



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

NEWSLETTER

NOVEMBER 2003

Professor Bryan Sykes - Genetics as history

Pete Hodgson, the Minister for Research, Science and Technology, can trace a direct line of maternal descent back to a woman who lived in Syria about 10,000 years ago, according to results just announced by the Royal Society of New Zealand. As part of a visit by best-selling author Professor Bryan Sykes, the University of Otago has run tests on several eminent New Zealanders' mitochondrial DNA.

The tests use the nucleotide sequence of mitochondrial DNA, which is inherited solely through the female line, to create an evolutionary framework going back 150,000 years. Described in Professor Sykes' book, "The Seven Daughters of Eve", the framework reveals that almost everyone whose maternal routes lie in Europe is descended from one of seven clan mothers. Eve was the original mother of all modern humans who lived in Africa about 150,000 years ago. Jasmine, from whom the Minister is descended, is the most recent of the seven, and lived near Syria around the end of the last ice age.

Other results announced last night show that Kiwis' proportions of clan mothers seem similar to those in Europe, with almost half of those tested coming from Helena, the most common "daughter of Eve". Helena's descendents include new Royal Society Fellows Professor Alison Mercer, Professor Robin Smith, Dr Allan Crawford, and Professor Rosalind Gibson, as well as Royal Society CEO Dr Steve Thompson. Forty-seven percent of modern Europeans belong to the clan of Helena, who lived around 20,000 years ago.

Professor Diana Hill, chief executive of Global Technologies NZ and chair of the Marsden Fund Council, is a descendent of Xenia, who lived about 25,000 years ago. Today, about one percent of Europeans and six percent of native Americans are descended from Xenia.

Professor Sykes' genealogy testing company has a new "Viking" test, which was done for Emeritus Professor George Petersen, New Zealand's "father of DNA". This test analysed the Y chromosome, passed down the paternal line, to discover where his male ancestors had originated from. Professor Petersen's Y chromosome showed a very rare result - it seems his paternal ancestors came from North Africa about 5000 years ago and worked their way up into Norway. They were then part of the Viking incursions into Britain.

At his lectures around New Zealand Professor Sykes will look at how the study of mitochondrial DNA has demolished any scientific basis for racism, revised our knowledge of the colonisation of the Pacific, and changed how we viewed Homo sapiens' settlement of Europe, a continent once dominated by the Neanderthals.

Professor Sykes has come to New Zealand as The University of Auckland Sir Douglas Robb lecturer for 2003. The Royal Society, in partnership with the British High Commission and British Council New Zealand, is hosting additional lectures in Dunedin (with UNESCO), Christchurch, Nelson, Wellington and Palmerston North as part of the celebrations of the 50th anniversary of the discovery of the structure of DNA. The lectures are free, but to be assured of a seat, those interested should email the addresses given below with the city in the subject line and their postal details in the body of the message.

Press Release: The Royal Society of New Zealand
24 October 2003

Otago Promotes 10 to Full Professorships

The University of Otago is promoting 10 staff to the rank of full professor, Vice-Chancellor Dr Graeme Fogelberg announced at today's meeting of the University Council.

The move recognises the "outstanding contributions to research, teaching and community service" by 10 senior academics from across the University's four academic divisions, says Dr Fogelberg.

"Each of these very fine scholars has clearly demonstrated that are exemplary leaders in advancing knowledge and learning at Otago. All have made significant and sustained contributions to both the University and the broader community which we serve," he says.

The promotions are the largest number in recent years and bring the University's complement of full professors - including Research and Clinical professorships - to 152, he noted.

Dr Fogelberg says he is "very proud" of the recipients' achievements and wished to "warmly congratulate them on what are hard-earned and well-deserved promotions".

Receiving Personal Professorships are:

Associate Professor Terry Crooks (Education/Educational Assessment Research Unit)

Associate Professor John Dawson (Faculty of Law)

Associate Professor David Green (Anatomy and Structural Biology)

Associate Professor Raechel Laing (Food Science/Clothing and Textiles section)

Associate Professor Neil McNaughton (Psychology)

Associate Professor Markus Milne (Accountancy and Business Law)

Associate Professor Roger Mulder (Psychological Medicine, Christchurch School of Medicine and Health Sciences)

Associate Professor Robert Poulin (Zoology)

Associate Professor Jeff Wickens (Anatomy and Structural Biology)

Receiving a Clinical Professorship is:

Dr Peter George (Pathology and Molecular Medicine, Christchurch School of Medicine and Health Sciences)

From the University of Otago Website

http://www.otago.ac.nz/news/news/2003/11-11-03_press_release.html

Enjoy Dunedin's most visited attraction.

Make your first stop Otago Museum.
Just a few minutes from the city centre you'll discover a collection of Otago's finest treasures.

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Visit the new Otago Institute Website

Contains:

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

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

A word from the President

Firstly, let me apologise for the delay in your receiving this newsletter. It has been ready to go for some time, and just waiting on me to write this column. That immediately puts the pressure on, as I need to come up with something interesting and worthy of the wait! In the interests of getting this out in a reasonable time, however, I think I will have to forgo trying to produce anything resembling intelligent comment on matters of science, and keep it short and sweet. Hopefully, I will have some inspiration in time for my comment in our next newsletter. The Otago Institute has an interesting year ahead, with a number of excellent speakers lined up for our monthly seminars, plus some additional RSNZ lectures planned. We will also be launching a new science communication programme, offering talk on various science topics to community groups. More details on this in the next issue. I hope to see a good level of support from our members at these lectures, and remember to give us feedback about how you are finding the talks. Also, if there are topics you would like to hear about, or people you would like to hear from, let the council know, and we will see what can be done. I look forward to seeing you all during the year!



Historic mars lander 'did find life'

Claims have re-emerged that the US space agency (Nasa) found signs of life on Mars during the historic Viking landings of 1976. Dr Gil Levin, a former mission scientist, says he now has the evidence to prove it, just days before the US and Europe send new expeditions to the Red Planet. The United States and Russia have spent billions since the 1960s on a handful of space craft designed to land on Mars.. Only three have succeeded so far: the two Viking probes in the 1970s and Mars Pathfinder in 1997.

In 1976, the world was gripped by excitement when a robotic spacecraft touched down on Mars for the first time in history. Biology experiments detected strange signs of activity in the Martian soil - akin to microbes giving off gas. Before announcing the news that life had been found on another planet, Nasa carried out more tests to look for evidence of organic matter. The Viking experiments failed to find this essential stuff of life and it was concluded that Mars was a dead planet.

Dr Levin, one of three scientists on the life detection experiments, has never given up on the idea that Viking did find living micro-organisms in the surface soil of Mars. He continued to experiment and study all new evidence from Mars and Earth, and, in 1997, reached the conclusion and published that the so-called LR (labelled release) work had detected life. He says new evidence is emerging that could settle the debate, once and for all.

He told BBC News Online: "The organic analysis instrument was shown to be very insensitive, requiring millions of micro-organisms to detect any organic matter versus the LR's demonstrated ability to detect as few as 50 micro-organisms." Dr Levin, now president and CEO of US biotechnology company Biospherix, has a new experiment that he says "could unambiguously settle the argument". But it was rejected by both Nasa and the European Space Agency (Esa) to go on-board this summer's Mars missions.

The British-built Beagle 2, which will be deposited on the Martian surface by Esa's Mars Express space craft, is going with the main purpose to hunt for life. This is a risky strategy, claims Dr Levin. "Strangely, despite its billing, Beagle 2 carries no life detection experiment!" he said. "Neither its GCMS (organic detector) which is claimed to be more sensitive than Viking's, nor its isotopic analysis instrument can provide evidence for living organisms."

Nasa's mission to Mars is taking a more circumspect approach to the big life question. Its two identical rovers will roam the ancient plains of Mars acting as robot geologists. Mark Adler, deputy mission manager, said the main science objective was to understand the water environment of Mars not to search for life. He told BBC News Online: "What we learnt from Viking is that it is very difficult to come up with specific experiments to look for something you don't really know what to look for." Claims of life on Mars have always proved highly contentious. Twenty years after Viking, microbe-like structures discovered inside a Martian meteorite found in Antarctica led to more claims that were later rejected.

As the astronomer Carl Sagan once said, extraordinary claims require extraordinary evidence. And there is no reason to believe that anything found this time will be any different. "It's going to take a number of missions if we want to know whether there is life on Mars or not," said Dr Charles Cockell, a Mars biologist at the British Antarctic Survey in Cambridgeshire, UK.

"If we find no evidence of life on Mars it may just mean we have looked in the wrong place."

<http://news.bbc.co.uk/1/hi/sci/tech/2941826.stm>

New Zealand's Royal Society backs call to UN to ban human reproductive cloning

New Zealand's science academy has backed a call to the United Nations to ban human reproductive cloning, which has hit headlines over the past year with purported attempts at cloning a human being. The move, endorsed by the Inter-Academy Panel (IAP) on behalf of more than 60 science academies from every continent in the world, follows the Academy Council of the Royal Society of New Zealand's own recommendation to the New Zealand Government to legislate a ban on implantation of any embryo whose genetic material has been derived from a human somatic cell.

IAP members will present the statement, on behalf of 16,000 of the world's leading scientists, to the UN Committee on Cloning, scheduled to meet at UN headquarters in New York city between 29 September and 3 October. Two bills that address the issue of human cloning in New Zealand are currently with parliament's Select Committee on Health. "The international science community has reacted with great concern to attempts by unscrupulous scientists to clone human beings. New Zealand needs to move quickly to enact legislation to prevent such potentially unsafe and socially unacceptable practices," said Dr James Watson, president of the Royal Society of New Zealand.

At the same time, the Royal Society and the IAP are voicing strong support for research and therapeutic cloning. Research directed towards the study of stem cells derived from human embryos up to the fourteenth day of development has enormous potential value for the development of tissue replacement therapy and the treatment of human disease. Such work must be done by approved laboratories, subject to control by rigorous ethical and practical guidelines.

The United Nations has examined the possibility of a convention to ban human cloning. Consensus, however, has been hampered by disagreements concerning the scope of such a ban, especially whether it should also apply to research and therapeutic cloning.

Otago Secondary Schools' Otago Institute Prize Winner

My science teacher told me about an absurd idea that has been used to clean surface rust of household item (e.g. tools) - to soak it in a solution of molasses! I wanted to prove whether molasses could really be used to clean surface rust. I also wanted to find out whether other sugar substances with similar properties to molasses (golden syrup and brown sugar) had the ability to clean surface rust. I hypothesized that molasses would be able to remove the surface rust but golden syrup and brown sugar won't be able to. My neighbour was able to provide me with some rusty nails dating back to the 1940's. In my experiment I soaked these nails in 3 solutions where each sugar (molasses, golden syrup and brown sugar) was mixed with a certain concentration of water. I left the nails in these solutions for 2 weeks. The concentration of each solution were 25% sugar, 50% sugar and another 25% sugar where I changed the solution once at the end of the first week to test saturation. The nails were first weighed before placing in the solution and at the end of two weeks they were taken out and reweighed to calculate the percentage of weight loss in the form of rust removal for each nail. The results show that all of the sugars in different concentration were capable of removing some rust.

However the most effective was molasses as I had hypothesized. But part of my hypothesis was wrong because I had hypothesized that golden syrup and brown sugar won't be able to remove surface rust at all. How do these sugars scientifically remove the rust of these nails? Through a process called chelation. A chelate is a complex chemical compound consisting of a central metal atom (iron) attached to a large molecule (the sugar) called a ligand, in a ring structure. Ligands are ions or neutral molecules with electron pairs that can donate to the metal atoms to form a co-ordinate covalent bond. Ligands that can attach to the same metal ions at 2 or more points are known as polydentate ligands. All polydentate ligands are chelating agents, which can envelop metal atoms on the surface of an object, trapping them and removing them. Therefore molasses, golden syrup and brown sugar are chelating agents and have the ability to clean surface rust

Aswathy Nandakumar.

New Otago Institute Council for 2004

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

Immediate Past President: Glenn Buchan (Department of Microbiology)

Vice-President: Dave Hutchison (Department of Physics)

Secretary: Michelle McConnell (Department of Microbiology)

Treasurer: Gen Matthews (Department of Biochemistry)

Council: Brendon J. Woodford (Department of Information Science), Clive Trotman (Department of Biochemistry), Brian Patrick (Otago Museum), Sarah Young (Department of Microbiology), Stephen Bunn (Department of Anatomy and Structural Biology), Jane Wilson-Wheeler (GeneWorks), and Gordon Parsonson

In addition the following representatives attend council meetings

Dunedin Astronomical Society: Rachel Peach

Otago Museum Trust Board: Bill Brockie

Otago Polytechnic: Ameila Brown-Smith

Otago Secondary Schools Association: Murray Smeaton

Archivist: Gordon Parsonson

Editorial



As 2003 draws to an end, I find myself with a little more time to catch up on some summertime reading.

Unlike the traditional lightweight reading material that defines a day out in the sun, I have been loaned rather fascinating book *The End of Science* by John Hogan in which he argues that achieving fundamental (scientific) discoveries are becoming increasingly difficult and that the only way for scientists to truly know the limits of science is to keep trying to overcome them.

After reading his book I reluctantly came to the same conclusion. Are we at an end to what we can discover or futher?

Fortunately this book is not just a bearer of bad news but also discusses some areas of research that still offer much investigation. Nanotechnology, fusion, chaos theory and the understanding complex systems, artificial common sense, and the furthering of our understanding of the brain will ensure that we still have much to learn.

And with advances happening so rapidly over the past century, then turning our efforts to these areas may see us crack some of these problems before the end of this decade.

So in essence science does have a bright future where we need to approach this discipline with energy to push the envelope of discovery.

Brendon J. Woodford
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Notes from the AGM

The 134th Annual General Meeting of the Otago Institute was held at 1pm on Wednesday the 19th of November in the Hutton Theatre, Otago Museum. In a break with tradition it was decided to hold this year's AGM following the last lecture in the 2003 lecture series. We hoped, as a result that more of the OI members might be encouraged to attend the AGM. Alas, this was not the case. Even though the lecture given by Dr Ian McLennan entitled "Worn out motor systems: motor neuron disease and age related frailty" was well attended only 12 members attended the AGM.

One of the highlights of the year for the outgoing council was the success of the new format of the Vincent George Travel Award for postgraduate students. The judges selected the top three students on the basis of their written submissions. These students then gave oral presentations in the July lunchtime lecture slot. These were very interesting and professionally presented.

Three members of this year's council retired at the AGM

- Lynn Taylor who has been the Dunedin Astronomical Society representative to the OI off and on for 20 years
- Kate McGrath who has taken up a new position at Victoria University
- Lynn Newall a Royal Society Teacher Fellow (through the NZ Science, Mathematics and Technology Scheme) for 2003 who represented the Otago Secondary Teacher's Association.

Brian Patrick, the 2003 vice-president indicated due to other commitments that he would not be able to serve as vice-president in the coming year but was happy to stay on council.

Speeding up Grape Vine Importation

A specialised laboratory technique being developed by New Zealand's largest grapevine nursery could substantially shorten the length of time that imported plant materials spend in quarantine.

The specific in vitro technique is new for use in grapevines, and has the potential to substantially accelerate the process of confirming the disease-free status of new vine materials.

Under Ministry of Agriculture and Forestry (MAF) regulations, imported plant materials must currently spend approximately two years in post-entry quarantine (PEQ) to ensure they do not bring unwanted pests and diseases into New Zealand. During that period, they are required to undergo a series of tests, including a process known as "woody indexing". In that process, buds from new vine materials are grafted onto "indicator plants", which, over time, demonstrate whether prohibited viruses are present.

If the new technique being developed by Riversun proves successful, that two year period could be reduced to just three to six months.

Riversun has reached the midway point of its research and development programme, which is being supported by the government funding agency, Technology New Zealand. The nursery successfully applied for investment assistance from Technology New Zealand's Technology for Business Growth (TBG) scheme.

Riversun's Technical Director, Dr Roderick Bonfiglioli, says the new technique involves "micro-grafting" tissue culture, and can be described as growing very small plants in vials of sterile agar.

"Woody indexing for large quantities of new stock is costly, time consuming and takes up a significant amount of quarantine space," says Dr Bonfiglioli, who is responsible for reporting on the health issues of the vines in quarantine and ensuring that MAF-approved practices and procedures are maintained.

"Time and space are two of the costliest components of the entire important process."

As an example, Dr Bonfiglioli says for just one vine to pass through quarantine under the current system, Riversun is required to pot up another 20 indicator plants with buds grafted onto them from the imported vine. The new technique under development will expedite the process and reduce the space requirements.

Riversun is leasing space at Trees and Technology's facilities at Te Teko. This is an accredited level 3 (high risk) PEQ facility that meets required biosecurity specifications and is environmentally controlled. The tissue culture research is being conducted in laboratory facilities on site.

Part of the research project involves grafting tissue from plants known to be diseased to double-test the accuracy of the new technique to ensure it is failsafe. The greatest challenge, says Dr Bonfiglioli, is developing the in-house skills for micro-grafting tissue from plants.

"It's looking very promising," says Dr Bonfigliolo. "Saving time and space through the use of micro-grafting will enable us to import more new material more quickly, and that ultimately provides the New Zealand wine industry with a competitive advantage."

<http://www.frst.govt.nz/news/2003/GrapeVines-Nov03.cfm>

The Royal Society of New Zealand Stance on GM

Two years ago, the Royal Society of New Zealand, this country's science and technology society, took a long hard look at the science and social science of Genetic Modification. The results of what the Society thought then, and summaries of what other groups said to the Royal Commission on Genetic Modification, can be found at www.rsnz.org/news/gene. At that time we said that more safeguards were needed before any release of a genetically modified organism should be contemplated. We didn't give any time frame to put them in place, but subsequently the government announced a two-year moratorium, due to finish at the end of October.

New Zealand's Hazardous Substances and New Organisms (HSNO) Act requires the Environmental Risk Management Authority (ERMA) to take the need for caution into account. When it comes to questions on risk and uncertainty, there is no doubt we need to be careful, but HOW careful? Views expressed around the country seem to imply that caution lies anywhere from the emergency brake to second gear. A review of the conditions laid down by the Royal Society and what has been done to date is given below.

1. Overall, the Royal Society wanted to see a stronger consultation, control and administrative framework. What we see now is that the changes coming through the New Organisms Bill (now going through parliament), combined with the recent review of ERMA, do provide a stronger process of consultation, control and administration. In particular ERMA can impose a wide range of conditions on release into the environment, including post-release monitoring

2. We asked that legislation and/or regulations should include not just scientific risk assessment, but also include cultural, ethical and social issues and concerns at both the research and field trial levels. We do now find that the requirements on both ERMA and the Minister to consider such issues have been strengthened. In particular the Government established the Bioethics Council specifically to advise the Minister on spiritual, cultural and ethical issues. The degree to which that advisory role has an impact on decisions by ERMA and the Government is of course yet to be tested.

3. We wanted to reduce red tape on the construction and importation into containment of low-risk GMOs, more clearly prescribe the steps needed for research and field trials, and establish a science panel to advise ERMA and research institutions on questions of containment. The red tape is being reduced, and a science panel now turns out not to be needed, as containment conditions are already in line with internationally agreed standards.

4. We wanted a good monitoring system in place before any GMOs were released. With the changes in legislation, the New Organisms and Other Matters Bill ensures that ERMA will be able to require effective monitoring and reporting of results to the appropriate authorities

5. We thought that those benefiting from the use of GM technologies should have to meet the costs of any adverse consequences of commercial release. The Law Commission was asked to look at this, and concluded that current laws are adequate. In fact, ERMA's penalty provisions also ensure that there is an incentive to comply with release conditions.

6. We noted that, inherent in the concerns expressed by Maori is the question of who decides on GM matters. Where non-negotiable beliefs were held, we wanted them to be heard. We are satisfied that the ERMA process now provides opportunities for all views to be taken into account, however, no one group should have the power to either veto or force the release of GMOs into the environment.

7. We noted a sense of disenfranchisement in respect to intellectual property rights. In particular, Maori are concerned that rights (both spiritual and financial) to customary knowledge about native flora and fauna could be lost through the use of intellectual property law. We also noted that, where ownership of the genetic resource is asserted, ownership must be resolved. Two years later we do see some progress on the Wai262 claim on Maori ownership of indigenous flora and fauna, and accept that this complex issue will take time to resolve.

8. Lastly, we asked that, where risks are apparent, both the probabilities and the individual/group perceptions of risk must be weighed. It is important that in making its decisions ERMA should use comprehensive understandings of risk and take account of a diversity of cultural and ethical understandings among New Zealanders. This remains a subjective area, however, where statistical assessments of risk must be supplemented by methods for dealing low probability catastrophic events. Risk must also include the dimension of public trust in the system and institutions entrusted with the decisions. Assessment of economic risk will entail the development of transparent and defensible criteria by which ERMA can assess the economic costs and benefits.

One last thing we suggested was that the Act at some stage be split into two parts, to deal separately with Hazardous Substances and New Organisms. That wasn't done, and wouldn't affect the conditions we set, but over the longer term it would make administration of this complex area simpler to understand and operate. As it stands, the revised Act contains a number of patches which make it difficult to follow.

Overall, the Royal Society welcomes the improvements in the conditions it wanted to see met before release of GMOs. Many scientists do not see any significant science problems yet with GMOs, but that doesn't mean that there won't be any. The Society sees no scientific need to continue with a blanket ban of release, but we continue to see a need for careful case-by-case assessment. We welcome the increased attention to safeguards against adverse effects and we recognise the need to attend, not just to the science issues in this field, but also the social, economic, cultural and ethical aspects of the use of GMOs.

Websites of Interest

The American Federal Aviation Administration (FAA) contains a host of website links to resources celebrating the Wright Brothers flight along with other information on the past 100 years of flight at <http://www2.faa.gov/education/wright/wright.htm>

The British led exploration of Mars is in the form of the Beagle 2. To find out the status of this initiative check out <http://www.beagle2.com/index.htm> for photographs and late-breaking news of the project.

NASA also has two Mars landers ready to investigate the surface of the red planet. A website devoted to chronicling this exploration can be found at <http://marsrovers.jpl.nasa.gov/home/index.html>.

Next Otago Institute Talk

Professor Ian Mclellan

Speaking on the theme "Worn out motor systems: Motor neuron disease and age related frailty"

12 Noon

Wednesday 19 November

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Otago Museum**

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