4800, Christchurch, Phone: +64 3 364 2404, Fax: +64 3 364 2469.