

This second ASBTE NEWS of 2007 has information on current biomaterials and tissue engineering research in New Zealand, as well as Society news items including ASBTE name and logo change, travel grant report, an update on the ASBTE website and ASBTE Student Column. Hope you will enjoy reading it.

## ASBTE Symposium 2008 – 2<sup>nd</sup> Call

Since it is a World Biomaterials Conference year, the ASBTE will be holding a 1 day Symposium instead of its annual conference. The theme of the Symposium is “Analytical Methods for Biomaterials, Tissue Engineering and Nanotechnology” and will be held at the National Museum of Australia, Canberra on February 22<sup>nd</sup>. Abstracts are due February 1<sup>st</sup> 2008. Registration forms are available at [www.biomaterials.org.au](http://www.biomaterials.org.au).

## ASBTE Membership 2008

It's time to sign up or renew your ASBTE membership for 2008! Membership forms are available at [www.biomaterials.org.au](http://www.biomaterials.org.au).

## ASB Changes its Name & Logo

It was decided at the last AGM held on 12<sup>th</sup> April 2007 that in order to reflect its contemporary scope the name of our society be changed to “The Australasian Society for Biomaterials & Tissue Engineering” (ASBTE, in short). As a result of the ASBTE logo competition, we also now have a brand new logo! The winner, Dr Philip Boughton, designed a very professional looking logo, which now adorns the Society's website, newsletter and letterhead, and incorporates the following themes:

- Orthogonal lines denote biomaterials or scaffolds and four point stars denote cells
- An interconnected logo illustrating cells connected together with the help of biomaterials
- An interconnected logo illustrating centres of research networked together by the ASBTE.
- The Southern Cross representing the Australasian origin of the ASBTE.
- Outstretched symbol indicates growth of the ASBTE as it networks into the Indo-Asia-Pacific region.

Congratulations to Philip and all those that submitted their designs ideas to the competition.

## ASBTE 2008 Travel Grants & WBC Travel Awards Announcement

The ASBTE is pleased to call for applications for our 2008 Travel Grants and World Biomaterials Congress Travel Awards.

**Travel Grants:** ASBTE will fund Travel Grants of up to \$5000 for international travel and up to \$1000 for local travel during 2008 for postgraduate research students and Early Career researchers. Guidelines and submission details are provided on the ASBTE website ([www.biomaterials.org.au/](http://www.biomaterials.org.au/)). **Application due date:** 5pm Friday 25 January.

**WBC Travel Awards:** ASBTE will fund five Travel Awards of up to \$2000 to assist postgraduate research students and Early Career researchers to attend the 8<sup>th</sup> World Biomaterials Congress in Amsterdam in May, 2008. Applicants must be current (2007) financial members of ASBTE, with renewal paid for 2008 and have submitted an Abstract for presentation at the Congress. The Travel Awards are intended to help those who have difficulty getting to the Congress through shortage of funds. The decisions on the Awards will be made by the ASBTE Committee and may vary in amount at the discretion of the committee. Letters of application, giving justification of need, showing travel budget and other funds available, plus a copy of the submitted Congress Abstract must be submitted to Dr Andrea O'Connor via email ([andreaajo@unimelb.edu.au](mailto:andreaajo@unimelb.edu.au), with Subject “ASBTE Travel Application”) by 5pm Friday 25 January.

Applicants for both the Travel Grants and WBC Travel Awards are strongly encouraged to present posters on their work at the **18<sup>th</sup> Annual ASBTE Meeting and Symposium** on 22 February 2008 in Canberra (see [www.biomaterials.org.au/](http://www.biomaterials.org.au/)).

## Biomaterials & Tissue Engineering Research in New Zealand

### Dr Tim Woodfield

This article briefly introduces aspects of Biomaterials and Tissue Engineering (TE) research currently ongoing in New Zealand. It is by no means a complete list, but hopefully it will serve to introduce both the ASBTE and NZ researchers to a wider audience. While biomaterials and TE research in NZ is not as developed as in Australia,

there is still a broad mix of academic institutions, biotechnology industries and government departments (Crown Research Institutes, CRI's) leading research in these fields.

Dr George Dias and colleagues from the Dept of Anatomy & Structural Biology at the University of Otago have investigated alternative bone graft substitutes, such as reconstituted keratin, as well as their application as scaffolds for bone TE. This has involved *in vitro* and *in vivo* characterisation in small and large animal (sheep) models utilising excellent animal facilities available at Otago (<http://anatomy.otago.ac.nz>). Also at Otago, Assoc Prof Tony Poole (Medical & Surgical Sciences) and his group have been researching for many years in the field of cartilage biology and "the chondron". More recently, significant focus has been in developing *in vitro* and *in vivo* strategies for cartilage TE and studying the role of the primary cilia in chondrocyte mechanobiology.

(<http://dnmeds.otago.ac.nz/departments/mss>).

At the Centre for Bioengineering, University of Canterbury, myself and Dr Mark Staiger run a biomaterials and TE (BioMATE) group. Our research focuses on fabrication of metal foams and novel metal alloys for bone interfacing implants; biodegradation; electro-spinning, rapid prototyping and 3D bio-manufacturing (e.g. 3D plotting, 3D cell printing) of porous scaffolds for bone, cartilage and neural TE; scaffold topology optimisation; "smart" scaffold design and *in vitro* models for cartilage and neural TE; *in vivo* models in collaboration with Otago. My work is also performed in conjunction with the Dept of Orthopaedic Surgery at the Christchurch School of Medicine & Health Sciences (University of Otago). ([www.bioengineering.canterbury.ac.nz/biomate](http://www.bioengineering.canterbury.ac.nz/biomate)).

Dr Michael Mucalo's group in the Dept of Chemistry at Waikato University has a particular interest in calcium phosphate-based biomaterials, specifically hydroxyapatite, and the use of processed, waste bovine bone from agricultural sources as a bone replacement material in humans (also see Dougal Laird's ASBTE student column). His group also collaborates with the University of Otago and Massey University Veterinary Hospital ([www.sci.waikato.ac.nz/staff/chem/mucalo](http://www.sci.waikato.ac.nz/staff/chem/mucalo)).

Dr Ian Anderson and colleagues from the Bioengineering Institute at Auckland University are using CT imaging and FEA to investigate remodelling of bone around implants as well as development of artificial muscle from dielectric elastomers. The group also has designed computer assisted surgery (CAS) tools for surgical implant alignment ([www.bioeng.auckland.ac.nz](http://www.bioeng.auckland.ac.nz)).

With respect to government research centres, AgResearch Ltd is NZ's largest CRI with capabilities in animal and plant genomics, food technology, biocontrol and biosecurity, animal

health and reproductive technologies. Relevant areas of specific interest includes animal adult and foetal stem cell research as well as studying cell biology and regenerative capacity of deer antler (e.g. cartilage TE) ([www.agresearch.co.nz](http://www.agresearch.co.nz)). Scion's focus is on next generation biomaterials. Formerly known as Forest Research, Scion is a NZ CRI focused on applying knowledge of plantation forestry, wood and fibre to the development of new biomaterials and biopolymers from renewable plant resources ([www.scionresearch.com](http://www.scionresearch.com)). Crop & Food Research is another CRI with research themes investigating biologically active (bioactive) compounds derived from plants and marine life as well as developing nanostructured biomaterials via electro-spinning in collaboration with the University of Canterbury ([www.crop.cri.nz](http://www.crop.cri.nz)).

As NZ's biotechnology research community, facilities and industry are small, many networks have been established to link institutions with some focusing on biomaterials, nanotechnology and regenerative medicine. For example, to bring together the significant resources of the abovementioned 3 major CRI's (i.e. AgResearch, Scion, Crop & Food Research), the Biopolymer Network was established to improve national and international links ([www.biopolymernetwork.com](http://www.biopolymernetwork.com)). Named after 2000 Nobel Chemistry Prize-Winner, New Zealander Alan MacDiarmid, the MacDiarmid Institute for Advanced Materials and Nanotechnology is one of seven national Centres of Research Excellence established in 2002-03. A Bionanonet (BNN) was established to link national research groups, many of which are focussing on nanostructured biomaterials and applications in nano-medicine ([www.bionano.net.nz](http://www.bionano.net.nz)). The Stem Cell & Regenerative Technologies Network (SCaRT – via Ministry of Health's NZBio initiative) was recently formed to promote interaction of scientists, clinicians and industry within NZ and internationally in the field of stem cell research and regenerative technologies. It provides a forum for groups and individuals with an interest in research & development relating to tissue and organ regeneration, with emphasis on research using stem cells (adult, foetal or embryonic), including basic stem cell biology and function. ([www.nzbio.org.nz/RegTechs/](http://www.nzbio.org.nz/RegTechs/)).

In terms of biotechnology industry with links to biomaterials and TE, Keratec, a spin-off from AgResearch, is developing a range of keratin based biomaterials isolated from wool for applications primarily in skin and wound healing, as well as cartilage and bone TE based on initial work at the University of Otago ([www.keratec.co.nz](http://www.keratec.co.nz)). Southern Lights Biomaterials (SLB) is an NZ-based biomaterials company supplying pharmaceutical-grade, BSE-free bovine and ovine raw tissue

animal materials for medical applications internationally ([www.slv.co.nz](http://www.slv.co.nz)). Living Cell Technologies (LCT) develops cell transplantation products to treat life threatening diseases. LCT uses encapsulated porcine cells to repair diseased tissues, without the use of immunosuppression ([www.lctglobal.com](http://www.lctglobal.com)). ENZTEC is an orthopaedic medical device company focussing on the design, manufacture and distribution of innovative surgical instrumentation, implants and consumables for reconstruction of the musculoskeletal system ([www.enztec.co.nz](http://www.enztec.co.nz)).

We will distribute the ASBTE Newsletter to this wider NZ audience in order to increase the awareness of the Society in NZ and to stimulate discussion and collaboration.

### **Reports from recipients of the ASB Travel Award 2006**

***Martin A. Cole (Ian Wark Research Institute, University of South Australia, Adelaide 25/08/07 – 22/10/07)***

The primary aim of my visit to ETH Zürich, Switzerland and The Kroto Research Institute, Sheffield, United Kingdom was to learn new techniques for the analysis and preparation of stimuli-responsive polymer coatings.

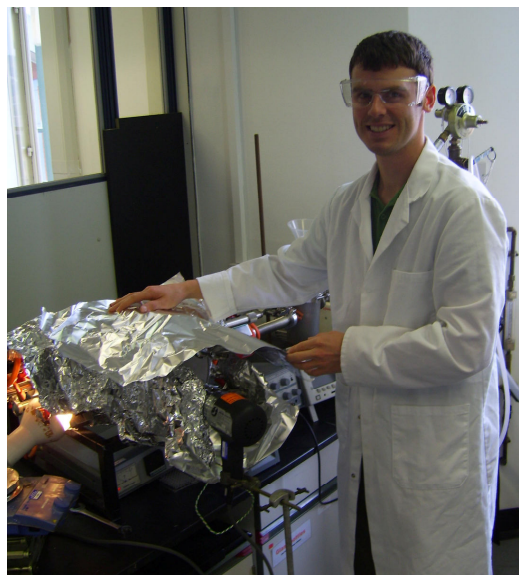
Research at ETH Zürich focused on investigating the bio-interfacial properties of coatings I had prepared in Australia prior to departure using the state of the art techniques of optical lightmode waveguide spectroscopy (OWLS) and quartz crystal microbalance with dissipation monitoring (QCM-D). Sensors were coated with pNIPAM via a number of methods based on surface initiated atom transfer radical polymerisation.

The phase transition of pNIPAM coatings was characterised using a QSense QCM-D where use of the 4 chamber instrument allowed parallel analysis of different samples plus controls. This allowed data subtraction and further processing to investigate solely the response of the temperature mediated switching of the polymer.

Analysis of the coatings by OWLS proved to be possible, showing ideal sensitivity for measuring the swelling and collapse of the immobilised coating. This was characterised for a number of different samples for comparison of different preparation techniques. However, interpretation of the observed optical responses is complex for such grafted hydrogel polymer systems and further work must be done to enable quantitative data analysis.

Work conducted at The Kroto Research Institute (24th Sept – 10th Oct) included investigation into the preparation of plasma polymerised NIPAM coatings and other plasma polymers integral to my project. Investigations into plasma conditions including power, monomer flow rate and temperature were performed as well as a study into

pulsed and continuous wave plasma deposition modes. Analysis of coatings via x-ray photoelectron spectroscopy (XPS) was conducted for chemical characterisation as well as stability testing of coatings.



*Martin Cole performing plasma polymerisation research at The Kroto Research Institute in Sheffield, UK.*

Attendance and participation at two international conferences during the trip allowed discussions with experts in my field. The runner up poster award was received for my poster at the Biomaterials Interfaces Division of the AVS 54th International Symposium.

### **ASBTE Website ([www.biomaterials.org.au](http://www.biomaterials.org.au))**

The new, more user-friendly ASBTE website has been launched! Please take a look and let us know if you have any comments on how it can be further improved, or suggestions for additional content. We are particularly interested for our student section to grow as well as provide a noticeboard for students looking for PhD projects/scholarships and for members advertising for vacant post-graduate positions.

Remember, any member wishing to supply news items, links or other relevant information should submit these to Dr Penny Martens ([p.martens@unsw.edu.au](mailto:p.martens@unsw.edu.au)).

### **ASBTE Student Column**

***Report from the ASBTE Student Reps Brooke Farrugia & Dougal Laird***

Welcome once again to the student column of the ASBTE newsletter. This time around we thought that we would give a bit more of an insight to our research with Dougal expressing his account of biocompatibility testing and the concept of animal experiments in the name of research.

### ***Biocompatibility testing and animal trials – Dougal Laird***

My most recent research has taken me into true biomaterials science territory. Although I am educated as a chemist, and doing a PhD in Chemistry, my research topic draws me directly into the biomaterials field because I am studying and producing bone implant materials. I recently did a stint at Otago University to undertake some biocompatibility testing on my bone implant material.

There are two preliminary biocompatibility tests commonly used for evaluating prospective implant materials prior to animal trials. The first one I used was a direct contact cell culture test using the immortalised mouse cell line L929. These are derived from cells that were isolated and derived in March 1948, which of course makes that mouse 59 years old! After completing my first 'passaging', I must confess to having developed a strange kind of parental attachment to these cells.

The second biocompatibility test was the hen's egg chorioallantoic membrane (HET-CAM) test. Here, the chorioallantoic membrane of a developing chicken embryo is exposed to the implant material then examined for signs of alteration to the membrane and blood vessel network in terms of haemorrhage, lysis and coagulation. The embryo must be used before the 10th day of gestation as after that period the nervous system is regarded as fully functional. This brings to mind a remark made to me by a friend before I went to Dunedin. She is a vegetarian and jokingly passed comment to the effect of, "off to do bad things to animals for the glory of science then?" I must confess that this struck a nerve and I found it somewhat difficult in that instant to defend myself.

However, after doing some background reading, I was comforted to discover that there are in fact scientists trying to reduce and in some cases eliminate the less pleasant aspects of animal testing. For instance, while reading literature in preparation for the HET-CAM test, I found that in response to public opposition to the testing of cosmetics on animals, Steiling *et al.* (1999) evaluated the replacement of the Draize rabbit eye test with the HET-CAM test. In another study, an institute in Stuttgart had developed a three dimensional human skin model for testing the toxicity of chemicals, in a bid to reduce the necessity for animal trials, at least for chemicals destined for use

on the skin.

It seems to me that some good advances have been made in this area. At the same time, I recognise that animal testing remains an essential practice to evaluate biomaterials and it is difficult to foresee a way around this in the near future. However, I think as students we inherently come to science from a fresh perspective, and are therefore in a position to examine established practices in a new light and to help improve on the way in which we can tackle these difficult issues in the future without compromising human safety.

### ***Other News:***

Do you have an aspect of your research that you would like to share with fellow students? If so please feel free to let us know your thoughts for the next student column! We, as the student representatives of ASBTE, would like to welcome and encourage fellow research students out there to let us know how your research is going or if you have any information that you would think fellow colleagues would appreciate. Follow the links to the 'Information for Students' page to check it out! (see [www.biomaterials.org.au/](http://www.biomaterials.org.au/)).

With abstracts for WBC2008 now long handed in, we hope to see a large number of student representatives from ASBTE in Amsterdam next May, displaying the exceptional research that is being conducted by the next generation of Australasian researchers.

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**Interested in becoming a member of ASB?** Membership Rates: Full Member (Calendar Year) \$60; Student Member (Calendar Year) \$30. A membership form is available at [www.biomaterials.org.au](http://www.biomaterials.org.au)

**ASBTE NEWS** is a biannual newsletter that covers news from The Australasian Society for Biomaterials and Tissue Engineering. If you have a news item that you wish to be included please contact the editors:

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