

Physics & Astronomy

FROM THE HOD

It was with great sadness this week that we said farewell to our Department Purchasing Officer, Mike Clark. Mike has done a great job of keeping the Departments finances in order and prior to this role had fulfilled a number of other functions in the Department over a 35 year span. Further tributes to Mike are included below. We wish him all the best for a well deserved and enjoyable retirement.

NO SEMINAR THIS WEEK

NEXT WEEK'S SEMINARFRIDAY 7 APRIL 11:00AM ROOM 701, RUTHERFORD BUILDING.

Professor Uwe Happek
University of Georgia

Title to be advised – it will be posted on the dept web page as soon as it is available
<http://www.phys.canterbury.ac.nz/>

PUBLIC LECTURE - WEDNESDAY 5 APRIL 7 PM - E1 LECTURE THEATRE

Paul Callaghan *Victoria University*

Surprising Connections – The Diverse World of Magnetic Resonance

[Note that the automatic doors into the Engineering complex will be open from 6:30 to 7:00]

BEN CARTER ORAL EXAM. (MIKE REID)

Ben will defend his PhD thesis “*Higher Dimensional Gravity. Black Holes and Braneworlds*” at 2pm on Friday, April 7, in room 701, Rutherford Building. Ben is happy to have interested observers.

MIKE CLARK'S RETIREMENT FAREWELL

Last Monday a retirement function was held for Mike Clark (the Department's Purchasing Officer) at the University Staff Club. It was an extremely pleasant evening both in that the weather held off and the notable convivial nature of the gathering. Phil spoke fondly of Mike's immense efforts in the Department over his long and varied service, acknowledging his many years as the superintendent at the Department's Mount John Observatory in Tekapo.



Mike was delighted with his leaving present: binoculars and was struck by the leaving card, depicting a guitar – “*You people know me too well*” he said, as he unzipped his jacket to reveal his guitar imprinted tie!”

On Tuesday afternoon Mike was again acknowledged at a Departmental afternoon tea in which many of his colleagues spoke warmly of their interactions with Mike over the years. Mike’s sense of humour was a favourite topic generating more than a few chuckles. Mike departed on Tuesday and already he is sorely missed - there is a distinct void on level 7! It is hoped that a suitable replacement will be found for Mike in the very near future! *See following for more memories on Mike.*



EARLY MEMORIES OF MIKE CLARK (GRAEME KERSHAW)

Here are my memories of working with Mike....

I first met Mike when I joined the Canterbury Astronomical Society in the mid 1960's. Later in that decade the society undertook the construction of the Joyce Memorial Observatory at West Melton and much of the early work and finishing touches were done by 'working bee' using member labour. Mike featured largely in this work; he seemed to be the backbone of the workers, always there and always working. I guess being a 'chippy' by trade helped a lot, but you can't sit exams in loyalty and enthusiasm. Some years later an accommodation lodge was built at the observatory site and yes, you guessed it; Mike was there with his un-ending enthusiasm and enviable skills.

Mike was the envy of the 'society' when on 1 March 1971 he was employed as an observer for Mt John Observatory. Oddly, it was at a very similar time that I was appointed as Christchurch based Mt John mechanical technician and so the association with Mike continued. Many projects were undertaken over the next 25 years that were to tax the energy of us all but again Mike was there, always on hand to help, no matter what the time was or what the weather was doing. In due course the position of superintendent at Mt John became vacant and Mike and June moved into the house on the mountain and set the standard for loyalty and dedication. Mike would tell you that it was 'his observatory' and that's why he loved to work endlessly towards its near faultless performance. If it was snow ploughing or weed spraying or hole digging, then Mike was there doing the work even after a week of clear nights, working 'all hours' and yes even weekends.

When Mike handed over the reins of superintendent to Alan Gilmore and moved to Christchurch my close association with was destined to continue. He was part of our workshop team for a short while doing those 'tricky little important jobs' about the place before he settled into a roll in the 3rd floor labs and more recently in the vital task of purchasing.

Now did I mention his sense of humour??? There seems to be much less laughter in the 2nd floor lunch room. Now that Mike has started his 'next career' I'm certain that he will tackle this with was much joy, laughter and enthusiasm as he displayed during his time in the Dept. of Physics and Astronomy.

SCINTILLATING STUFF! (ALAN BELL)

The following is a report from Medical Physics Masters student Alan Bell who spent two months working at CERN (the European Organisation for Nuclear Research) on hardware projects with other NZCMS members. While at CERN he also worked with the Medipix medical imaging team, as well as learning about the medical imaging work which Auckland University researchers are involved in. Alan's work at CERN has led to significant progress on our hardware projects, and has greatly enhanced the image and visibility of New Zealand's involvement in CMS.

Long sandy beaches... a cool, blue ocean lapping at your toes whilst sipping a glass or two of fine French wine... warm, clear moon-lit nights. These are the things that you wish for whilst working at CERN during the grasp of a freezing European winter! Night time temperatures dropped as low as -11°C and even the mercury in the thermometer found it hard to get inspired to get out of the bulb and climb much above zero degrees each day. Nevertheless, two intrepid New Zealand/British

physicists (the other being Dr Richard Gray from Auckland University) braved the frosty winds and the French motorists to get to CERN and design the Beam Scintillation Counter (BSC) and Beam Condition Monitor (BCM) for the CMS experiment.

In order to get CMS data from CERN in late 2007, New Zealand has to put something in. The BSC was a perfect project to get involved in as the hardware was available from salvaged parts from the previous OPAL experiment. It involves placing scintillation tiles at either end of the CMS in the configuration shown in Fig 1.

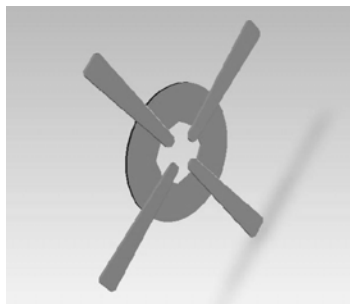


Fig1. Geometry of the scintillation tiles

The poly-vinyl toluene tiles produce light when hit by high energy particles produced at the interaction point. This light is converted to green light via wavelength shifting fibres embedded in the tiles and fed down optical fibres to a bank of 32 Photomultiplier tubes. These tubes convert the light into electrical signals of 20 – 80mV. We were fortunate to be able to negotiate the use of some readout channels from the HF section of CMS. This greatly reduced the cost and workload of the BSC project as no readout electronics needs to be

designed and built. The next step is to write software which will take the output from the readout system and display the information on a monitor in the control room.

As a sideline to the BSC, investigations in to obtaining a signal from synthetic single crystal diamond (Fig 2)



Fig 2. Testing the single crystal diamond and the AFP chip.

Charged particles of sufficient energy produce electron-hole pairs. A high voltage bias across the diamond causes these e-h pairs to drift and induce a current which is fed in to an active feedback preamplifier (AFP) chip. Small signals were detected using γ rays from Strontium-90 and the next phase involves building a test board with a differential amplifier and optical output device to see if the signals can be sent down a 60m optical fibre to the control room. The test board will be taken to PSI's test beam in Zurich and irradiated.



Arriving at CERN in the snow. At least the coffee tastes good when you get there!

With a bit of hard work (and a fair amount of good luck) New Zealand will be able to make a valuable contribution to the CMS project and strengthen the links between NZ Universities and CERN. Well worth the daily walk through the snow and rain... providing you can dodge those crazy European motorists!

NEWS REGARDING THE PROPOSED MACKENZIE HERITAGE CENTRE

In their latest newsletter: "Inspired", the Trustees of the Mackenzie Centre Community Trust have advised that plans to proceed with the application to the Ministry of Culture and Heritage under the Regional Museums policy to establish the Mackenzie Heritage Centre have been abandoned. This has resulted because the Trust has not been able to confirm that all other funding required was secured.

“No further efforts at fundraising will be made. The Mackenzie Centre Community Trust will be wound up once all work-in-progress has been completed. We, the Trustees, feel extremely sad to reach this point, and know that large numbers of others who have in one way or another supported and been excited by the project will feel the same.”

It was noted that there would be many benefits from the establishment of the Centre – more funding would need to be attracted from outside the region and greater support also needed to occur from within. *“Clearly the time for the vision we have had has not yet come.”*

MT JOHN OPEN NIGHTS (ALAN GILMORE)

We had four telescopes open to the public last Thursday and Saturday night. (Friday was overcast.) Nigel showed the globular cluster 47 Tucanae in the One Metre; Pam had the Orion nebula in the OC. Paul Tristram pointed Earth & Sky's 16-inch Meade reflector at Eta Carina, then Jupiter when it was high enough. Alan showed Saturn in the B&C.

Parents from Tekapo School directed traffic and collected admission fees.

We don't usually run Open Nights at the dark of the moon, but optimal April was busy so we grabbed this opportunity. Many people enjoyed seeing a really dark sky with the Milky Way and Magellanic Clouds nicely visible.

Around 50 adults and uncounted children visited on each of the fine nights. Tekapo School made about \$500 out of the effort; well down on some years but not a bad effort given the short notice.

INTERESTING INFO FROM THE GUARDIAN WEEKLY (PETER COTTRELL)

Nanotechnology restores eyesight / Hopes raised of stroke and spinal cord treatments, reports Ian Sample in the Guardian Weekly for 31 March, 2006

Scientists claim to have repaired brain damage and restored the eyesight of blind animals using a revolutionary nanotechnology-based treatment. It raises hopes that nanotechnology, the science of the incredibly small, may herald an era of therapies for such medical conditions as strokes and spinal cord damage.

The treatment will require extensive animal testing before scientists know if it is safe to use on humans and what kinds of damage it can help repair. But the study's researchers believe it could be used in humans within five years.

Rutledge Ellis-Behnke of the Massachusetts Institute of Technology, who led the research, said that the technology could first be used to prevent patients undergoing brain surgery from suffering more damage from the surgeon's scalpel. Injecting nanoparticles into the brain during an operation could, researchers say, heal nerve damage caused by the removal of a tumour.

The therapy uses tiny particles which, when injected into a damaged part of the brain, spontaneously assemble themselves into a "scaffold" gel which spreads through the damaged area. Tests show that severed nerves later regrow through the scaffold and form new connections.

The treatment exploits the ability of peptides, the building blocks of proteins, to assemble into 3D scaffolds under specific conditions.

In the latest research, scientists at the institute used peptides measuring only five billionths of a metre long which assemble into a fine mesh of woven fibres as soon as they mix with cerebrospinal fluid, the liquid that bathes nerves in the spinal cord and brain.

In tests, injections of the nanoparticles formed a gel that triggered fresh growth of damaged nerves and helped restore the eyesight of 75% of animals, according to the study published in the Proceedings of the National Academy of Sciences. "We saw the tissue heal itself, which we've never seen before," said Dr Ellis-Behnke.

Repairing nerves in the central nervous system is fraught with difficulty because injuries to the brain or spine usually scar with thick tissue which prevents nerves from regrowing. The body also

releases chemicals that hamper nerve growth, a safety mechanism that prevents damaged nerves forming the wrong connections, which could be disastrous.

Dr Ellis-Behnke believes the therapy stops scar tissue forming and protects damaged nerves, allowing them to regrow only in the damaged area of the brain.

Surgeons made incisions a millimetre or two long in hamsters' brains and injected them with nanoparticles up to 45 minutes later. After six weeks most of the animals had regained their sight, while control animals injected only with a saline solution remained blind. The tests were conducted on 10 young and 16 adult hamsters to check that the therapy worked in older animals, in which nerve growth is limited.

Examination of the animals' brains after surgery showed that weeks after the injections, the scaffolds dissolved. The researchers believe that the breakdown products of the scaffolds - amino acids - may be taken up by surrounding cells, and so help the healing mechanism.

"Using nanobiomedical technology and molecular self-assembly to repair brain structures opens up a new field and a new source of hope for efficacious treatment of central nervous system trauma," the scientists write. "This successful outcome gives us a glimpse of what reconstructive brain surgery may hold for the future."

One British scientist who spoke to the Guardian on condition of anonymity said the therapy needed to be repeated by other groups to ensure it worked before it moved to human trials.

FROM THE PHYSICAL SCIENCES LIBRARY

New Titles Lists

The Library has changed the way [New Titles Lists](#) are created.

A New Titles form is now available for users to create customised lists. These lists will now include *all* new items received by the Library. The previous printed list only included those items on the New Book display and did not include items for Restricted Loan or those that had been requested urgently. You can now customise the list to include individual or multiple libraries, specific subjects, collections and media and by specifying the date range, you can retrieve items added since you last viewed the list. The list can be accessed from the PSL web page:

<http://library.canterbury.ac.nz/psl>

Create your bibliography in seconds! Learn how to use EndNote

This 1 hour tutorial for staff and postgraduate students will include: importing references from science databases into your own EndNote library, linking full-text articles, and creating and editing bibliographies in Word.

Two Sessions are available specifically for Physical Scientists:

- [Tuesday, 28 March, 10:30am](#)
- [Wednesday, 5 April, 2pm](#)

SciFinder Scholar 2006

CAS have advised that they will stop supporting SciFinder Scholar 2004 Windows and Macintosh versions as at the end of March. The old versions will probably continue to work, but if problems occur after 1st of April, it may be necessary for users to upgrade. Note that for pre-OS X Mac systems there is still only a 2004 version. The software is at

<http://library.canterbury.ac.nz/files/systems/scifinder/files.shtml>

The above link also provides options to download:

- SciFinder Scholar Toolbar to initiate Explore tasks within Internet Explorer

Discovery Studio™ ViewerLite – a 3D visualization tool that can be downloaded free of charge by SciFinder Scholar customers

If you have anything you would like to contribute to the Newsletter, please email Ro or Gill on rosalie.reilly@canterbury.ac.nz or gill.evans@canterbury.ac.nz or mail your item to: Newsletter, Department of Physics and Astronomy, University of Canterbury, Private Bag 4800, Christchurch, Phone: +64 3 364 2404, Fax: +64 3 364 2469