A Brief Report on 2006 Activities

PROGRAMS FOR STUDENTS IN YEARS 5 – 8

MUPPETS (*Melbourne University Physics Promotion, Education and Teaching Services*)

This is an engaging physics show designed to involve school students from grades 5-8 in discovering more about nature. **The aim is to interest students in Science at an early age, so as to broaden their choices as they progress through the school system.** It is organised and presented by Dr. Rassool regularly throughout the year, either at schools, or in a theatre at the School of Physics. As well as the presentation, students and teachers have access to a Web site with background information aimed at the appropriate level. **Over the past five years some 25 schools have been visited, with about 2400 students attending.**

The "Physics And Laser Show"

This uses many of the demonstrations and activities of the MUPPETS program, but incorporated into a theatrical production. The program consists of a fascinating production, by outstanding presenters, of carefully selected demonstrations of basic physics phenomena. The positive reaction of the students needs to be seen to be believed: the presentation is all-involving. Following the physics show, there is an exceptional laser show that will captivate and excite the students.

Over the past 4 years the show has been staged over 1-week periods in Melbourne (twice) Bendigo (twice) Mildura, outback NSW, and most recently at Traralgon (see attached report). **A total of at least 12,000 year-5/6 students have attended.**

Mentoring

On occasion gifted students come to our attention, and physics staff and research students are involved in mentoring these students.

ENRICHMENT LECTURES FOR COUNTRY HIGH-SCHOOL STUDENTS

The School of Physics annually sponsors two series of lectures that provide background material that is designed to expand the view of senior high school students. These are the *Physics Gymnasium Lectures*, and the *July Lectures in Physics*, which consistently attract capacity audiences. Students regularly comment on the pivotal role the lectures have played in maintaining their enthusiasm for science. However, neither of these programs is available to keen students in country areas, consequently reducing their chance of high achievement at VCE.

Part of our program is to take some or all of these lectures to major provincial cities. At this stage as part of Science Week we took lectures in Bendigo. Details are in the attached circular. This area of the program requires a degree of dedication by the lecturers, who are all active researchers.

Highlights of 2006 - the "Gippsland Tour"

During the week of July 10-15 a team of about 15 graduate students and staff took the "Physics and Laser Show" on its "Gippsland Tour".

We were centred at Traralgon, and used the excellent auditorium of the Lavalla Catholic College. Two days were spent in setting up the extensive lighting, laser and sound systems, and rehearsing the show. Over the next three days **2300 year-5/6 students attended the day-time shows.** A further 350 members of the public and parents with children attended the two evening shows. Some schools travelled more than 100 km to attend. This was our biggest and most professional show to date.

There is no charge for this program, as we believe the long-term community benefits justify our investment. Because we specifically want the program to be accessible to all school, regardless of their financial limitations, we subsidise or provide transport.

The aim of the program is to interest students in Science at an early age, so as to broaden their choices as they progress through the school system. Roger Rassool and graduate students of this department present the show, which provides an exciting and stimulating exposure of physics to schoolchildren, and helps to illustrate that Science can be fun.

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One of the outstanding characteristics of this, and other presentations of the show, is the enthusiastic and crucial contribution of the large number of graduate students who constitute the volunteer staff. Their dedication is essential to the success of the program, and in itself confirms to the students that science is fun, and that real people do it.

We received extensive radio coverage on ABC and local radio, and articles in all local papers: The Traralgon Journal and The Moe and Narracan News.

Enrichment lectures given at the School of Physics of the University of Melbourne. These are part of the pool from which we would select a subset to be given in rural centres.

The July Lectures in Physics

Waves in the 21C

8:00 pm Every Friday in July/August

Sound Waves: Winds of change in music by Joe Wolf (UNSW)

We are still working to understand the subtle details that are qualitatively known to expert musicians. This talk will look at how mechanical and acoustic systems combine to produce the sounds of the voice and of musical instruments. The speaker has a background in both acoustics and music and promises extensive demonstrations. Among other things, we'll discover some ancient techniques in digital communication and their advantages and disadvantages.

Matter Waves: The strange world of the quantum by David Jamieson

At very small scales our world of solid matter dissolves into shifting patterns of waves, uncertainties and probabilities described by quantum mechanics. A theory of immense precision and versatility, the quantum mechanics of matter waves has provided us with silicon chips, lasers, superconductivity and neutron stars. We look at the strange foundations of the theory and some revolutionary new applications.

Electromagnetic waves: Hot topics in synchrotron science by Chris Chantler

Here in Victoria will soon be built a vast machine, called a synchrotron, for the production of special types of electromagnetic waves. These waves will be used to probe the structure of matter with great precision and answer fundamental questions in crystal structure and electrodynamics. We look into the new science promised by Victoria's synchrotron.

Gravity waves: Echoes of cosmic cataclysms by Andew Melatos

Long past and far off cataclysmic cosmic events may create disturbances in the fabric of space and time. Predicted by Einstein, these ripples in spacetime may soon be detected on Earth as gravity waves. We look at how gravity waves may be detected and what sort of information they bring to us about some of the most violent events in the cosmos.

The Physics Gymnasium Program for High School Students

A/Prof Lloyd Hollenberg
The Frontiers of physics and the limits of knowledge

Prof Rachel Webster
Structure of the Universe

Prof. Geoffry Taylor
Particle accelerators of the new millennium: the largest machines on Earth

A/Prof Robert Scholten
Warpspeed zero: stopping light in the lab.

Prof David Jamieson
Einstein's theory of relativity: outrageous but true.

Dr. Andrew Melatos
The origin of life

Dr. Roger Rassool
If we could talk to the animals, what would they say?

Music From Two Cultures

As part of Science Week, we are delighted to be able to present two fascinating lectures on the science of music, given by two outstanding lecturers. The lectures are designed to appeal to lovers of science and music, and are accessible to all.

They will be held at the Bendigo Science and Discovery Centre

Dr.Lloyd Hollenberg
Assoc. Prof in Physics
The University of Melbourne
http://www.ph.unimelb.edu.au

The Didgeridoo
..... mind over matter

This illustrated lecture will give a clear and accessible introduction to the physics of sound, using seldom-seen demonstrations. With this knowledge, you will be guided through the unique characteristics of the music of the yidaki (didgeridoo).

A/Prof. Hollenberg is an outstanding researcher in theoretical physics. However it is his interest in the intriguing music of the didgeridoo that will be the subject of this lecture. As part of his research into this remarkable instrument he has spent several periods in Arnhem Land collaborating with learned Yolngu leaders, forming a unique exchange of information between the two intellectual traditions.

A/Prof. Hollenberg has presented this lecture at national and international venues, and we are particularly honoured that he has agreed to appear here.

Graeme Wall
Music Educator
Operatic tenor
http://www.australianmusicevents.com.au

The Human Voice
.....from POP to Pavarotti.

What characterises the difference between the normal human voice, and the sublime sound of the gifted singer? This multimedia presentation will show the fundamentals of the mechanism of the human voice, and illustrate with carefully selected excerpts, the various characteristics of the voices of outstanding singers of all types — popular, classic and operatic.

After winning the Sydney Sun Aria, Graeme Wall studied in the UK, returning to become principal tenor with the Victoria State Opera for 12 years. He is the founder of *Australian Music Events* that presents *Opera in Alps*, and *Opera in the Market* as annual music highlights in Victoria. Graeme Wall has presented this lecture at many venues, including the School of Physics of University of Melbourne, and has been requested to perform at the Melbourne Festival for 2004. We are honoured that he has agreed to appear here in Science Week.

THE UNIVERSITY OF MELBOURNE
SCHOOL OF PHYSICS