



# The Otago Institute, the Otago Branch of the Royal Society of New Zealand

NEWSLETTER

JANUARY 2003

## "The Otago Museum: Past, Present, and Future"

On November 13th before the Annual General meeting we were entertained to a fascinating look behind the scenes at the Otago Museum and the recent and future developments at the museum by Shimrath Paul, Director of the Otago Museum.

The Otago Museum has three main themes in its displays:

1) Human history incorporating the Tangata Whenua Gallery (displaying Southern Maori artefacts), the Pacific Culture Galleries, People of the World Gallery and the Maritime Gallery.

2) Natural History, which incorporates the much loved Animal Gallery which opened in 1878, as well as galleries depicting native birds of NZ and Otago's natural history.

3) Interactive Sciences incorporating Discovery World and education programmes for schools. As well the museum hosts special exhibitions and holiday programmes.



A massive redesign of the museum has been carried out over the past few years with the new Atrium being the most visible to the passer-

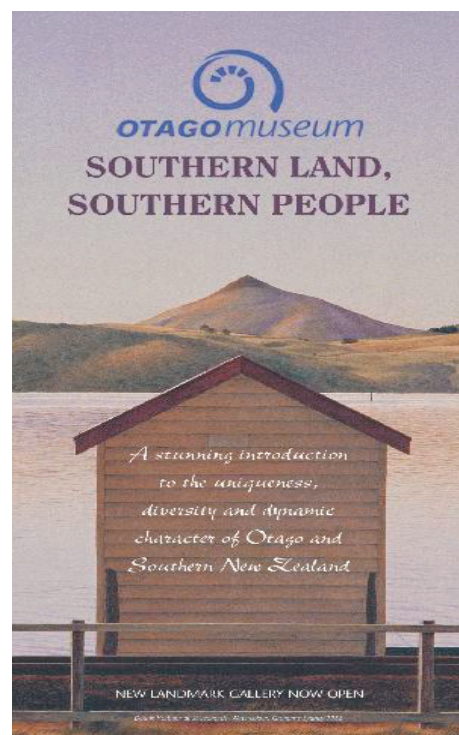
by. The Atrium has led to improved access to the galleries. The Otago Museum has an enviable collection of artefacts, many of which have been stored in sub standard conditions over the years. New construction in the collection storage area has allowed controlled storage of these artefacts. The Otago Museum has a number of curators and honorary curators who look after the Museum's collections and research a large number of topics ranging from NZ insects to Oceanic textiles and artefacts.

Visitor numbers to the museum have been climbing steadily since the new development was undertaken and show no signs of dropping off. The biggest catchment for the museum is the people of the Otago region and displays and special exhibits are designed to encourage repeat visits to the museum. The Otago Museum has been successful in gaining a number of business awards recognising its excellence in the fields of business management and community service.

Customer service within the museum has been improved with the creation of communicator positions, which are proving especially popular with overseas visitors. For a small fee a communicator will guide you round the collection and supply you with extra information. The shop and café have been substantially upgraded and the museum now offers expanded conference facilities as well.

The highlight of the year was the opening of the new landmark gallery

Southern Land, Southern People, which celebrates the history of the region.



Future developments being considered for the Otago Museum include the establishment of a Tropical House and the development of a Kopapa Maori position (to stand guard over the collection). A database is also being established, which will have pictures of all the objects in the collection allowing studies to be undertaken by computer instead of handling precious objects.

The Otago Museum is a world class facility of which the region can be proud and the current planning should ensure that it remains one.

# News from the Otago Museum

The Otago Museum has a number of exhibitions open to the public at present.

ANZAC - The New Zealand Story is a special NZ Defence Force exhibition that reflects the common heritage between New Zealand and Australia and is relived through moving stories, video clips, photographs and objects. ANZAC closes on March 2nd 2003 and admission is free.

Southern Land, Southern People is now open. It explains the origins of our demanding landscape and environment, its discovery, exploration and utilisation of natural resources. Until the end of March if you take a guided tour with a communicator (cost \$10) at 3.30pm daily you will go in the draw for for two return tickets to a Freedom Air Australian destination.

Voyages - The Art of Lindsay Crooks is in the Special Exhibitions Gallery until 2nd February. Admission is free.

Footprint of the Spirit - The Burrinja Collection a display of various Aboriginal artworks will be in the People of the World Gallery form 8th February.

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## Websites of Interest

<http://www.nzedge.com> profiles New Zealanders who have made a major contribution in their field both to their country and also in a more global context. There is a section on scientists including Ernest Rutherford, Alan MacDiarmid, and Maurice Wilkins which makes very interesting reading.

If you were an astronaut, and looking at the Earth from a space shuttle, what would you see?  
<http://eol.jsc.nasa.gov/sseop/EFS/> contains fascinating images of Earth from the Space Shuttle. It is searchable by type of image such as images relating to Earth-human interaction, hurricanes, weather, and more.

Pathfinder Science at <http://pathfinderscience.net/> is an online community of teachers and students using technology to promote and engage in science learning.

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## Visit the Otago Institute Website

Contains:

- Updated events calander for this year.
- Hot links to other website full of information on science and technology.

<http://otagoinstitute.otago.ac.nz>



**Enjoy Dunedin's most visited attraction.**

**Make your first stop Otago Museum.  
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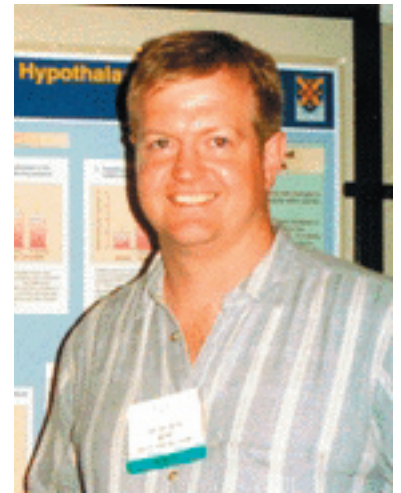
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## A word from the President

Hi everyone,

My first official contribution to the newsletter as president of the Otago Institute finds me about as far away from Dunedin as it is possible to be! Having tired of the Dunedin summer (!) I have travelled to the northern hemisphere for an extended winter. I am based in Edinburgh for 3 months, so am having a chance to view the world from another perspective. I thought I might offer a few observations on the face of science in the United Kingdom compared with New Zealand.

One major difference I have noted is that there are a lot more “science-based” programs on public television over here, something that we have been badly let down on. Several of the major newspapers also have regular science sections, which are informative. In many ways, however, there is a similarity about the science issues that are topical here and those we hear about at home.



Genetic modification and cloning continue to make the headlines. (By the way, for an interesting spin on this debate, see Richard Dawkins' recent article in the Times newspaper, which can be viewed online: <http://www.timesonline.co.uk/article/0,,7-557225,00.html> ). Education has been in the news, with significant reform underway. There has been much debate about the decision to allow Universities to charge “top-up” fees, leading to significant increases in the cost of University study. Sound familiar? Another topic of interest is a recent study documenting the link between poverty and ill health, also relevant to New Zealand. However, by far the biggest news stories are terrorism and the possible war with Iraq. I am not qualified to attempt any in depth commentary on these issues in our newsletter, but I will leave you with one thought. What a pity that the most visible application of science and technology in the present environment is the development of bigger and better weapons! Isn't there something more constructive we could be doing?

**Dave Grattan (PhD)**  
**Department of Anatomy and Structural Biology**  
**School of Medical Sciences**  
**University of Otago**

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## US experts on GM to visit

The United States is sending two experts to New Zealand to counter public “misinformation” about genetically modified crops.

Dr Patrick Byrne, a specialist on genetically modified maize and corn at the University of Colorado, will meet local officials and give a public lecture in Wellington for MPs and others on February 24. He will also visit Auckland, Palmerston North, Christchurch and Dunedin.

Professor Martina Newell-McGloughlin, who heads the University of California's biotechnology research and education programme, will talk to officials, MPs and the public about food and environmental safety at Auckland and Wellington in March.

US Embassy public affairs officer Bill Millman said the embassy asked the two experts to come under its visiting speakers' programme because it wanted “legitimate, truthful honest information about the whole biotech industry to be brought to the New Zealand people”.

“Our office here has responded to a lot of inquiries about genetic modification, and to what I think is a lot of misinformation, to try to get people here who can explain the realities of the entire biotech industry,” he said.

The Weekend Herald reported on Saturday that the United States was increasingly isolated in allowing genetically modified crops, and recently sent advisers to China to train Chinese officials in transgenic crops. New Zealand's moratorium on commercial release of GM organisms ends in October.

**From the New Zealand Herald's**

## Letter to the Editor

Dear Editor,

Your Newsletter gives me much pleasure to read. Having been in my working days a student of scientific methodology, the article "Interpreting scientific studies...." in the latest Newsletter gave me special interest.

In a very succinct and enjoyable article, I found one important word which seems to negate its spirit. It is the use of 'correct' in the final paragraph. "... it will not necessarily give the correct answer" and again "... there can be some confidence that the answer is indeed correct".

I raise this issue from two points of view. Firstly, is there ever in science an answer which must always be and remain correct? And secondly, the teacher who has this 'correct' answer in his mind, would tend to reject any other which may indeed be an imaginative possibility. The progress of science through the ages has been dependant on those who searched for other than the commonly accepted correct idea.

I feel passionate about this concept. Perhaps a better expression in the Newsletter article might be "most appropriate" answer.

**J. G. Johnstone**  
Dunedin

*Brendon J. Woodford, Editor of the Otago Institute, replies:*

Thank you for your comments. The issue you raised seems to be one based on semantics. In the article referred to, the author obviously had an intention in mind when using the word "correct" but this word may not have reflected that intention. One other way of interpreting the authors usage of the word correct in the context of the article could also have been "correct based on current scientific thinking". This then lends itself to a more flexible point of view where the statement is only correct so long as the theory remains true, thus leaving others to challenge the validity of the statement.

**Brendon J. Woodford**  
Editor  
Otago Institute Newsletter

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## Otago University During January

What happens at the university during the summer? While the majority of students and many of the staff are taking a well earned break a number of people are on site to ensure the success of two programmes run by the university. The first of these is Summer School, which runs from the 6th January to the 22nd February. A number of papers are offered – some of which are offered in one of the semesters and others, which are unique to Summer School. Instead of completing a paper in 12 weeks, the work for the paper is compressed in to a six-week time frame. This enables students to shorten the time taken to complete a degree, to be able to do papers for interest or to enable students to do pre-requisites for papers if they decide to change the focus of their course. Summer School has proven to be very popular with numbers enrolled increasing each year. Small class sizes are a bonus of this programme.

The other programme run during January is Hands-On-Science, a course aimed at high school students entering years 11,12 or 13 in 2003. The aim of this course is to encourage talented young new Zealanders to consider science as a career. Twenty-one different science projects are on offer, which the students complete in five four-hour sessions. Science snacks, which take two two-hour sessions to complete, are also part of the course. The rest of the time during the week is taken up with social and recreational activities. Approximately 200 students take part in this programme each summer. Further information on both these programmes can be obtained on the university website <http://www.otago.ac.nz>.

## New Otago Institute Council for 2003

**President:** Dave Grattan (Department of Anatomy and Structural Biology)

**Immediate Past President:** Glenn Buchan (Department of Microbiology)

**Vice-President:** Brian Patrick (Otago Museum)

**Secretary:** Michelle McConnell (Department of Microbiology)

**Treasurer:** Gen Matthews (Department of Biochemistry)

**Council:** Brendon J. Woodford (Department of Information Science), Dave Hutchison (Department of Physics), Jane Wilson-Wheeler (GeneWorks), and Kate McGrath (Department of Chemistry)

In addition the following representatives attend council meetings

**Dunedin Astronomical Society:** Lyn Taylor

**Otago Museum Trust Board:** Bill Brockie

**Otago Polytechnic:** Ameila Brown-Smith

**Otago Secondary Schools Association:** Prue Casey

**Archivist:** Gordon Parsonson

The first priority of the incoming council is to set the speaker's programme for 2003. As 2003 is the 50th anniversary of the discovery of DNA we hope to acknowledge this with one of our lecture series. We have also been fortunate to be included in the Rutherford Lecture Series NZ Tour for 2003. The incoming council is also going to re-evaluate the format of the Vincent George Travel Award with the idea of being able to offer prizes to more than one student.

### *Editorial*



2003 will see many new events and challenges for the scientific community of New Zealand. At least one major event this year will be the celebrations to mark the 50th anniversary of the discovery of DNA. Although there will be events held around the world to mark this occasion, it is of more importance to New Zealand as one of the members of the team also hailed from this country. Maurice Wilkins aided Francis Crick and James Watson in this great scientific breakthrough and also shared a Nobel Prize with them. The other New Zealanders who previously received this most prestigious accolade is Ernest Rutherford and Alan MacDiarmid. Not bad for a population of only 3.8 million people.

The other, related to the discovery of DNA, is the lifting of the two-year moratorium on the release of genetically modified organisms later on this year. The debate on genetic modification is still very much current especially as it was a central component in the elections of our government last year. This issue highlights how a single major scientific discovery can not only be of potential benefit to human society but also raises issues on how we should progress with these ideas in the future. Food for thought for the new generation of NZ scientists.

Regards

**Brendon J. Woodford**

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# Seismic Hazard in the South: Active Faults and Earthquakes in Southern New Zealand

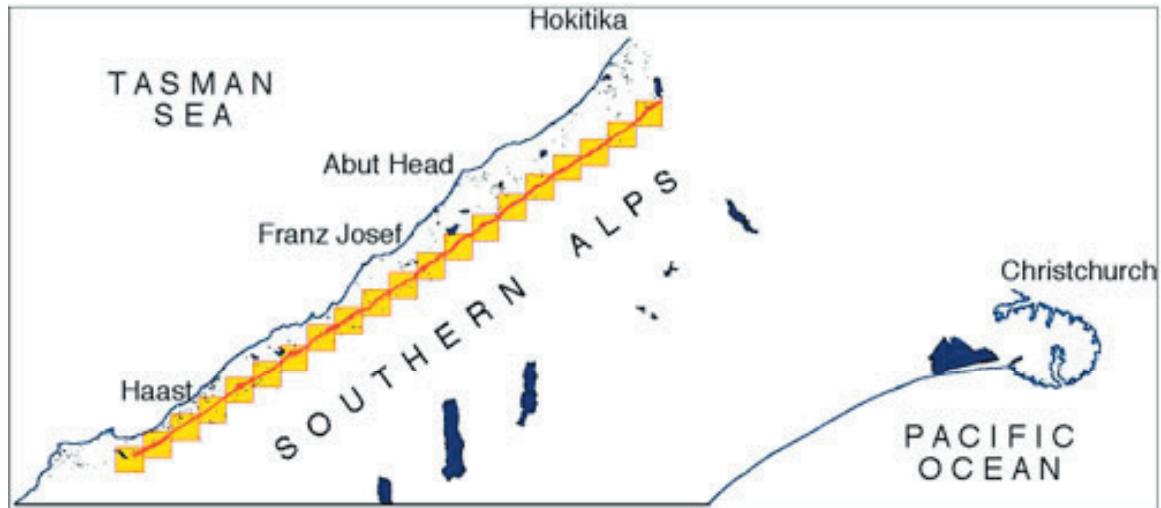
On July 3rd Richard Norris gave us a very informative talk about the history of earthquakes in New Zealand during the past 160 years and the way in which predictions can be made, using current technology, for future earthquakes.



New Zealand lies at the edge of both the Australian and Pacific tectonic plates. To the northeast of New Zealand, and underneath the North Island, the Pacific Plate is moving towards and being subducted below the Australian Plate. To the south of New Zealand, and underneath Fiordland, the two plates are also moving toward each other but here the Australian Plate is being subducted under the Pacific Plate. The Australian and Pacific Plates generally don't move smoothly past each other. They move in a series of small rapid motions, each of which is accompanied by one or more earthquakes.

Since 1840 there have been no large earthquakes recorded in the South Island. The central South Island is considered a very low hazard for earthquakes based on collected data from seismographs since 1940. There are a number of active South Island faults with the largest being the alpine fault. Along the Alpine Fault the plates are not only moving past each other, they are also moving towards each other. Here, the main part of South Island is being thrust over the Australian Plate on a bearing of about 250 degrees. This compressional movement is

causing the Southern Alps to be uplifted at a rate of approximately 7 millimetres per year forming a high elongate mountain range parallel to the Alpine Fault. The map below shows the Alpine Fault, enclosed in gray squares, from south of Haast to Hokitika in the north.



Earthquakes occur when there is movement in the fault plane resulting in a build up of elastic strain followed by rupture. A number of measurement stations have been set up along the alpine fault to measure build up of elastic strain. Using global positioning satellite technology it is now possible to measure very small displacements (cm) between these stations. There have been no ground ruptures on the alpine fault since European settlement. However, smaller magnitude seismicity has been evident over the last decade. A number of sites have been chosen to investigate movement on the alpine fault over time (fossil earthquakes). These are based at Gaunt Creek in Westland, Okuru River and Haast. Investigators trench across the scarp and hand excavate trapped swamps. A hand auger is used to sample sediments. The soil types give an indication of previous earthquake activity e.g. presence of liquefied sand between soil types. Tree ring counting of damaged trees is carried out, as it is known that there is a reduction in growth following a traumatic event. As well, tree ring dating of forest re-growth is carried out. Using these studies scientists have discovered a number of major events on the Alpine Fault dating back to 1100-1200 followed by 1445 ± 20, 1620 ± 10 and 1717.

Using these historical records and a number of other parameters enables predictions to be made about future earthquakes. In making these predictions both the size of the earthquake and earthquake shaking have to be taken in to account along with the measured slip rates of the fault. Earthquake size or magnitude is a measure of the energy released and is measured by using the Richter scale. Each step on the Richter scale relates to 30x more energy released. At present the Richter Scale is 0-9 e.g. the magnitude 7 event which occurred north of Gisborne in 2002 released approximately 1000x more energy than the magnitude 4.9 event which occurred in Dunedin in 1974. As well as magnitude, earthquake shaking is recorded. Intensity of an earthquake is the degree of shaking and varies as  $1/d^2$  where  $d$  = distance from the epicentre. This is described using the Modified Mercalli (MM) scale I-XII, from not felt at all to total destruction. In the South Island the Alpine fault only accounts for about 75% of the plate motion that is observed. There are other faults in the South Island and a number of them are active, e.g. the Ostler fault in the McKenzie Basin and the Dunstan fault at Clyde.

Using observed data and inserting in possible magnitudes or shaking it is possible to calculate the probability of a specific event (e.g. Alpine Fault earthquake) on a known source. This is a useful tool for determining worst case scenarios. Professor Norris used an example of a possible event in Dunedin. The event he chose was a surface break on the Akatore fault (or an offshore parallel fault); a 1-3metre offset along 40km of fault producing a magnitude 6.5-7.5 earthquake. Fossil earthquake data tells us that the frequency of this type of event is 2-3,000 years. By taking all earthquake sources (recorded earthquakes, paleoseismic data on faults etc) it is possible to calculate the probabilities of occurrence. The intensity produced by these events at all places in the South Island is calculated. By summing up probabilities for various intensities at each locality, a map is produced showing the probability of various levels of shaking over the Island. The probabilistic seismic hazard was calculated at 10% during the next 50 years i.e. there is a 10% chance that an earthquake of magnitude 6.5-7.5 will occur in Dunedin in the next 50 years.

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## **GM cows yielding more caseins in milk**

Scientists at the Government's AgResearch science centre at Ruakura, near Hamilton, say they have produced a herd of nine cloned, transgenic calves whose milk boosted yields of two types of caseins by up to 100 per cent.

The researchers, led by Goetz Laible, said the technique of delivering extra casein, if taken out of the lab and adopted by the dairy industry, offered "substantial economic gains". It could be widened, to "tailor" milk for human consumption, they said.

The two key proteins are a boon to dairy manufacturers because they help liquid cheese to solidify and they also drive off whey, a watery by-product that is unwanted in the curdling phase of cheese-making. AgResearch won permission from the Environmental Risk Management Authority (Erma) in 1999 for two parts of its original project to create up to 90 engineered holstein-friesian cows.

The most controversial part of the research - putting a copy of a human myelin basic protein gene into cattle cells so the beasts would secrete the gene in their milk - was held up in regulatory delays and court battles, but eventually approved.

Then in 1999, the scientists were given the go-ahead for two pieces of important research related to dairy production. One was to knock out of transgenic cattle the gene that controls beta lactoglobulin, the main whey protein in the milk of cows.

This protein, thought to bind fatty acids for the benefit of animal young, is not found in human milk, and causes allergenic reactions in some infants and adults.

The other was to insert additional copies of two cattle milk casein genes to produce milk with more protein, without reducing the amount of milkfat already produced.

Conventional selective breeding to lift the protein level would be accompanied by a drop in the fat production. This is important for butter and cheese manufacture.

**From the New Zealand Herald**

# Celebrating the 50th anniversary of the discovery of the structure of DNA

Most New Zealanders remember 1953 as the year Sir Edmund Hilary knocked the “xxxxxx off”. It was also the year that New Zealander Maurice Wilkins played a part in one of the greatest scientific breakthroughs of the twentieth century or any century, for that matter the discovery of the molecular structure of deoxyribonucleic acid (DNA), the code for all life. In 1962, Francis Crick, James Watson, and Maurice Wilkins shared the Nobel Prize for Physiology or Medicine for finally solving the puzzle.

Maurice Wilkins was born in Pongaroa in the Wairarapa, and then moved to Kelburn, Wellington. His family returned to Britain when Maurice was just six-and-a-half, and though he never returned, he still has clear and cherished memories of his New Zealand childhood. He regards himself as a New Zealander still.

In an interview with Kim Hill in 2001, he said that he and his sister both regarded those early years in Wellington as “probably the most enjoyable part of our whole lives ... the New Zealand connection is extremely important to me ... not to be regarded as a New Zealander is something which I find very dispiriting because I feel that my life in New Zealand - those experiences - did so much to put my life on the right kind of track”.

Professor Wilkins (86) lives in London and is working hard to complete his autobiography which will be published early next year, coinciding with the 50th anniversary celebrations in Britain.

The Minister of Research, Science and Technology, Hon. Pete Hodgson, is supporting the Royal Society of New Zealand’s plans to coordinate celebrations of the 50th anniversary of DNA in 2003.

“Unlocking the secret of DNA has been enormously significant for the advancement of the life sciences,” Mr Hodgson said. “Vast areas of new knowledge and new technologies have opened in the last 50 years, yet we have only just begun to explore the possibilities. New Zealand should be very proud of Maurice Wilkins for his contribution to this scientific revolution. It is indeed something to celebrate.”

The celebrations will profile the work of many New Zealand scientists following this seminal discovery, including the sophisticated forensic science techniques practised by the Institute of Environmental Science & Research Ltd (ESR) and the fascinating scientific sleuthing of the Allan Wilson Centre for Molecular Ecology and Evolution in Palmerston North, tracing the origins of Pacific peoples.

New Zealand’s acknowledged “father of DNA”, Emeritus Professor George Petersen from Otago University, was in the forefront of early work in the 1960s and 70s to develop methods for determining the detailed chemical sequence of DNA that culminated in the human genome programme.

He trained a generation of New Zealand scientists who have gained prominence in DNA studies, including Dr Diana Hill, who chairs the Marsden Fund for research, and Professor Warren Tate, Professor of Biochemistry at Otago University.

President of the Royal Society of New Zealand, Sir Gil Simpson, said New Zealanders have reason for great pride in our history and current achievements in this area.

“Everyone knows Sir Edmund Hilary. New Zealand scientists like Wilkins should be just as well known. Generally, Wilkins’ contribution has been somewhat overshadowed by those of Watson and Crick, two highly colourful and eccentric personalities.

“This anniversary of the discovery of DNA structure gives us an opportunity to think seriously about how the knowledge gathered in the last 50 years can best be used to benefit humankind,” said Sir Gil.

From the RSNZ website

## Next Otago Institute Talk

**Richard McKenzie (NIWA)**  
Recent RSNZ Science and Technology Medal winner

**Topic of talk:**  
“Is it safe to go outside?”

**12 Noon**  
**Wednesday 12 March**  
**Hutton Theatre**  
**Otago Museum**

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