Chairman’s Note

According to the latest TIN100 report, NZ’s Healthcare sector is strong and healthy, with an 11% growth in the last year. The sector is now $1.3B based on the 13 companies (each with revenue greater than $10M) on the TIN100 list. Ten of these are from the medtech industry – 6 device and 4 eHealth companies - while the remaining three are in pharmaceuticals.

The need for new technologies to help reduce healthcare costs through community/at-home monitoring addressing the increasing aging population and prevalence of chronic disease is still the major global issue, as reinforced in the recent US medtech forum, AdvaMed, in Chicago. Solutions that show benefit to patient outcomes are sought to support new delivery pathways; the emphasis is on remote healthcare, integrated delivery of care, earlier detection of disease, prevention and patients taking charge of their own health. This is an opportunity for NZ companies which have shown that they can be competitive globally and in various instances ahead of the world in new technologies.

Callaghan Innovation, in partnership with NZTE and MTANZ, led a NZ delegation of thirteen new and emerging companies to AdvaMed in October. These companies span a range of technologies from diagnostics and wound care to rehabilitation and eHealth. All certainly have technologies that target the challenges in healthcare today. The trials and tribulations of developing and taking new technologies to market cannot be underestimated but the future looks bright for our medtech sector.

On the CMDT front - our list of CMDT affiliates is growing and we would like to welcome Otago Polytechnic, Estendart Ltd and Brandwood Biomedical NZ to the CMDT network. Check them out on our website (www.cmdt.org.nz). Do feel free to contact any of the CMDT committee members if your organisation is interested in joining us.

Finally, we would like to thank our previous editors, Kim Jordan (Callaghan Innovation) and Thor Besier (Auckland University) for starting our newsletter. The mantle has now passed onto Simon Fraser and Brenda Lazalle (Victoria University) - enjoy their first editorial.

Diana Siew and Peter Hunter, CMDT Steering Committee Co-chairs
What can design bring to the research, development and commercialisation of medical devices? The invitation to edit the next two editions of CMDT Quarterly presents the VUW School of Design with an opportunity to show just what they can bring. Their two-part contribution calls on recent case studies that focus on two major themes – speculative design as a research strategy for future products, and interactive design challenges for real-world medical devices.

As a result of international acknowledgement from the James Dyson Foundation in the UK, students from the VUW School of Design are developing a reputation for innovative design solutions to healthcare concerns. For the second year running, a research project from the School has won the New Zealand James Dyson Award and now awaits the jury’s decision as a finalist in the international competition in November.

The success reflects a holistic and human-focused approach to designing medical devices, as Prof. Simon Fraser, Associate Dean of Research, explains. “While technology inspires and shapes us, it is also the role of design to shape technology for the benefit of humanity. For it is at the point where social, behavioural and cultural insights of humans meet technology, that truly innovative, unexpected and meaningful designs emerge.”

The outcome of this approach is evident in design student Jake Evill’s Cortex cast, a speculative project that won second place in the 2013 International James Dyson Awards. With advances in scanning, digital modelling and 3D printing, we can now design casts and splints based on sophisticated structures. The Cortex exoskeleton proposes the combination of an X-ray and a 3D scan to provide all the data needed to parametrically model a cast, using algorithms and customised software to calculate the optimal form for fit, support and strength-to-weight ratio. Cortex replaces time-consuming hand fabrication with highly customised digital production, thereby substantially improving the clinical and technical processes of treating fractures and sprains. It also addresses the serious issue of medical waste. Unlike plaster and fibreglass, nylon can be recycled.

Cortex not only addresses immediate issues of comfort such as weight, fit, hygiene and irritation, but also the process of integration back into normal life after an accident – such as taking a shower or putting on a jacket. The project recognises that emotional issues are as important as the physiology of healing; that patients not only want to get well, they want to feel well, too.

This year’s James Dyson Award entry from the School is titled Desirable Prosthetics, a shock-absorbing scaffold that sits under a traditional prosthetic nose, created by design student Zach Challies. It was inspired by similar technologies but with a different application. The loss or disfigurement of features such as a nose or an ear is typically remedied with a handcrafted silicon prosthesis, and while such prostheses serve as a form of concealment, they fail to provide patients with complete confidence. For example, many patients avoid social interactions for fear of their prosthesis being ‘discovered’ or, worse, knocked off to reveal the nasal cavity beneath.

Desirable Prosthetics seeks to reposition the facial prosthetic as an honest but desirable declaration of the condition, in much the same way that spectacles have made the transition from ‘prosthesis’ to ‘fashion statement’. 3D scanning and generative software now make highly customisable and financially viable prosthetics a reality. The scanner maps the shape of the face as an anatomical landscape from which programmes can generatively model structures, such as the shock-absorbing strut, the facade and the external shell (as seen in image on left).

Multi-material 3D printing builds each component with variable densities and rigidities. In accommodating the complex dynamics of facial expression, the flexible materials facilitate something for the patient that many of us take for granted: the seemingly simple and spontaneous act of smiling.

The intention of such design speculation is to stretch our current technological capabilities beyond what is currently possible, but at the same time to provide tangible reference points for future development. The rationale is that the very act of pushing technology, societal practices and cultural beliefs beyond their limits opens up new design possibilities. If an outcome brings a convincing and recognisable improvement, it will awaken the interest of other specialists who will pick up the opportunity and find the means to achieve it.

Collaborators
Cortex student: Jake Evill. Supervisor: Ross Stevens.
http://www.jamesdysonfoundation.com/james-dyson-award/
http://www.jamesdysonaward.org/profile/zchallies

Medical Devices by Design
The future Health Precinct/Te Papa Hauora is the hub of a creative and inspiring network that integrates world class healthcare, research, innovation, education and industry with a strong emphasis on population health. It will accelerate economic growth, act as a magnet for talent and promote community wellbeing.

Situated close to Christchurch’s main hospital in the new South Frame, the Health Precinct creates an opportunity to bring together the Canterbury District Health Board (CDHB), the University of Otago Christchurch (UOC), the University of Canterbury (UC) and Christchurch Polytechnic Institute of Technology (CPIT) in a world class collaboration around clinical services, research, teaching and professional development.

The Health Precinct will include:

- A Health Research and Education Facility – providing clinical education and training and a hub for research activities
- Private and public services delivering health care and health innovation in and near hub
- Allied health – partnerships between industry and clinicians
- A proposed medi-hotel – where patients and families can stay while receiving outpatient or specialist care

One of the major areas of interest in the development of the Health Precinct is medical technologies and devices. Christchurch already has a number of medical technology companies that occupy specialist market niches. The facilities of the Health Precinct will encourage on-going collaborations between clinicians, researchers and engineers that are expected to produce new technology solutions and devices.

A feasibility study is currently underway for a proposed Centre of Excellence. The current thinking on the key research themes for the centre to showcase includes a strong emphasis on medical technologies, devices, imaging and bioengineering, themes which have come through strongly in workshops that have been held with health and industry members. Such centres of excellence sustain an ecosystem which helps attract and retain the best quality clinicians and researchers.

In addition to hospital based clinical disciplines and medical technologies and devices, there is also the opportunity to embrace broader interests in community health, allied health and education through the University of Canterbury and CPIT. Whether mobile health (mHealth) might be an additional theme is also being considered. This would enable wider engagement with students, staff and patients through a variety of personal health applications on mobile devices.

With co-location of laboratories and other workspaces - staff and especially students from different institutions and disciplines can mix and mingle and share ideas and problems. Key ingredients often include attractive common spaces, informal meeting areas and of course, exceptional coffee! Over time institutional barriers diminish and new relationships and collaborations will be forged.

The Health Precinct will create a legacy of enduring collaborative leadership. The strong partnerships between the public and private sectors will lead to the development and delivery of cutting edge health, research and education outcomes.

**Collaborators**

* **Cortext student:** Jake Evill. Supervisor: Ross Stevens.  

  **Desirable Prosthetics student:** Zach Challies. Supervisors: Bernard Guy, Ross Stevens.  

**Images:** Above - high fidelity mock-up of a patient ward set up at Canterbury District Health Board's Design Lab and credited to CDHB.  
Left - Health Precinct Draft Concept and credited to CCDU.
Matakina Technology, an award-winning breast-density screening company, is one of our medical device success stories. Founded in 2009 to enable radiologists to give women highly accurate information regarding their breast health, Matakina has grown from a staff of three to a team of 15 full-time employees in Wellington. Its Volpara software, with which radiologists can devise high-quality, individualised breast cancer screening, is now in use across Europe, the United States, Australasia and Asia. Founder and CEO Dr Ralph Highnam says that Matakina will not take its success for granted and that to remain at the forefront of breast cancer detection, it needs to and will continue to innovate.

Initially self-funded, Matakina have received support from New Zealand agencies such as NZTE and Callaghan Innovation, and plans to continue investing in further development in order to grow the company. While Matakina is very grateful for the support of government agencies, Highnam says that their experience of developing a global product in New Zealand has not been without its challenges, and that New Zealand companies can face a mixed response from the local medical research community.

Conducting critical research locally can be difficult, and while District Health Boards nominally allocate a percentage of clinicians’ time to research, the reality is somewhat different with clinicians under pressure to see routine patients. Matakina has found that they can more easily conduct research in hospitals in the United States, which are often privately owned and more willing to adopt new technologies. “In the last three years we’ve done some huge trials with the breast-screening programmes around the world,” Highnam told journalist Alisa Yong in July. “In the next few months the results will be coming out, and they’re all very, very positive about our technology.” Matakina’s Volpara software was recently selected for a world-leading stratified screening programme that will be carried out across the five University of California medical centres.

A major upside of the US research, Dr Highnam says, is that it has supported Matakina to meet the regulatory needs of the US market – and other New Zealand companies need to recognise the importance of fulfilling those requirements too. “New Zealand companies are naïve to the challenges to meeting regulatory requirements,” he says. “Products and services should be developed for the US market from the outset so they are developed to meet the regulatory needs of the most demanding market, and companies need access to specialist expertise to achieve this.”

Matakina has chosen to base itself in Wellington for the quality of the

The Matakina Story

Dr Ralph Highnam completed his PhD in breast imaging under the oncologist Professor Sir Michael Brady at the University of Oxford in 1989, and went on to co-author the seminal book Mammographic Image Analysis (1999). Together Brady and Highnam successfully commercialised Oxford intellectual property related to molecular imaging via a start-up in 1999, which was sold to CTI Molecular Imaging in 2003.

In 2009, Brady and Highnam joined with Drs Martin Yaffe and Nico Karssemeijer with the goal of reducing the mortality and cost of breast cancer by producing better, safer screening tools. The four specialists – who comprise four of the world’s most prominent breast imaging scientists – are still involved with Matakina.

“Matakina” is the Maori word for “double-check” or “review”. Conventional breast screening can miss early signs of breast cancer, particularly in dense breast tissue. Matakina’s Volpara software works to increase the chances of successful treatment by enabling medical professionals to measure breast density, monitor and minimise radiation dosage, and better manage their mammography systems.

Volpara software is currently used at around 155 locations around the world, including Wellington Hospital and Auckland private clinics. It is also undergoing trials by national screening programmes such as the Dutch Breast Screening Organisation and other European screening programmes, which could lead to lucrative contracts for the company. This year, Matakina has won the Frost & Sullivan Award for Technology Innovation Leadership, as well as the top prize in the export section of the Wellington Gold Awards.
Medical rehabilitation company Im-Able Ltd and Callaghan Innovation have developed and successfully trialled the AbleM to help people with stroke to recover their arm movement. The device operates with sophisticated software exercise games designed to increase range of arm, hand and finger movement. Initial prototypes have been deployed in high-profile new approaches to arm recovery treatment in Australia. Clinical trial data shows very good efficacy.

The device looks like a giant computer mouse with the clicker above the hand. The games are designed specifically for recovery from brain injury, improving a person’s movement and concentration.

The basic unit was designed by iDesign Solutions in Christchurch with the intention of low-cost mass production. However, the mould cost quotes started at $70k and minimum run sizes were large. This amounted to a very large outlay for a small company.

Director of Im-Able, Sunil Vather, says that the company initially investigated 3D manufacture through iDesign but were advised this would be too expensive and the product too brittle. A discussion with Dr Edgar Rodriguez and Kah Chan at the VUW School of Design led to the decision to produce modest numbers of AbleMs using 3D manufacturing. This would make it easier for Im-Able to build demand to the level where a larger investment would be justified.

“This took Edgar, Kah and ourselves down the 3D learning curve,” Vather says. “The design had to be slightly modified and adapted. Initially VUW arranged the first prototypes to be manufactured in the Netherlands. This was amazing, as within a week we had a beautiful-looking product back.” Unfortunately, the product was still too expensive. “The guys at the Design School who, by the way, are fantastic,” says Vather, “put more time in and decided that they could do it at an affordable price.” Two months later, after further experimentation and improvements, this has been realised. “In fact, ahead of the supplier of the electronics,” says Vather, “but that’s another story.”

Watershed moment in Medical Imaging research

In a watershed moment in the development of medical imaging in Christchurch, GE Healthcare has signed a partnership agreement with the Centre for Bioengineering at the University of Otago. GE Healthcare is one of the world’s largest medical technology companies, and the Centre for Bioengineering is one of the developers of the Medipix All Resolutions System (MARS), the world’s first full-spectral CT colour X-ray scanner designed for human clinical trials. Their partnership was announced in April this year.

The partners will work together on medical imaging technology projects. Associate Professor Anthony Butler, Director at the Centre for Bioengineering, says the partnership provides great recognition of the international quality of the research being done in Christchurch, and that it is also a sign of the growth of the medical imaging market.

“Five years ago there were only a small number of people in the world doing this research,” he has said. “There are now special editions of journals covering the topics and conferences. The human medical imaging market is currently worth $US27.4 billion and growing at 4.4 percent a year.”

The partnership agreement is partly attributable to the groundbreaking work of the Centre for Bioengineering. Led by Butler and his 25-strong team, development of the MARS scanner, which is likely to revolutionise medical imaging, is now into its second phase. The programme has been boosted by last month’s announcement of a six-year $12 million funding decision by the Ministry of Business, Innovation and Employment and the Tertiary Education Commission. Once built, the scanner will be hosted by the Otago Medical School and is likely to lead to better, faster, safer diagnosis of conditions such as breast cancer and vascular disease. Dr Butler has likened the effect to moving from black-and-white photographs to colour. “What’s so exciting and new is that this scanner has the capability of picking up high, medium and low energy – the X-ray equivalents of red, green and blue light. This has huge advantages in interpretation of medical imagery.”

The Chief Executive of GE Healthcare Australia, Michael Ackland, says he is delighted at the prospect of working with the University of Otago. “Having the University of Otago as lead partner in Christchurch will allow us to develop key relationships within the city as new infrastructure is built,” he has said. “We hope this will lead to a longer relationship with a number of research groups and companies within Christchurch.”
Sino-Green III—The China and Taiwan Connection

The new GRC Sino-Green III is a venture capital fund supported by a partnership between the government-backed New Zealand Venture Investment Fund and its Taiwan counterpart, the Taiwan National Development Fund. To date the fund has raised US $75 million, and will continue to raise capital towards a final target in excess of US $100 million. Offices are located in Beijing, Taipei and Auckland.

The GRC Managers, formerly known as Pan Pacific Capital, have a 15-person team that combines investment and business management experience from the Silicon Valley, Taiwan and China with intimate knowledge of the China and Taiwan markets, as well as a direct relationship with the Industrial Technology Research Institute in Hsinchu, Taiwan. Direct relationships are also maintained with research organisations based in China.

While the fund technology investment brief is broad, there is keen interest in the New Zealand medical device, agritech, environmental, cleantech and big data technology sectors.

Given the nature of the New Zealand market, the fund has built in flexibility around the investment stages. While the “sweet-spot” is in early expansion, the investment can come as early as seed, provided that the technology has a unique advantage. A number of later stage deals are also being considered where New Zealand companies are seeking to develop strong sales traction in China. Heading the investment activities in New Zealand is Tony Bishop.

To find out more, or if you’d like to discuss investment into your business, contact Tony: tbishop@grcfunds.com

Upcoming Events

26-27 November 2014  D4: Devices for Diagnostics and Drug Delivery hosted by Otago University, Hutton Theatre, Otago Museum, Dunedin

03 December 2014  Mechanobiology Symposium – 505-007, Faculty of Medicine and Health Sciences, Auckland University, Grafton campus.
Contact: Justin Fernandez, j.fernandez@auckland.ac.nz

16 December 2014  Medtech in Christchurch – Centre for Bioengineering and Nanomedicine, University of Otago, Christchurch.
Contact: Peter Hilton, p.hilton@otago.ac.nz

Contact: Diana Gash, d.gash@auckland.ac.nz

Do you have a story for our Newsletter?

If you would like to contribute to the quarterly CMDT Newsletter or have a story you would like to share, please email the details to:

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