TORU has undergone some fundamental changes over the past four months. Jennie Scarvell, who has so ably managed the clinical research arm of TORU for the past four years, has moved to the University of Canberra as Head of Physiotherapy. As Associate Professor she will oversee both the successful masters programme and lead the development of the new undergraduate degree. Jennie is a talented and enthusiastic researcher and has elected to devote most Fridays to research as a visiting research fellow at TORU pursuing the image registration work that she, Mark Pickering and Paul Smith have pioneered. She will also act as an advisor and collaborator for other TORU projects firmly cementing TORU’s links with the University of Canberra.

TORU’s new Clinical Research Co-ordinator is Diana Perriman. Diana has taken on the position on a temporary basis pending interviews for a permanent officer.

Diana is one of TORU’s three recently successful PhD candidates. She will join Dr Angie Fearon and Dr Susannah Littleton in a graduation ceremony to be held at ANU on the 14th of December.

TORU currently has more than 25 ongoing research projects with topics as contrasting as cardiac surgery and three-dimensional dynamic joint imaging and kinematic analysis. Exciting new projects which are about to commence include a collaboration with the ANU College of Engineering and Computer Science which will utilize a state-of-the-art materials testing facility to evaluate different cable fixation systems. We are also in the early stages of designing a modular web-based fracture outcome database with an intuitive graphical interface. The system will enable interrogation of outcomes for specific fracture types. A fundamental design aim is to create a system which will be simple for clinicians and patients to use so that data upload will be efficient and automatic.

Our ARC research fellow Dr Laura Gladkis is coming to the end of her tenure under the current grant. Her work on wear debris using a state-of-the-art knee simulator has resulted in a number of discoveries, the most recent being that nano-size debris particles are bioactive. This discovery was made in collaboration with A/Prof Rachel Li in the TORU laboratories. Her work has also led to the development of novel methods of deep radioisotope implantation into polyethylene for long-term ‘real time’ wear experiments. She has also, for the first time, produced three-dimensional wear particle images.

Finally, this edition of the TORU newsletter will be published in time for the 2011 Annual Australian Orthopaedic Association Scientific Meeting (Canberra Branch) to be held at the Canberra Hospital on Friday 25th 2011. Our keynote speaker will be Prof. Peter Chong who will be speaking about nano-technology in orthopaedics and the challenge of academic surgery in the new millennium. We have received generous sponsorship from a number of companies and look forward to the busiest programme we have hosted to date. In order to accommodate the unprecedented number high quality abstracts received this year we have reduced the presentation times to eight minutes and five minutes. This format is not uncommon at contemporary meetings and we expect that the increased pace will make for an even more successful meeting.
**Biomarker today, drug targets tomorrow**

In many cases the surgical procedures to repair joint destruction, or therapies to prevent and delay joint destruction, cannot be easily tested due to our inability to accurately measure disease progression and response to these interventions. There are significant needs for well-conducted clinical and laboratory research to apply and validate outcome measures.

One of TORUs core research aims is to identify and validate novel biomarkers for monitoring disease onset, predicting disease development and responses to surgical and therapeutic interventions, and developing drug targets. Our laboratory and collaborators at the Canberra Hospital, ACT Orthopaedic Group, The ANU JCSMR, Beijing University (in China) and Shan Dong Provincial Hospital (in China) are establishing a research resource to aid in the discovery and validation of disease risk factors, genetic, and biochemical markers for joint diseases. One of our ongoing projects is to examine a specific enzyme (HS) activity, expression and its correlation with angiogenic and osteogenic gene expression in serum and synovium of patients with arthritic conditions. With the support of the Private Practice Fund of The Canberra Hospital, we have recently achieved promising results showing that the serum HS mirrored the disease progression achieved promising results showing that the serum HS mirrored the disease progression and has great potential to be a new biomarker and target of therapeutics.

**Wear Particle-mediated Osteolysis**

*Working to Prevent and Cure*

Late-state failure in total joint replacement (TJR) is predominantly caused by osteolysis mediated by wear particles. With support from an AOA Research Grant, we have provided an evidence that nanoscale UHMWPE wear particles induced dendritic cell (DC) activation and consequently increased cytokine expression, such as IL-6, TNFα and IL-1β (Pal et al., 2010).

A major update of our ongoing research in this area is "MicroRNA (miRNA) in Wear Particle Mediated Osteolysis". MiRNAs are an abundant class of endogenous small non-coding RNAs, approximately 22 nucleotides (nt) in length, that can regulate gene expression post-transcriptionally by affecting the degradation and translation of target mRNAs. MicroRNAs (miRNAs) play an essential role in cell proliferation, differentiation and apoptosis. However, the expression of miRNAs in wear particle-mediated osteolysis remain unknown. Here, we report the alternations and likely role of miRNA expression in prosthesis failure.

In our pilot study, we found that the expression of all three members of the miR-29 family (miR-29a, miR-29b and miR-29c) were dramatically deceased in the trabecular bone tissue of patients with osteolysis. This down-expression was associated to the up-expression of Dikkopf-1 (Dkk1), a key antagonist of Wnt signaling which is important for OB differentiation. Certainly, while a large number of mechanisms remain to be clarified, it is still perhaps not too optimistic to suggest that a novel therapeutic intervention based on manipulation of miRNA levels could lead to the prevention and cure of osteolysis in future.

**Collaborative Projects Are on the Way**

*Collaboration with Professor Qinghua Qin, Group Leader, Materials and Manufacturing Research School of Engineering, and A/Dean (Higher Degree Research) of College of Engineering and Computer Science at the ANU.*

Professor Qin and his students have been working on creative software to mimic bone remodelling in human bone with a focus on osteocytes. One of his PhD students, Song Chen will work in our laboratory on a project which aims to develop novel approaches that could improve the lives of individuals with delayed and non-union fractures. This includes determining the most effective stimulation patterns for promoting bone growth in bone cells derived from different individuals. This may lead to the design of individualized devices which promote healing.

*Collaboration with Dr David Nisbet, an ARC Research Fellow at the ANU Research School of Engineering, in developing bioscaffolds made of biocompatible and biodegradable materials infused with biological molecules to promote the growth of mesenchymal stem cells, as well as bone cells.*

*Collaboration with Professor Ma-Li Wang, Team Leader, Translational Medicine Program at The ANU John Curtin School of Medical Research.*

Almost every household in Australia is affected in some way by diseases of bones, joints, diabetes and depression — diseases that affect people of all ages, racial and ethnic populations, and economic strata. Our collaborative projects are looking into the interplay between common molecules in diabetes, depression and osteoporosis.

*Collaboration with Professor David Little and Dr Michelle McDonald at Westmead Children's Hospital, Sydney.*

Prof Little is the director of the Orthopaedic Research and Biotechnology Unit based at Westmead Hospital. His high calibre team consists of orthopaedic surgeons, research scientists and biomedical engineers. He pioneered the use of bisphosphonates in paediatric medicine. The TORU laboratory team is collaborating with Prof Little’s team to develop pharmaceutical therapies that
TORU Wins Prizes at ANZORS

This year the Australian and New Zealand Orthopaedic Research Society (ANZORS) Annual Scientific Meeting was held in Brisbane at the Queensland University of Technology’s Kelvin Grove campus. ANZORS is a dynamic society which aims to promote, support, develop and encourage research in musculoskeletal disorders, diseases and injuries and in their management. It provides a unique juxtaposition of basic scientists, orthopaedic surgeons, rheumatologists and industry scientists to promote the interdisciplinary collaboration necessary for innovative translational research.

TORU presented four papers at the ANZORS meeting this year. Rachel Li presented a paper titled Osteo-immunological Response to Nanoscale Wear particles; Jennie Scarvell presented Muhits paper detailing new developments in the Registration Software for Kinematic Analysis; Laura Gladkis spoke about characterising UHMWPE wear particles using atomic force microscopy and Diana Perriman presented “A comparison of thoracic and lumbar erector spinae activity during extension in prone-lying and sitting”. Diana received a travelling scholarship for this meeting and also won the best PhD paper prize. The abstract for this paper is reproduced on page 7 of this newsletter.

TORU Laboratory Research Report

which could be used as anabolic agents of bone growth.

Congratulations to Dr Xinghou Wu

Completion of Endeavour Research Fellowship at TORU Laboratory

Dr Xinghou Wu, a Chinese Orthopaedic Surgeon and 2011 Endeavour Research Fellowship Award Holder, travelled to Canberra to join TORU team this year. He has been a highly active team member working at TORU laboratory on the project “Activated T cells Suppress Osteogenic Differentiation of Mesenchymal Stem Cells”. Wu says of his experience, “The Endeavour Research Fellowship Program was a tremendous boost to my research potential, and I received excellent support from TORU Laboratory and I will encourage people to take the opportunity to extend their research interests in Australia”. He wrote “It’s hard to find the right words to thank you for your help. It will be very helpful and meaningful for my career”.

International Collaboration

Visiting the Trauma and Orthopaedic Hospital in Shandong Provincial Hospital

During my recent personal trip to China (lecturing to my home university), I visited Shandong Trauma and Orthopaedic Hospital (STOH) which is located in the new campus of Shandong Provincial Hospital (Fig 1). The various buildings and complexes in campus appear to be quite independent. However, they are interconnected and from this building (the Orthopaedic Hospital) one can easily access the Medical Centres of Internal Medicine.

Professor Dongsheng Zhou, Head of the STOH, and his staff warmly welcomed me and took me on a tour of his 2000 bed Orthopaedic hospital. As part of our Memorandum of Understanding with the Department of Orthopaedics of Shandong University (SDU) which was signed by A/Prof Paul Smith (Director of TORU) and Professor Zhou (Dean of Trauma and Orthopaedics of the SDU and President of Shandong Orthopaedic Association), I presented my talks “How to Write A Research Proposal” and “Introduction to TORU: Recent Research”.

This collaboration has provided us with education and research exchange opportunities; STOH sent a PhD student, Dr Yongliang Yang, to our Lab (2010) and collect tissue samples for our miRNA research. This type of exchange helps us to develop close personal ties, cross-cultural understanding and intellectual cooperation – which are all hallmarks of what an international collaboration sets out to achieve.

Associate Prof Rachel Li, Senior Scientist and Laboratory Research Coordinator, TORU Laboratory.

TORU Wins Prizes at ANZORS

Figure 1: Trauma and Orthopaedic Hospital in Shandong Provincial Hospital, China

Associate Professor Rachel Li lecturing at Shandong Provincial Hospital, China

A/Prof Rachel Li (second from left) and Dr Xinghou Wu (second from right)


Brisbane’s Kelvin Grove, campus of the Queensland University of Technology (QUT).
TORU Clinical Research—Research Students’ Projects

Report on EORS and IASP European Conferences

Dr Angela Fearon, PhD

I recently travelled to Europe in order to present research findings at two conferences; the European Orthopaedic Research Society (EORS), and the European Federation of IASP Chapters (EFIC; IASP = International Association for the Study of Pain).

The EORS meeting was highly relevant to TORU practice, including papers on the pitfalls of metal on metal (MoM) hip replacements. Discussions included the causes of the MoM complications, the characteristics of those at risk of developing MoM pseudo tumours (younger women with small components), and the safe and unsafe levels of serum of Cobalt and Chromium ions in people with bilateral MoM implants. Different management approaches ranged from systematically revising every MoM candidate, to revision only once the serum Chromium reached a critical level. There were several papers on managing infected implants, including one from Italy which claimed to salvage 60% of implants via multiple surgeries with anti-biotic loaded bead placement around the joint. Another key set of papers related to the reliability and validity of accelerometers and gyro-meters as measures of activity. This technology may prove to be useful for future TORU research designs. In addition, we can be proud that several presenters cited the Australian joint registry.

Because the EORS conference was held in Vienna I was able to visit the local medical museums; the Austrian museums of surgery and the museum of pathology. The Austrians have had a formal surgical training programme since the fourteenth century providing a fascinating demonstration of the evolution of surgical techniques.

The second conference was the EFIC conference. This conference had 4000 delegates, concurrent invited speaker special topic sessions, and an outstanding poster session.

At both conferences I presented two pieces of work. The first was some histological work on trochanteric bursa, retrieved at the time of gluteal tendon reconstruction for recalcitrant greater trochanteric pain syndrome, or hip arthroplasty surgery for hip osteoarthritis. We found structures that may account for bursal thickening seen on ultra-sound examination; furthermore, we found no evidence of acute or chronic inflammation in this tissue. The second presentation was on the level of function and disability in people with greater trochanteric pain syndrome compared to people with hip osteoarthritis, and an asymptomatic control group. We found that the people with greater trochanteric pain syndrome had levels of function and disability comparable to those with hip osteoarthritis. Thus people with greater trochanteric pain syndrome should not be dismissed as having “only a soft tissue problem”. Both presentations were well received. This trip to Europe afforded me the opportunity to meet highly regarded researchers; Jeremy Lewis (consultant physiotherapist and visiting professor, University of London) with extended scope practice rights, and Graham Riley (Arthritis Research UK Senior Research Fellow University of East Anglia).

Lessons from Europe: Australia has a progressive health care system that recognises chronic pain as a major health issue, and Australia’s strong anti-smoking policies make it a leader in the world on this issue. Australia can learn from Europe about addressing obesity by facilitating incidental exercise (via good public transport and suitable cycling facilities), and by limiting fast food outlets. The TORU can be proud of the high level of research that is produced. The research we undertake compares very favourably to the research that was presented at both these conferences. TORU can continue to build international collaborations, working with Europeans as well as those in the US and China.

Rehabilitation after elective total hip replacement

Corinne Coulter, Masters of Philosophy (Research) Candidate

This study is being undertaken as part of my Masters of Philosophy (Research) supported through the ANU and TORU. The aim is to determine the value of physiotherapy rehabilitation after total hip replacement. There is current uncertainty in practice and throughout the literature regarding physiotherapy for patients after discharge from hospital after total hip replacement, and this study’s aim is to determine the benefit of physiotherapy post total hip replacement by looking at two rehabilitation interventions; a supervised or unsupervised program.

This randomised control trial is in the participant recruitment phase; this was commenced in June 2010 and is still continuing with ideal participant numbers aimed at 120. Recruitment has improved since last report due to the addition of Calvary John James Deakin campus as a recruitment site in July. Data collection will be completed by December 2012.

Outcomes to be evaluated during this study are the WOMAC (Western Ontario & McMacnisters University Osteoarthritis Index) and SF36 (Short form 36) questionnaires; standardised quality of life measures and a functional timed walking measurement.

My supervisors are A/Prof Paul Smith and A/Prof Jennie Scarvell.
Canberra Joint Replacement Outcomes Project

Over 80,000 joint replacements were performed in Australia over the past year. Of these, 36,000 were hip replacements, which represents a 3.6% increase on the previous year; and 45,000 were knee replacements which is an increase of 7.6%. This trend has been a consistent theme in the Australian National Joint Replacement Registry Report since it was established in 2003 and seems destined to continue in line with an ever increasing proportion of the population reaching ages of greater than 65 years.

As the impact of musculoskeletal conditions escalates, there is a growing imperative to ensure that patients are provided with optimal, effective treatment. This includes a need to follow up on the survival of the implants (as the ANJRR does) as well as outcomes in terms of function, patient satisfaction and quality of life post surgery. The Canberra Joint Replacement Outcomes Project collects patient outcome data in terms of function and quality of life, pre-operatively, and at 1, 4, 7 and 10 years post surgery. Data collected includes:

- Demographic data - i.e., age, sex
- Medical examination data – i.e., aspects of the medical examination as recorded on the Harris Hip Score, Knee Society Score, and Charnley D’Aubigne Postel Score forms
- Radiological evaluation
- Clinical Outcomes data – i.e., SF-12, Oxford knee, Oxford hip and WOMAC questionnaires.

A/Prof Paul Smith (1,562 clients, commenced completing data sheets in 1998), Dr Phillip Aubin (61 clients, commenced in February 2011), Dr Alexander Burns (95 clients, commenced in June 2010) and Dr Damian Smith (19 clients, commenced in February 2011) are the surgeons involved in the Canberra Joint Replacement Outcomes Project at this time. Dr Brendon Klar and Dr Gawel Gulisiewicz will commence in February 2012. Other surgeons are looking to become involved in the future as the project is expanded to include upper limb replacement outcomes.

Dr Diana Perrimsn, Clinical Research Coordinator of TORU and Dr Bruce Shadbolt, PhD Epidemiology and Director of Clinical Epidemiology at Canberra Hospital, make up the project management team. Christine Hanrahan is the project database manager and ably follows up the patients and controls the quality of the data.

This project is supported by Global Orthopaedic Technologies. We are looking forward to collaborating with other industry partners interested in collecting outcome data on their implants in a similar way in the future.

ACT Bone Bank has the important job of coordinating the donation and processing of human femoral heads for use in orthopaedic procedures. The bone bank has had numerous challenges in the last quarter. Despite these challenges we have managed to continue to retrieve bone donations in reasonable number. ACT Bone Bank has been relocated (metaphorically) and is now part of DonateLife rather than a division of TORU. Our close ties with TORU continue of course, and Associate Professor Paul Smith is still our Medical Director.

Maria Hartley, the ACT Bone Bank Production manager, is currently acting as the Manager of DonateLife until the end of 2011. In the days prior to this change Maria had to contend with a TGA audit of the Bone Bank! The TGA audit was closed out in record time at the beginning of October which was an absolute credit to Maria’s hard work and organisational skills. A replacement Production Manager was found in August in the guise of Tara Russell who was previously the Immunisation Coordinator at Health Protection Service. Tara is covering the Bone Bank from Monday to Thursday for now. During September Tara Russell presented to the University of the 3rd Age (U3A ACT). U3A is an organising for the over 50’s that promotes lifelong learning. ACT Bone Bank presentation was given in conjunction with DonateLife and UCs body donation program. All topics were very well received and many questions were asked. October seems to be the time for hip replacements which is a boon for the Bone Bank. Maybe everyone wanting to be “beach-ready” for Christmas? Whatever the reason, hopefully we can harvest a “bumper crop” of bone donations in October to compensate for the August staff changeover and the potential end of year lull.

Come and visit anytime!

ACT Bone Bank records the following statistics for this financial year:

<table>
<thead>
<tr>
<th>Month</th>
<th>Donations retrieved</th>
<th>Requests for bone</th>
<th>Bone used</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2011</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>August 2011</td>
<td>5</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>September 2011</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>October 2011</td>
<td>3</td>
<td>12</td>
<td>1</td>
</tr>
</tbody>
</table>
TORU Medical Students Project Group

The Australian National University (ANU) medical students are required to complete a research project as part of their medical degree. This year TORU is supervising six students who are attached to the unit for 2011/2012. They are all talented post - graduates who have completed degrees in Physiotherapy, Psychology, Pharmacy, and Radiography. The topics of their research are listed below and have been designed to provide a practical education in research methods while also providing important information for the orthopaedic clinicians and researchers attached to the unit.

Supervision takes the form of design advice, tutorials on research methods and statistics as well as operational assistance where required. This year we are piloting a new statistics strategy. Dr Terry Neeman, who is an eminent statistician at the ANU, is conducting group statistics sessions instead of one-to-one sessions. In this way each of the students’ study designs become statistics lessons for the whole group. So far the students have been very positive about this learning model and are beginning to actively engage in debate on statistical design with their colleagues. We are looking forward to following the progress of these formidable young future doctors and are very happy to have the opportunity to assist them to develop their research skills.

The 2011 Medical Student Projects:


John Au: Standing or Supine X-rays for Total Hip Replacement – Are they comparable.

Sarah Wood: Surgical outcomes after tibio-femoral dislocations.

Josh Tobin: The utility of ultrasound for determining Weber B fracture management.

Kai Wong: A comparison of 4 year outcomes in Birmingham Resurfaced Hip replacement compared to Total Hip Replacement.

Report on R-Cardiac Trial Progress

Under the guidance of TORU Director, A/Prof Paul Smith, Dr Camilla Smith at TORU has been managing a cardiac surgery trial in collaboration with cardiac surgeons, cardiologists and anaesthetists from Canberra Hospital (Dr Peter Bissaker, Dr Peter Subramaniam, Dr Walter Abhayaratna and Dr Thomas Brussel), and researchers from ANU (Dr Steven Weiss). The aim is to produce a prospective, randomised double-blind study to assess the effect of Riluzole during cardiac surgery. It is the first study of its kind in humans. The trial has received ACT Human Research Ethics Committee and Therapeutic Goods Administration approval (CTN 2010/0295); it is listed on the Current Controlled Trials Registry (ISRCTN30506717).

Recent developments to the trial include the addition of Aortic Valve Replacement (AVR) to the inclusion criteria, in addition to the previously included CABG patients. The reasoning behind including these patients was primarily to increase the pool of eligible candidates, and because the ischaemia time for AVR and CABG is comparable. For this same reasoning, patients undergoing Mitral Valve Replacements are excluded, having an extended ischaemia time under bypass.

The recruitment period for this trial has been extended, and TORU projects that recruitment and data collection will conclude by early 2013.

3D/2D Registration Software for the kinematic analysis of human joints

Dr. Abdullah A. Muhit had the opportunity to work with TORU as a Sr. Research Officer after completing his PhD from the University of New South Wales, Canberra. At TORU, he has developed a novel 3D/2D Registration Software for the kinematic analysis of human joints using CT and Fluoroscopy. Dr. Muhit has recently joined the Biomedical Engineering Dept. at Johns Hopkins University, USA as a Sr. Research Scientist. He currently works with Dr. Jeffrey Siewerdsen at the I2STAR Lab on the development and clinical evaluation of a new cone-beam CT imaging system for musculoskeletal radiology, orthopaedics imaging, and rheumatology. Muhit is also involved with dual-energy CT, novel 3D reconstructions and image-guidance for surgery research in the same lab.
**A Comparison of Thoracic and Lumbar Erector Spinae Activity during Extension in Prone, Lying and Sitting** (abstract for the ANZORS meeting—Brisbane 2011)  

**INTRODUCTION**
Thoracic hyperkyphosis (excessive anterior curvature) is associated with decreased physical function and increased mortality [1]. It has been suggested that back extension exercises in prone lying reduce thoracic hyperkyphosis [2]. However, prone extension exercises are also used to strengthen the lumbar extensors [3]. The effectiveness of seated extension exercises on thoracic extension has not been examined. The primary aim of this study was to assess the relative contribution of the thoracic erector spinae (TES) and the lumbar erector spinae (LES) during extension from prone and to compare this to extension in sitting.

**METHODS**
Twenty healthy subjects (10 aged < 30 and 10 aged > 70 years, equal males and females in each group) participated in the study. Surface electromyography (sEMG) was used to measure the amplitude of muscle activity in the LES during extension in prone lying with the arms in three positions (P1, P2, P3), and during sitting extension without, and with, scapular retraction (S1 and S2) (Figure). Because TES activity cannot be measured directly with sEMG [4], the log-ratio of normalised moment / normalised LES amplitude (reflecting the relative contribution of LES to the total moment) for each extension task was used as a surrogate marker of TES activity. Amplitudes and moments were normalised to the maximum value measured for each subject over all five extension tasks.

**RESULTS AND DISCUSSION**
The LES were significantly more active in prone than they were in sitting but the moments generated for all of the tasks were similar (Table). The log-ratio of normalised moment to normalised LES amplitude was significantly higher for the sitting tasks than for the prone tasks (0.51 ± 0.08 vs 0.003 ± 0.06; p < 0.001) indicating that the TES contributed more to extension in sitting. Retracting the scapulae in sitting, resulted in significantly increased LES activity (p < 0.001) (Table) but there was a trend to greater extension moment and a higher Nmoment/LES log-ratio indicating greater TES contribution.

**CONCLUSIONS**
The results indicate that extension exercises in prone primarily activate the LES while extension in sitting, especially with scapular retraction, results in greater TES activation. Extension in sitting with scapular retraction may therefore be the better exercise for reducing thoracic hyperkyphosis and improving posture in the elderly and osteoporotic.

**Table.** The sEMG amplitudes for the lumbar erector spinae (LES) and the moments, normalised moments and log ratio of normalised moment/normalised LES amplitude for the five extension tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>N.LES</th>
<th>Moment</th>
<th>Nmoment</th>
<th>Log-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0.87 ± 0.02*</td>
<td>106.66 ± 11.16</td>
<td>0.85 ± 0.05</td>
<td>-0.13 ± 0.13</td>
</tr>
<tr>
<td>P2</td>
<td>0.79 ± 0.03***</td>
<td>109.87 ± 10.51</td>
<td>0.88 ± 0.03</td>
<td>0.06 ± 0.06</td>
</tr>
<tr>
<td>P3</td>
<td>0.75 ± 0.03**</td>
<td>100.65 ± 12.73</td>
<td>0.79 ± 0.05</td>
<td>0.09 ± 0.09</td>
</tr>
<tr>
<td>S1</td>
<td>0.37 ± 0.03</td>
<td>93.20 ± 8.96</td>
<td>0.75 ± 0.04</td>
<td>0.52 ± 0.11</td>
</tr>
<tr>
<td>S2</td>
<td>0.43 ± 0.04†</td>
<td>102.27 ± 9.90</td>
<td>0.84 ± 0.05</td>
<td>0.50 ± 0.12</td>
</tr>
</tbody>
</table>

Note: * significantly greater than all the other task values (p<0.001); ** significantly greater than S1 and S2 (p<0.001); † significantly greater than S1 (p<0.001)
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Journal Articles (selected papers 2010-2011)


TORU’s People

A/Prof Paul Smith, BMBS FRACS (Ortho). Director

Associate Professor Smith is an orthopaedic surgeon at the Canberra Hospital and at Calvary John James Hospital in Canberra. He is also Co-Director of the Trauma and Orthopaedic Research Unit at the Canberra Hospital. Assoc. Prof Smith is also president of the Arthroplasty Society of Australia, and Clinical Director of Orthopaedic surgery at the Canberra Hospital.

A/Prof Smith received his medical and surgical training in Adelaide before specialising in hip and knee joint reconstructive and replacement surgery. He was a Royal Australasian College of Surgeons Travelling Fellow in 1996 and 1997 with Fellowships in joint replacement surgery at the University of Western Ontario in Canada and at The Princess Elizabeth Orthopaedic Hospital in England. He has recently been honoured by The Knee Society, receiving the inaugural John N Insall Travelling Fellowship in knee surgery and has been appointed as Associate Professor in Orthopaedic Surgery at the ANU Medical School. A/Prof Smith’s particular clinical interests are in reconstruction and replacement surgery of the hip and knee, complex revision joint replacement surgery and management of pelvic and acetabular injuries.

Contact: smithadmin@co.net.au

Dr Damian McMahon, MB BS FRACS. Director

Dr McMahon is the Director of the Shock Trauma Service, Senior Staff Specialist in surgery and Co-Director of the Trauma and Orthopaedic Research Unit at the Canberra Hospital. In addition, Dr McMahon is the Director of the Clinical Skills Centre and Senior Lecturer in surgery at the Australian National University Medical School.

Dr McMahon received his medical and surgical training in Melbourne where he specialised in Trauma Surgery. He became Trauma Service Coordinator at Preston and Northcote Community Hospital in 1993 and from 1994 until 1997 he worked as Trauma and Surgical Critical Care Fellow and Attending Traumatology surgeon at the Hospital of the University of Pennsylvania, Philadelphia PA. In 1997 Dr McMahon took up his position as co-joint academic/senior staff specialist at the Canberra Hospital.

Dr McMahon was instrumental in establishing the Snowy SouthCare Helicopter retrieval service to service the region with medical and specialist support. He achieved recognition for the hospital as the first accredited Trauma Centre in Australia.

Contact: damian.mcmahon@act.gov.au

A/Prof Rachel Wei Li, MD, PhD. Laboratory Research Co-ordinator

Associate Professor Li obtained a Bachelor of Medicine from China Medical University in 1982 and worked as a surgeon and senior infectious diseases specialist at China Medical University from 1982-1996. Her Master project was on immune responses to viral infection. She led a number of clinical trials in anti-viral and anti-inflammatory drugs and successfully transferred an intellectual property to pharmaceutical industry. In 2002 A/Prof Li completed her PhD in pharmacology at Southern Cross University and gained her postdoctoral research experience in molecular pharmacology in the University of Hawaii School of Medicine.

A/Prof Li returned to Australia in 2006 joining TORU and has established TORU laboratory with a focus on osteoimmunology. She has developed a range of laboratory capabilities to determine the effects of therapeutic, surgical and physiotherapeutic treatments on biomedical markers using human primary cell culture and large animal models.

In addition to her research work, she is an Adjunct Associate Professor at the University of Canberra teaching and supervising the students in Master of Pharmacy Program.

Contact: rachel.li@anu.edu.au
Dr Diana Perriman, PhD. Acting Clinical Research Co-ordinator

Diana Perriman, BAppSc (USyd), MSc. (University of East London), PhD (ANU). Diana is a physiotherapist who has recently completed her PhD at the ANU. Her clinical career has spanned two decades in which she worked in hospitals, the community and private practice both in Australia and the UK. She has worked at the Trauma and Orthopaedic Research Unit since returning from the UK in 2003. Her PhD research included a suite of thoracic spine biomechanical and imaging studies culminating in a randomized controlled trial of the effect of conservative treatment for thoracic kyphosis. Since completing her PhD she has undertaken the role as Clinical Research Coordinator for TORU. Contact: diana.perriman@act.gov.au

Laura Gladkis
Dr Gladkis has a PhD from the Australian National University in nuclear physics. Her PhD involved the development of nuclear physics techniques for environmental applications. Her current areas of research are: accurate techniques of dynamic wear debris identification using radioisotopes, tribology of knee prostheses under realistic static and dynamic conditions and 3 dimensional UHMWPE wear morphology. She is based at the UNSW Canberra campus, as an Australian Postdoctoral Fellow (Industry).

Camilla Smith
B. Medicine B. Surgery (MBChB): Camilla graduated from the University of Cape Town in December 2009. She is currently working on the R-Cardiac Trial; researching cardiac surgery patients undergoing coronary artery bypass grafting. camilla.smith@act.gov.au

John Warmenhoven
B Coaching Sci. John is a graduate of University of Canberra and is currently working on his honours thesis for his Bachelor of Sports Studies (hons) in biomechanics at the Australian Institute of Sport. John is studying the kinematics of rowers. He has a keen interest in swimming. John manages the TORU pelvic fractures database and assists with data management of the total knee and hip replacement study. Contact john.warmenhoven@act.gov.au

Kylie McKay
is the Office Manager for TORU. Contact 02—6244 3858 kylie.mckay@act.gov.au

Dr Diana Perriman, Acting Clinical Research Coordinator

Sumedha S. Amarasekara
MBBS (Syd), MS (Colombo), FRCSed
Dr Sumedha Amarasekara graduated from the University of Sydney and is a Board Certified Orthopaedic Surgeon from Sri Lanka. He is currently doing an MPhil with both a clinical component (outcomes of periprosthetic fractures) and a laboratory component (the efficacy of methods in fracture fixation). Contact: sumedhaamarasekera@bigpond.com

Corey Dore
B Sc. MBBS.
I graduated from ANU Medical School in 2010 and am currently an intern at The Canberra Hospital interested in pursuing a career in surgery. My current project is looking at outcomes and complications following acute compartment syndrome of the leg treated the The Canberra Hospital. Contact: coreydore@hotmail.com

Jonathon Slater
Jonathon is an MBBS/PhD student at ANU. His thesis looks at side impact motor vehicle collisions.

Corinne Coulter
B(App)Sc, Physiotherapy. Corinne is doing her research Master's degree with an RCT to explore efficient and effective rehabilitation post total hip replacements. Contact: corinne.coulter@act.gov.au

Ben Serpell
BSc, B(App)Sc OT (hons), B(App)Sc Human Movement (hons). Ben’s PhD asks “Is there a relationship between hamstring and quadriceps strength, and the knee joint kinematics which predict anterior cruciate ligament injury?” We look forward to collaboration with the AIS and UC

Jennie Scarvell
B(App)Sc Physiotherapy (Sydney), Grad Cert Higher Ed, (Canberra) Cet Health Economics (Monash) PhD (Sydney), A/Professor Department of Physiotherapy (University of Canberra). Jennie's recent research studied the incidence of osteoporosis in people over 40 with minimal trauma fractures. A career as clinical physiotherapist lead Jennie to a PhD on knee kinematics and the role of aberrant motion in degenerative change using a model of ACL injury. Exciting projects currently in train include collaborations with Mark Pickering at UNSW@ADFA in 2D fluoroscopy to 3D CT image registration for kinematic analysis to provide 3D modelling of motion, and with Heiko Timmers for radioisotope labelling of polyethylene to measure wear in total knee replacement. She is an affiliate Senior Lecturer at University of Canberra and at ANU. Contact: jennie.scarvell@act.gov.au

Angela Fearon
BAppSc(Physio), MPhysio, PhD. Angie completed her Bachelor of Physiotherapy at Lincoln Institute of Health Sciences and her Master’s degree in 2001. She has been a clinical physiotherapist since 1986 and established her own practice in Canberra. Angela’s PhD thesis looks at tendinosis, enthesisopathy and Greater Trochanteric Pain Syndrome. Contact: angie.fearon@anu.edu.au
Interested in Studying with TORU in 2012?

TORU is affiliated with the Australian National University and works closely with UNSW@ADFA and University of Canberra as well. Prospective higher degree students are encouraged to consider possible research opportunities at TORU in 2011. Contact TORU or prepare a 1-2 page research proposal for TORU to consider. TORU is committed to progressing research in trauma and orthopaedics, and to developing young researchers.