

Director's Message

The TCBE Annual Report has been generated and submitted to the Dean of Research. The Report for 2011 demonstrated that TCBE has consistently had high impact in terms of our scientific publications. We are generating approximately 75 journal publications per year, but more importantly our journal citations are increasing at a very high rate. Since 2002 we have published 532 journal articles, had our articles cited 6,466 times by researchers in 86 countries, with an average citations per journal of 12.15. The map below shows the global impact worldwide. All of this combines to give TCBE an impressive H-index of 111. This is due to all of your hard work and commitment to TCBE.

in this issue

Director's Message **P.1**

TCBE News **P.3**

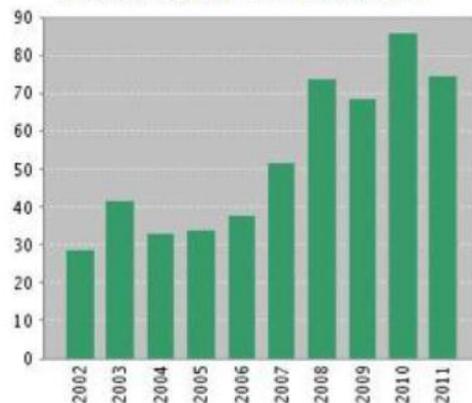
Papers & Publications **P6**

Conferences **P7**

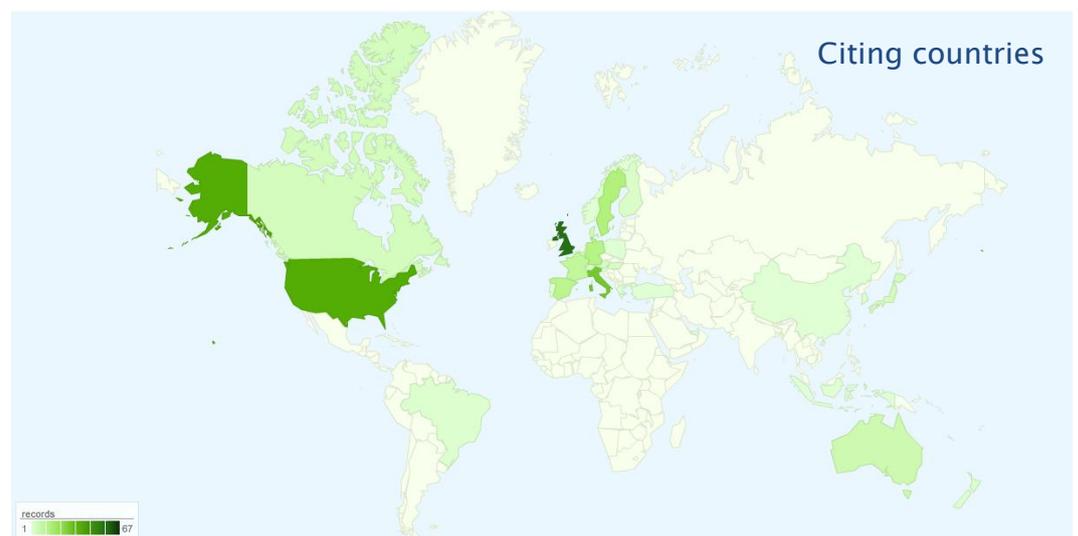
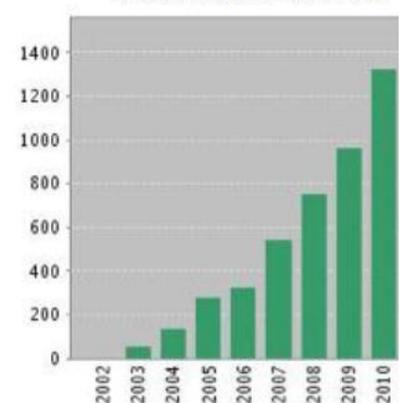
TCBE News **P10**

New to TCBE **P11**

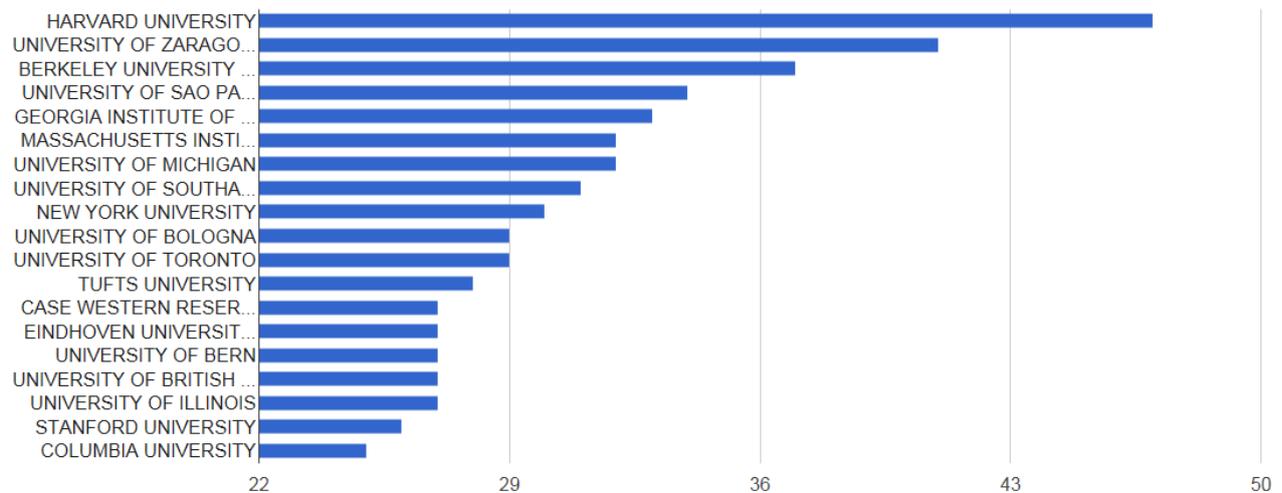
Published Items in Each Year



Citations in Each Year



The top 20 citing institutions of our research are as follows



Our international scientific advisory board Professors Conway, Kirkpatrick, Vaughan and Planell (UK, Germany, South Africa and Spain) were most complementary on our performance this past year. Of course, journal publications are not the only measure of our impact. We have made excellent impact clinically with TCBE being partners in a number of recent successful Health Research Board Clinical Scientist awards and also on recent Enterprise Ireland Commercialisation awards. These awards provide for new PhD and Postdoctoral positions. We have also impacted public policy as detailed in this newsletter.

My four-year directorship of TCBE comes to an end in July. I thank you and very much appreciate all of your support during this time, as we built together new opportunities, new educational programs and new facilities for TCBE and the Centre for Medical Device Technologies. I look forward to helping the new Director on continuing these activities. I am sure you join me in wishing Dr. Daniel Kelly and Dr. Bruce Murphy great success in their term as incoming Director and Deputy Director of TCBE.

Paul R. Rulley



NEW GRANTS

TCD and NUIG researchers Dr Bruce Murphy and Dr Faisal Sharif were awarded an Enterprise Ireland commercialisation award in May 2012. The award proposes to develop an alternative approach to thermal renal denervation for management of resistant hypertension. The award has a monetary value of €300k and the research project will run for 16 months.

ROYAL IRISH ACADEMY ELECTION

Professor Richard Reilly was elected as member of the Royal Irish Academy on Friday May 25th last, in recognition of his academic achievement.



Professor Richard Reilly and Dr Daniel McCarthy, two of the three new Trinity RIA members are congratulated by Professor Luke Drury, President of the RIA (centre)

Membership of the Royal Irish Academy is the highest academic honour in Ireland and a public recognition of academic achievement. It has been keenly competed for over the past 227 years. There are now 466 members of the Academy, in disciplines from the sciences, humanities and social sciences.

HONORARY FELLOW

Professor Clive Lee was announced Honorary Fellow on Monday 16th April, at the beginning of the annual Trinity Week.



Professor Clive Lee is photographed here with his wife Hannah, daughter Sophie and the Provost Dr. Patrick Prendergast after receiving Honorary Fellowship of Trinity College Dublin.

The announcement was made by the Provost of Trinity, Dr Patrick Prendergast, surrounded by members of the Board of the College in full academic gowns and hoods on the steps of the Public Theatre. Research achievement or scholarship of a high order is the primary qualification for Fellowship, along with evidence of the candidate's contribution to the academic life of the College and an effective record of teaching.

He is the first PI of the Centre for Bioengineering to receive Honorary Fellowship of College, and we congratulate him on this achievement.

RESEARCH OPPORTUNITY

The Trinity Centre for Bioengineering is keen to host Marie Curie Individual Fellows. European Commission has launched three calls for individual fellowships. Two for career development of modestly experienced researchers and another for the international career enhancement of more experienced researchers. Deadline for application is August 16, 2012. More details can be found at the following link.

<http://acro.ceu.hu/news/2012-04-11/new-calls-for-marie-curie-individual-fellowships>

Marie Curie Individual Fellowships provide funding for researchers who want to set up their own research project at a host institution in another European country or a Third Country. Researchers from Third Countries have the opportunity to apply for an Incoming Fellowship at a host institution in Europe. The Trinity Centre for Bioengineering has experience of being a host for Marie Curie Individual Fellowship holders.

The Trinity Centre for Bioengineering offers excellent research infrastructure within a multidisciplinary biomedical sciences environment to allow fellows to carry out biomedical engineering research to the highest international standards. If you have a research proposal and are seeking a hosting opportunities, please contact tcbe@tcd.ie

MSC BIOENGINEERING

BEST POSTGRADUATE COURSE OF THE YEAR 2012 IN ENGINEERING

At the 2012 GradIreland Awards, the Engineering postgraduate course of the year award went to the MSc in Bioengineering. The awards were presented at a gala dinner and awards ceremony on 25 April 2012 in Dublin's Mansion House attended by 470 of Ireland's leading employers, third level careers services and professional bodies.



Judged by an independent panel of industry experts, the awards recognise the best programmes in Ireland's university and institute of technology sector. In deciding the awards, the judges consider the quality of teaching, the relevance of the course work for prospective employers along with reputation, innovation and relationship with industry. Commenting on the significance of the awards, Trinity's Dean of Graduate Studies, Professor Veronica Campbell, said: "Trinity College Dublin provides a vibrant, dynamic and creative environment in which excellence in research and teaching flourish. These awards reflect the dedication of our academic staff who continue to deliver world class teaching, ensuring our graduate students are equipped with the necessary skills to join the workforce. "

"This award is very significant as it demonstrates the dedicated commitment of the academic staff and administration to ensure that our students obtain excellent education in biomedical engineering. We provide students with education of the state-of-the-art in biomedical engineering, innovation and creative design to allow them to meet the global challenges in healthcare and to become leaders in the medical device sector so as to deliver the best medical care possible," said Professor Richard Reilly, Course Director MSc Bioengineering, Professor of Neural Engineering at Trinity College, Dublin and Director of the Trinity Centre for Bioengineering on the occasion of the award.

In a special report in the Irish Times (Friday 27 April) Mark Mitchell of GTI Ireland said "The main criterion for this award is the employability of the postgraduates rather than the quality of the course itself". There are many excellent postgraduate courses which are not really focused on employment opportunities but this award looks at that. The MSc in Bioengineering is particularly good in this regard as it represents a collaboration between Trinity College Dublin, University of Limerick, University College Dublin, Royal College of Surgeons in Ireland and the National College of Art and Design. The institute went out and brought all the different skillsets required for the qualification together. It wasn't a question of simply offering the best course it could provide but

**"the
best
course
possible"**

AWARDS

At the 2011 Science Awards hosted by Zwick Roell in Munich, the [2011 Paul Roell Medal](#) was awarded to Dr Jan-Henning Dirks and Prof. David Taylor who investigated the 'Fracture toughness of locust cuticle.'



Dr Dirks hopes that his findings might inspire the development of new biomimetic composite materials.

Their paper "Fracture toughness of locust cuticle" was selected as "Editor's choice" in the recent edition of [the Journal of Experimental Biology](#)

The respective paper "Fracture toughness of locust cuticle" has just been published and featured by the [Journal of Experimental Biology](#) and resulted in some [media coverage](#)



SEMINARS & KEYNOTES

Professor Richard Reilly presented at showcase of the Trinity Biomedical Sciences Institute's research capability and a BioConnect focus on "Research Prioritisation – Consequences for the Life Sciences Industry which took place on 31 May in the Trinity Biomedical Sciences Institute.

Prof. O'Brien was interviewed about his research on Newstalk which was broadcast on April 7th. The podcast is available on their website: www.newstalk.ie

At the May 2012 Alchemist Café Prof. Fergal O'Brien from the Trinity Centre for Bioengineering and the Dept. of Anatomy, Royal College of Surgeons in Ireland gave a talk on the state of play and where the field is going in the future and what he hopes will be areas that will help the field flourish. Every day thousands of surgical procedures are performed to replace or repair tissue that has been damaged through diseases or trauma. There is now a developing field of tissue engineering that aims to regenerate damaged tissues by using cells from the body with biomaterials to promote and guide the growth of the new tissue.

You can hear Prof. O'Brien interviewed on Scibernia in April [here](#).

Professor Richard Reilly presented at the The *Movement Disorder Society's* 16th International Congress of Parkinson's Disease and Movement Disorders which took place in Dublin's Convention Centre. This is a week-long conference focusing on Parkinson's disease involving some 5000 neurologists and movement-disorder experts from around the world.

OLYMPIC FLAME

Áine Ni Choisdealbha was one of the Trinity students selected to participate in the Olympic torch relay. Áine is pictured here carrying the torch down Grand Canal Street to Holles Street. Áine said it was a huge honour to get to participate in the relay and to represent the college in doing so.



Áine Ni Choisdealbha carrying the olympic torch

Photograph courtesy of Sharon Lunney

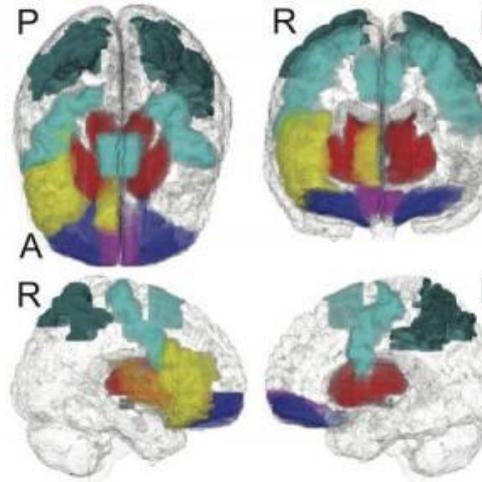
PAPERS AND PUBLICATIONS

Why do some teenagers start smoking or experimenting with drugs—while others don't?

In the largest imaging study of the human brain ever conducted—involving 1,896 14-year-olds—scientists have discovered a number of previously unknown networks that go a long way toward an answer.

Robert Whelan, a postdoctoral fellow from the TCBE Neural group, and Hugh Garavan, Ph.D., a University of Vermont postdoctoral research fellow and associate professor of psychiatry and psychology, along with a large group of international colleagues, report that differences in these networks provide strong evidence that some teenagers are at higher risk for drug and alcohol experimentation—simply because their brains work differently, making them more impulsive

Newly discovered networks in the brain, shown in color, go a long way toward explaining why some teenagers are more likely to start experimenting with drugs and alcohol. Diminished activity in some of these networks, discovered by two scientists at the University of Vermont and their European colleagues, makes some teens more able to inhibit urges to try alcohol, cigarettes and illegal drugs in early adolescence.



(Credit: Robert Whelan, University of Vermont, *Nature Neuroscience*, 2012)

Their findings were presented in the journal *Nature Neuroscience*, published online April 29, 2012 and received extensive press coverage worldwide. To read more see these links:

<http://www.independent.ie/health/health-news/teenage-drink-and-drug-abuse-linked-to-brain-wiring-3095575.html>

<http://www.sciencedaily.com/releases/2012/04/120429152251.htm>

Whelan R, Conrod PJ, Poline JB, Lourdasamy A, Banaschewski T, Barker GJ, Bellgrove MA, Büchel C, Byrne M, Cummins TDR, Fauth-Bühler M, Flor H, Gallinat J, Heinz A, Ittermann B, Mann K, Martinot JL, Lalor EC, Lathrop M, Loth E, Nees F, Paus T, Rietschel M, Smolka MN, Spanagel R, Stephens DN, Struve M, Thyreau B, Vollstaedt-Klein S, Robbins TW, Schumann G, Garavan H, and the IMAGEN consortium (2012). Adolescent impulsivity phenotypes characterized by distinct brain networks. *Nature Neuroscience*, 15(6): 920–925.

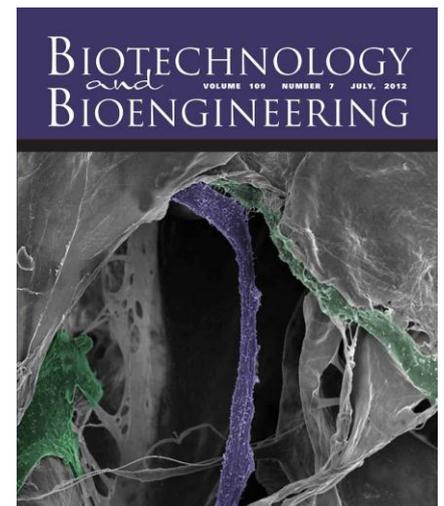
Congratulations to Conn Hastings whose first paper from his PhD research has just been published in the prestigious *Journal of Controlled Release*. The work focused on the development of thermoresponsive chitosan gel combined with human MSCs and desferrioxamine as a pro-angiogenic therapeutic for the treatment of critical limb ischemia.

R.J. McCoy, C.Jungreuthmayer, F.J. O'Brien. Influence of Flow Rate and Scaffold Pore Size on Cell Behavior During Mechanical Stimulation in a Flow Perfusion Bioreactor

Mechanical characterization of a customized decellularized scaffold for vascular tissue engineering

W.S. Sheridan, G.P. Duffy, B.P. Murphy *Journal of the mechanical behaviour of biomedical materials* 8 (2012) 58–70

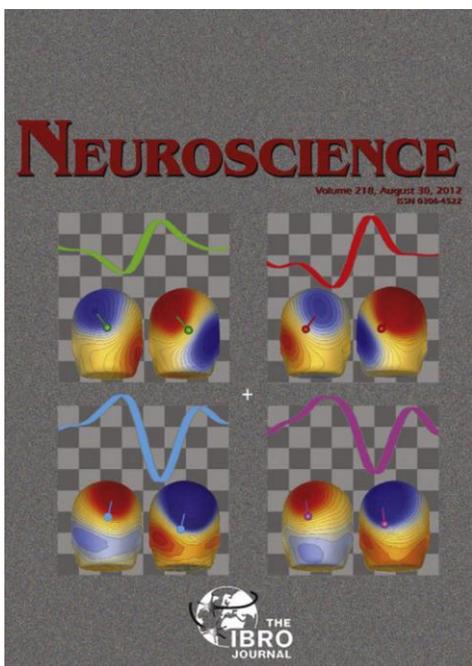
The front cover of the July edition of *Biotechnology & Bioengineering* featured a nice image from Dr. Ryan McCoy's work which depicts cells adapting both flat and bridged morphology types within a collagen-GAG scaffold.



PAPERS AND PUBLICATIONS

Lalor EC, Kelly SP, Foxe JJ (2012). Generation of the VESPA response to rapid contrast fluctuations is dominated by striate cortex: evidence from retinotopic mapping. *Neuroscience*, 218(2012): 226–234.

This article was selected for the front cover of the journal:



Lalor EC, De Sanctis P, Krakowski MI, Foxe JJ (2012). Visual sensory processing deficits in schizophrenia: is there anything to the magnocellular account? *Schizophrenia Research*, 139(2012): 246–252.

Murphy JW, Kelly SP, Foxe JJ, Lalor EC (2012). Isolating early cortical generators of visual evoked activity: A systems identification approach. *Experimental Brain Research*, 220(2): 191–199.

Kelly SP, Schroeder CE, Lalor EC (2012). What does polarity inversion of extrastriate activity tell us about striate contributions to the early VEP? A comment on Ales et al (2010). *NeuroImage*, doi: 10.1016/j.neuroimage.2012.03.081

Power AJ, Foxe JJ, Forde EJ, Reilly RB, Lalor EC (2012). At what time is the cocktail party? A late locus of selective attention to natural speech. *European Journal of Neuroscience*, 35(9): 1497–1503.

Burke, D., Kelly, D.J. Substrate Stiffness and Oxygen as Regulators of Stem Cell Differentiation during Tissue Differentiation: A Mechanobiological Model. *PLoS One* (in press).

Boccaccio, A., Kelly, D.J., Pappalètere, C. A model of tissue differentiation and bone remodelling in fractured vertebrae treated with minimally invasive percutaneous fixation. *Medical & Biological Engineering & Computing* (in press).

Gerardo Presbitero, Fergal J. O'Brien, T.Clive Lee, David Taylor. Distribution of microcrack lengths in bone in vivo and in vitro *Journal of Theoretical Biology* 304 (2012) 164–171

CONFERENCES ATTENDED

Sohail Noor, an MSc Bioengineering student, presented a poster at AREADNE 2012 held in Santorini, Greece from 21 – 24 June 2012. This conference was a gathering of scientific leaders from around the world to present their recent findings on the functioning of neuronal ensembles. Sohail's poster was titled "Theta Burst Stimulation to Medial Septum Enhances Spatial Coherence of Hippocampal Place Cell Representation" (Muhammad S. Noor, Marian Tsanov, Richard B. Reilly, Shane M. O'Mara).



Sohail presenting his poster at AREADNE 2012 conference in Greece

The Irish Neurological Association Meeting in University College Cork was held in May 2012. Nathaniel Reynolds, an MSc Bioengineering student in the Neural lab presented his poster on using along-tract statistics to identify white-matter abnormalities, titled "Diffusion Imaging Study of Reading Epilepsy"

CONFERENCES ATTENDED

Canadian Summer Program in Ageing

Hanni Kiiski, a TCBE PhD student from the Neural lab, attended the prestigious Canadian Summer Program in Ageing, held 6–11 May 2012 in Vancouver Island, Canada.



The Summer Program in Ageing was hosted by the Simon Fraser University – Gerontology Research Centre. Hanni was one of the chosen early career researchers from Ireland, who were sponsored by the Centre for Ageing Research and Development in Ireland (CARDI) in association with the Canadian Institute of Health Research (CIHR) – Institute of Aging. The other researchers were Ms. Aoife Callan (Irish Centre for Social Gerontology, NUI Galway), Dr. Bernadette McGuinness (Department of Medicine, NUI Galway), Dr. Shane O’Hanlon (University Hospital Limerick, University of Limerick), and Dr. Roman Romero Ortuno (Department of Medical Gerontology, Trinity College Dublin).



The aim of the Summer Program in Aging (SPA), organised by the CIHR Institute of Aging, is to provide a program of advanced research training that crosses disciplines, sectors, institutions and geography. The focus was on applied gerontology which has an emphasis on well-being, enablement, and social participation of older adults.



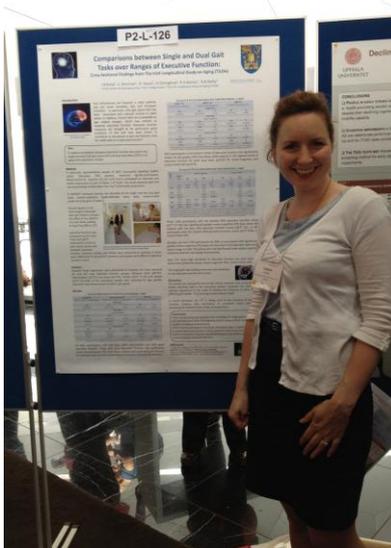
The trainees gained understanding of the use and design process of technology applications for people in old age; examined multidisciplinary collaboration, communication and knowledge transfer, research process (grant preparation, peer review), user-participation and ethics in the context of aging research through experiential learning tasks in groups; and networked with other emerging researchers and academic mentors in aging research.

Joint International World Congress of ISPGR and Gait & Mental Function

Isabelle Killane (3rd Year PhD student in Neural Engineering) presented her work at the first Joint International World Congress of ISPGR and Gait & Mental Function entitled "From Bench to Bedside" in Trondheim, Norway June 24–28.

Isabelle presented her work on the correlations between gait speed and executive function from the The Irish Longitudinal Study on Aging dataset (n=8704) which gained interest from fellow international researchers at the conference due to the large normative population sample involved. Isabelle also attended two workshops on "Measurement of Real Life Falls Data" and also "Gait Variability" which will be of great benefit to her current research.





Pictured above is Isabelle Killane with her poster at the Joint International World Congress of ISPGR and Gait & Mental Function, Norway, June 2012.

Traditionally, ISPGR* focused on application of electrophysiological methods to document gait and balance physiology and pathophysiology and Gait and Mental Function focused on clinical aspects of gait and balance dysfunction in patients with neurological disorders, in particular the influence of cognition on motor functions. However, this congress successfully merged the two prior conferences which allowed for a flow of information from the clinical and patient perspective to the current research findings through to results from new patient interventions.

Motivating and informative presentations were attended

in particular keynote lectures were enjoyed from Prof B.R. Bloem MD, (President) "The interplay between posture, gait and mental function", Prof M Hallett MD "How does the brain create movement and how can this be influenced with brain stimulation?", Prof S Studenski "What is it with gait speed?", Prof. J van Dieen "Gait stability: to fall or not to fall, that is the question" and Prof J Verghese, MD "Cognition: Motor Perspectives". Isabelle hopes to attend and present again at the conference next year in Akita, Japan."

*ISPGR = International Society of Posture and Gait Research



Location of Frontal lobe as illustrated on Isabelle's poster

CONFERENCE AWARDS

Congratulations to Tara McFadden who won the prize for best presentation at the MSC 2012 International Mesenchymal Stem Cell Conference which was held in Galway last week.

Congratulations to Dr. Stephen Thorpe who won the prestigious SM Perren Research Award at the European Society of Biomechanics meeting in Lisbon last week for work carried out during his PhD in Dr. Daniel Kelly's group.

RECENT TCBE SEMINARS

Making EMG recordings during fMRI work: experiences from fundamental and applied studies of the motor system.

Speaker: Natasha M. Maurits
Professor of Clinical Neuroengineering, Dept. of Neurology, University Medical Centre Groningen, the Netherlands

Measuring Cortical Evoked Potentials in Cochlear Implant Users

Speaker: Dr Myles McLaughlin
Neural Engineering Group, Trinity College Dublin
Hearing and Speech Laboratory, University of California Irvine

IN THE PRESS: HOW SAFE IS IT TO CYCLE OUR STREETS?

More of us are travelling by bike, but just how risky is it to take two wheels?

TOTS ON trikes, robed barristers on racers, high-heeled hairdressers on High Nellies – Ireland has gone mad for cycling. Once empty cycle lanes are now red conveyor belts of pedallers, and rush hour junctions are a jam of wheels. It's clear we're having a love affair with the bike. But now that more road users are sharing the same space, is cycling safe? We're not yet half way through the year and six cyclists have already been killed on Irish roads. That's up from five killed in all of 2010. And these figures don't reflect the far greater numbers who are injured.

While the most common cause of cyclist fatality is head injury, the most common injuries to cyclists are to the lower body, according to Dr Ciarán Simms from the Trinity Centre for Bioengineering and the School of Engineering.

"In about 60 per cent of cases, cyclists are hit from the side and then leg injuries are likely because the leg gets hit by the front of the car." But, as with pedestrians, the design of the impacting vehicle can make a big difference with high-fronted SUVs likely to cause more significant injuries. Citing research from his 2009 book, *Pedestrian and Cyclist Impact – A Biomechanical Perspective*, Simms says about 45 per cent of injuries to cyclists are to the lower body with the head accounting for about 28 per cent of injuries.

Whether it's sustained through impact with a vehicle, hitting a pothole or falling off your bike in your own back yard, an injury to the head is likely to yield the most catastrophic consequences. "If you have an impact that fractures the skull or that causes the head to rotate very quickly, it can cause brain injuries which can kill you," says Simms. In the case of impact with a vehicle, the speed at which the vehicle is travelling can make all the difference – yet the introduction of a 30km/h speed limit on Dublin's Quays has raised the hackles of many motorists. "Without doubt, the speed limit of 30km an hour, the one that people complain about, is in fact a major benefit to the safety of cyclists," says Simms. In fact, there is data to show that while 10 per cent of pedestrians are likely to die on impact with a vehicle travelling at 30km/h, this jumps to a whopping 80 per cent if the vehicle is travelling at 50km/h. Similar results would pertain to cyclists. [Read full article](#)



Dr Ciaran Simms with his children, Katie (5) and Anna (1). He says "we are doing our children a disservice by saying it is too dangerous to cycle. The statistics don't show that it's more dangerous than ever before. It's actually the reverse. Photographed: Dave Meehan

TCBE TAG RUGBY

Pictured below is the Trinity Centre for Bioengineering tag rugby team of 2012. The team are currently playing in the Wednesday night league at Lansdowne RFC in the shadow of the Aviva Stadium. After six weeks of competitive action the team are doing TCBE proud as they are currently topping their group.

Finals night will be on Wednesday 1st August with the TCBE team playing at 8pm. Everyone is invited to come along and cheer on the team.



Front Row (L to R): Alejandro Lopez Valdes, Martin Holmes, Chris Bligh, Rory Farrell. Back Row (L to R): Jake Mealy, Maria Browne, Tara McGowan, Adam O'Reilly, Hanni Kiiski, Natalie Steinemann, Karen Coughlan. Team members missing from photo: James O'Sullivan, Adriana Dabacan, Clive Curley, Mick Crosse.

NEW TEAM MEMBERS



Welcome to Masooma Naqvi who joined as a post-graduate researcher in April 2012 after receiving her M.Sc. (Clinical Research) from NUI Galway. Masooma's research is focused on investigating the specific environmental conditions that can aid in regeneration of the intervertebral disc using mesenchymal stem cells (MSCs) and drug based therapies, specifically the nucleus pulposus region.

Amy Lynch is a new PhD student working with Mark Ahearne in the regenerative medicine group within TCBE. She obtained a BSc. in Biology from NUI Maynooth and an MSc. in Regenerative Medicine from NUI Galway. Her project will examine the application of adipose derived stem cells for tissue engineering cornea.

There are a number of students on summer internships in the Centre, you are all very welcome and we hope you enjoy your time here.

Tomas Gonzalez, is a Spanish student of 4th year of Biotechnology from the Athlone Institute of Technology in Ireland and the University Francisco de Vitoria in Spain. His research in the Trinity

His research in the Trinity Centre for Bioengineering is focused in the use of injectable biopolymers as alginate for the regeneration of cartilage and bone.

Lara Kelly is an undergraduate Mechanical Engineer due to commence 4th year at Trinity College in September. This summer she is working in the Tissue Engineering Laboratories and her research is focused on fabricating scaffolds for bone tissue engineering by freeze-drying Chitosan.

Monica McNerney is a chemical engineering major from the University of Notre Dame in the United States. This summer, she is investigating the mechanical and chemical properties of freeze dried scaffolds made of either cartilage or growth plate and the way that each type affects the differentiation of bone marrow stem cells.

Joaquín Ródenas Rochina, a Spanish PhD student from the Universitat Politècnica de València, is researching the effects of different PCL composite scaffolds (PCL + Bioglass 45S5® and PCL + Hyaluronic acid) on Mesenchymal Stem Cells under hypoxic conditions.

Albert Puigbó, a Catalan student from Universitat Politècnica de Barcelona, is researching wireless EEG recording and processing. The aim is to create a wireless computer brain interface.

Milena Tryfon will be looking at stem cell based therapies for regeneration of the intervertebral disc and the effect of growth factors on their metabolism.

Khadijah Olusekun and Helen Fletcher are on a summer internship in the TCBE Neural lab with Dr. Lalor investigating ventral stream processing and stimulation.

Sophia Karok has accepted an IRC(IRCSET) EMBARK Postgraduate scholarship and will join Dr. Alice Witney's lab in October.

CONGRATULATIONS

Congratulations to Dr. Robert Whelan on the birth of his son, James Peter Whelan, born on 8th July 2012. Dr. Whelan is a member of the TCBE Neural group,

