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SeminarsESEM Summer School
Trinity College Dublin
July 10th – 22nd 2011Adaptation and
Remodelling of Vascular
Wall in HypertensionProf. Kozaburo Hayashi
Department of Biomedical
Engineering, Okayama
University of Science,
Okayama, JapanDate: Tuesday, 26th July 2011

Time: 4.00pm

Venue: Crossland Theatre,
Parsons Building, Trinity College
DublinThe 4th International
Conference on the
Mechanics of
Biomaterials and Tissues
(ICMOBT-4)

Hawaii, December 2012



Dean of Research, Dr David Lloyd, the Taoiseach, Enda Kenny, TD and Provost, Dr John Hegarty at the opening of the Trinity Biomedical Sciences Institute on 17th June 2011.



Máire Geoghegan-Quinn, Commissioner for Research, Innovation and Science, the Taoiseach, Enda Kenny, TD and Provost, Dr John Hegarty at the official opening.

Message from the Director

Activities in the past few weeks have been dominated by the opening of the new Trinity Biomedical Sciences Institute. The new landmark building, the biggest in Trinity College, will provide the Trinity Centre for Bioengineering with a new, purpose built location with start of the art laboratories for regenerative medicine, biomaterials, cardiovascular and neural engineering research. There is sufficient desk space for 34PhD researchers, 12 Postdoctoral researchers and administration staff.

The Eur55M provided under the Government's PRTL program has allowed creation of three new Centres: Cancer Drug Discovery, Immunology and Medical Device Design. Therefore we have a great opportunity to develop the medical device aspects of TCBE with the opening of this new building, which we will share with the School of Medicine, School of Pharmacy, School of Biochemistry and School of Chemistry. The official opening was carried out by the Taoiseach and the European Commissioner for Research, Innovation and Science also spoke at the launch.

July will also see our 3rd Summer School for medical and engineering undergraduate students. We have 30 students arriving from across Europe along with their Professors and all will be engaged in lectures and projects from 11th –23rd July. Given it is the third year of this school, we are now seeing international students returning to Trinity College for MSc and PhD programmes. This has been a great initiative in promoting TCBE internationally.

PIs in the TCBE have had success recently in a number of funding schemes: SFI, FP7, ERC, Enterprise Ireland, HRB, PRTL, Atlantic Philanthropists etc. I would like to congratulate all and encourage others to seek out advice from PIs on possible grant applications.

Prof Richard Reilly
Director, Trinity Centre for Bioengineering

NEW GRANTS

2011–2015 VERVE: Vanquishing fear and apathy through E-inclusion: Personalised and populated Realistic Virtual Environments for clinical, home and mobile platforms FP7: ICT for smart and personalised inclusion. PIs Profs Carol O'Sullivan, Fiona Newell, Richard Reilly. TCD amount: Eur1,292,5145. TCBE&TCIN amount: Eur628,478

2011–2013 Cross Border Collaborarion:
Collaborative research in the area of neuroscience computational neuroscience.

PIs Profs Richard Reilly, Fiona Newell and Roseanne Kenny. TCD amount: Eur200, 000

2011–2014 Bone regeneration using stem cell-directed endochondral ossification Bone tissue mineralization during osteoporosis. Health Research Board Project Grant – General. O'Brien FJ (Principal Investigator), Gleeson J. €298,525.

2011–2014 Development of a gene-activated smart scaffold for bone repair. Science Foundation Ireland Research Frontiers Programme. O'Brien FJ (Principal Investigator), Cryan SA, Kelly H, Duffy G. €198,000.

AWARDS

Oana Istrate won a CMA Bursary to carry out "Scanning electron microscopy studies on the fracture mechanisms in polymer-clay nanocomposites" in the Centre for Microscopy and Analysis.

Amro Widaa, a PhD student in Prof. O'Briens group won the Donegan Medal yesterday at the Royal Academy of Medicine in Ireland Biomedical Sciences Section Annual meeting 2011 with a talk entitled 'The identification of a novel drug target in the treatment of bone infection'.

FEATURED IN THE PRESS:

Trinity Biosciences Development Supplement received extensive press coverage, there was an entire supplement in the Irish Times on the official opening day. The headlines in this supplement convey the scale and impact this ambitious project has both nationally and internationally:

"Leading the world in research success"

"A new era for graduates"

"Introducing the biomedical scientists of the future"

There were many subsequent articles following the opening day in the Irish Times and other press:

["TCD research unit to assist 'millions'"](#)

["New institute will deliver a 'global impact'"](#)

"The future of discovery gets a new home"

["Trinity College opens €131 m biomedical sciences R&D operation"](#)

Click here to view the [Taoiseach's opening speech](#)

Click here to view the speech of [Máire Geoghegan-Quinn](#), Commissioner for Research, Innovation and Science at the opening event.

CONFERENCES ATTENDED

The 5th IEEE/EMBS Neural Engineering Conference took place in Cancún, Mexico from the 29th April – 2nd May. A wide range of internationally renowned scientists attended presenting work on such varied topics as neuromimetic computing, neural prosthetics, connectivity analysis of neuroimaging data and brain-computer interfaces.

Trinity Centre for Bioengineering Director Professor Richard Reilly chaired a well-received session on imaging and mapping. This session included a presentation from Hugh Nolan, PhD student in TCBE Neural lab, on his work using EEG on a motion simulator platform to investigate the neural correlates of movement processing.

Hugh Nolan

CONFERENCES ATTENDED

Researchers from TCBE attended the **ASME (American Society of Mechanical Engineers) Bioengineering Division Summer Bioengineering Conference (SBC)** in the beautiful Nemaquin Woodlands Resort and the surrounding Laurel Mountains of Pennsylvania which ran from June 22–25 2011.

The conference has a strong engineering focus and offers us the opportunity to present our work to the American bioengineering community as this is their major engineering meeting.

Darren Burke, Thomas Nagel, Eric Meyer and Stephen Thorpe all presented their recent research findings with three podium presentations and one poster presentation:

Thomas Nagel: "Compaction And Anisotropy Induced By Remodeling Of The Collagen Network's State Of Tension-Compression Transition"

Darren Burke: "Could substrate stiffness and oxygen tension regulate stem cell differentiation during fracture healing?"

Hanifeh Khayyeri: "Simulation of the Emergence of the Endochondral Ossification Process in Evolution"

Stephen D. Thorpe: "Cell-Matrix Interactions Modulate Mesenchymal Stem Cell Response To Dynamic Compression"

Thomas Nagel

Ms Oana Istrate gave an oral presentation on "Polymer-clay nanocomposite foams: preparation, structure and properties" on the **Second International Conference on Multifunctional, Hybrid and Nanomaterials** in France.

TCBE PEOPLE & ACTIVITIES

TERMIS Tissue Engineering and Regenerative Medicine International Society

The 2011 annual meeting of the European Chapter of the Tissue Engineering and Regenerative Medicine International Society (TERMIS) recently took place in the historical city of Granada, Spain. From Tuesday the 7th to Friday the 10th of June the Granada Conference and Exhibition Centre was a hub of activity for researchers where a range of topics under the theme of 'Cells and Tissues as Advanced Therapies' were discussed. As well as the 500 podium presentations on offer, more than 400 posters were on display along with an impressive industry exhibition.



The highlights included noteworthy talks given by plenary speaker Prof. Anthony Atala, director of the Wake Forest Institute of Regenerative Medicine who discussed current concepts and changing trends in regenerative medicine with a reminder of the clinical impact of success in this field. Also of note was a talk entitled 'the language of cells: lost in translation' given by plenary speaker Prof. James Kirkpatrick.

Researchers from the Tissue Engineering Research Group in TCBE/RCSI took to the podium amongst 500 other presenters on both small and inspiringly large stages.

Five excellent talks were delivered on current research by Prof. Fergal O'Brien's group from 'scaffold properties directing mesenchymal stem cell fate' to 'osteocondral scaffolds for osteochondral defect repair'.

Dr. Daniel Kelly's group in Trinity took to the stage to execute a series of talks from such topics as 'engineered cartilaginous tissue' to 'engineered hydrogels' giving an impressive total of 12 talks across a range of symposia from TCBE combined. Prof. O'Brien himself was an invited keynote speaker in the 'Bioreactors technologies for tissue engineering' symposium and gave a reputable talk entitled 'Collagen-based scaffolds in tissue engineering: applied biomaterials and cellular response to biophysical stimuli'.



The annual gala dinner took place on Thursday evening following a scenic walk along the Darro river bank to the foot of the renowned Alhambra fortress. Dinner was served in a beautiful renaissance palace accompanied by a taste of Spanish cuisine and culture with flamenco dancing and Spanish guitar for the senses.

On Friday we commenced the day with an interesting session on 'protein morphogens and material engineering in regenerative medicine' by Prof. Jeffrey Hubbell.

A debate session was then sparked off by Prof. James Kirkpatrick where young scientists were encouraged to express their opinions on topics of the day with both sides fervently arguing the value of both engineered and more innate approaches to regenerative medicine.

We later bid farewell to the enchanting Granada in the hope of bottling up some sunshine for the journey home and looked forward to where our research would take us for TERMIS 2012.

Elaine Quinlan

SEMINARS

Dr Mary Murphy from Regenerative Medicine Institute, NUI, Galway gave a presentation on Therapeutic Potential of Mesenchymal Stem Cells in Arthritis on 22nd June in RCSI. This was sponsored by the Anatomical Society Seminar Series Grant.



Dr. Jane McGrath of Trinity's Neuropsychiatric Genetics Laboratory gave a talk on her neuroimaging project in children with high functioning autism to the Neural Engineering lab on Wednesday 15th June. The project focuses on investigating brain structure, function and connectivity in autism spectrum conditions.

PAPERS & PUBLICATIONS

Kimmich O., Bradley D., Whelan R., Mulrooney N., Reilly R.B., Hutchinson S., O'Riordan S., Hutchinson M., "Sporadic adult onset primary torsion dystonia is a genetic disorder by the temporal discrimination test", *Brain* (in press)

Bradley, D., Whelan R., Kimmich O., O'Riordan S., Mulrooney N., Brady P., Walsh, R., Reilly, R.B., Hutchinson, S., Molloy, F., & Hutchinson, M. Temporal discrimination thresholds in adult-onset primary torsion dystonia: an analysis by task type and by dystonia phenotype. *Journal of Neurology* (in press)

Tsanov M., Chah E, Vann S.D., Reilly R.B, Erichsen J.T., Aggleton J.P., O'Mara S.M., Crossover between Theta Rhythm and Head Directional Processing in Anterior Thalamus, *Journal of Neuroscience* (in press)

Setti A, Finnigan S., Sobolewski R., McLaren L., Robertson I.H., Reilly R.B., Kenny R.A., Newell F.N., "Audiovisual temporal discrimination is less efficient with ageing: An ERP study", *NeuroReport* (in press)

McHugh J, Reilly R.B., Connolly S, "Examining the effects of age, sex, and BMI on normative median motor nerve excitability measurements", *Clinical Neurophysiology* (in press)

M.A. Brennan, J.P. Gleeson, M. Browne, F.J. O'Brien, P.J. Thurner, L.M. McNamara, Site Specific increase in heterogeneity of trabecular bone tissue mineral during oestrogen deficiency. *eCells and Materials* (IF: 5.378, No. 2 ranked journal in biomaterial field)

John P. Gleeson and Fergal J. O'Brien. Book chapter on Composite Scaffolds for Orthopaedic Regenerative Medicine published in a new book on *Advances in Composite Materials for Medicine and Nanotechnology*.

J. C. Holland, O. Brennan, O. D. Kennedy, S. M. Rackard, F. J. O'Brien, and T. C. Lee. Subchondral trabecular structural changes in the proximal tibia in an ovine model of increased bone turnover. *Journal of Anatomy*. (2011) 218, pp619-624

Maher, E., Creane, A., Sultan, S., Hynes, N., Lally, C. Kelly, D.J. Inelasticity of Human Carotid Atherosclerotic Plaque. *Annals of Biomedical Engineering* (in press).

Meyer, E., Buckley, C.T., Steward, A., Kelly, D.J. The effect of cyclic hydrostatic pressure on the functional development of cartilaginous tissues engineered using bone marrow derived mesenchymal stem cells. *Journal of the Mechanical Behavior of Biomedical Materials* (in press).

C. Wan, M. Frydrych, B. Chen: Strong and bioactive gelatin/graphene oxide nanocomposites, *Soft Matter*, DOI:10.1039/C1SM05321C, In Press.

M. Frydrych, C. Wan, R. Stengler, K.U. O'Kelly, B. Chen: Structure and mechanical properties of gelatin/sepiolite nanocomposite foams, *Journal of Materials Chemistry*, DOI:10.1039/C1JM10788G, In Press.

S. Sathyanarayana, P. O'Reilly, S. Liu, B. Chen: Preparation, structure and properties of thermoplastic starch-clay nanocomposite films, *Journal of Nanostructured Polymers and Nanocomposites*, In Press (Invited).

Nagel, T., Kelly, D.J. Remodelling of collagen fibre transition stretch and angular distribution in soft biological tissues and cell-seeded hydrogels. *Biomechanics and Modeling in Mechanobiology* (in press).

Tania Claro, Amro Widaa, Maghnus O'Seaghda, Helen Miajlovic, Timothy J. Foster, Fergal J. O'Brien, Steven W. Kerrigan. Staphylococcus aureus Protein A Binds to Osteoblasts and Triggers Signals That Weaken Bone in Osteomyelitis. *PLoS ONE* | www.plosone.org 1 April 2011 | Volume 6 | Issue 4 | e18748

RESEARCH OPPORTUNITIES

GRADUATE RESEARCH EDUCATION PROGRAMME IN ENGINEERING

Applications are invited for 16 PhD Studentships in the new Graduate Research Education Programme in Engineering. This structured PhD programme is offered by Trinity College in partnership with University College Dublin, University College Cork and Dublin Institute of Technology.

The PhD Programme is aimed at students with strong engineering backgrounds who want careers in the design and development of products and devices that will drive economic growth and sustainability and solve current human problems in healthcare, climate change, and energy security.

The program will provide a high quality bioengineering PhD education, which will produce the critical mass of talented and capable bioengineers required to underpin the design and development of medical devices that will drive economic growth and sustainability.

In carrying out original research students will use and develop core research skills with a capacity to exploit and advance scientific knowledge. The programme will focus on Bioengineering & Medical Devices and Sustainable Energy & Energy Efficient Devices, offering advanced taught modules in the areas of:

- Bioengineering Fundamentals;
- Medical Device Design;
- Sustainable Electric Energy Systems;
- Energy Efficient Devices & Technologies.

The programme will also provide the additional skills to enable the students to recognise how their research can lead to the innovation and creative design process fundamental to a sustainable medical device sector. This provides a focused, coordinated education geared towards enabling the student's creativity and research skills whilst enhancing the impact of their research through technology transfer and potential for "start-ups" and will be achieved through engagement with the [Innovation Academy](#).

For details of the particular projects and all enquiries please email grepeng@tcd.ie. Applications should be made online through the Postgraduate Application Centre: www.pac.ie/tcd / Course reference code: TRB22

Closing date for applications is: 1st August 2011

POST-DOCTORAL FELLOWSHIP IN BONE MECHANICS BONE & JOINT CENTER, HENRY FORD HOSPITAL, USA

Applications are invited for a post-doctoral fellowship position within the Bone and Joint Center Research Laboratories at Henry Ford Hospital. The general area of research will be bone mechanics as related to aging and metabolic diseases with specific emphasis on high resolution image-based computational and experimental analysis of vertebral bone.

The position will be supported through grants from federal sources as well as institutional funds. The successful candidate will be part of a collaborative group of investigators who have expertise in and facilities for biomechanics, imaging, computational mechanics, motion analysis, animal models, anatomy, cell biology, histology, biochemistry and molecular biology. The main responsibility of the candidate will be within the Biomechanics Section. Duties and responsibilities, under minimal supervision, will include, 1) planning and carrying out various experiments that may involve biological specimens, 2) analyzing and interpreting the data, 3) preparing manuscripts and abstracts for publication, 4) maintaining accurate and efficient functioning of instrumentation used for experiments, and 5) supervising activities of students or other laboratory personnel and participating in educational activities. It is expected that the individual will make an attempt to develop independent projects compatible with their experience level. Support for career development exists for motivated individuals. Applicants should have a Ph.D. in Mechanical Engineering, Bioengineering or a related field. A dissertation or other research experience in an area related to bone mechanics is desired. Good oral and written communication skills are required. Applicants should submit their CV, contact information for three references and a one to two-page statement of research interests and career goals. Initial applications may be via email. Candidates who are invited to submit a final application should send their documents via surface mail for full consideration.

Please direct correspondence to: Yener N. Yeni, Ph.D. Head, Section of Biomechanics Bone and Joint Center, Henry Ford Hospital, 2799 W. Grand Blvd, ER2015, Detroit, MI 48202, email: yeni@bjc.hfh.edu

The position is available immediately. Applications will be accepted until the position is filled. Henry Ford Hospital is an AA/EO Employer.

NEURAL
ENGINEERING



REGENERATIVE
MEDICINE



BIOMATERIALS



MUSCULOSKELETAL



CARDIOVASCULAR



Adaptation and Remodelling of Vascular Wall in Hypertension

Professor Kozaburo Hayashi
Department of Biomedical Engineering,
Okayama University of Science, Okayama, Japan

Date: Tuesday, 26th July 2011

Time: 4.00pm

Venue: Crossland Theatre, Parsons Building, Trinity College Dublin

Living organs, tissues, and cells functionally adapt themselves to mechanical demands, and remodel by changing geometry, structure, and properties. The key factor for this phenomenon is "Mechanical Stress". Major stresses applied to blood vessels inside the body are: 1) hoop stress induced by blood pressure, that is normal stress in the wall circumferential direction, 2) wall shear stress developed by blood flow, and 3) axial stress by elongation to the axial direction. This presentation deals with the biomechanical studies on the responses of arterial and venous wall to the elevation of blood pressure. One of the specific biomechanical manifestations to arterial wall adaptation in response to hypertension is wall hypertrophy. This restores circumferential wall stress, i.e. hoop stress, at in vivo operating pressure to a normal value, and changes arterial stiffness to an optimal level. Vascular smooth muscle cells are activated by hypertension. Essentially similar phenomena are also observed in venous wall.

