

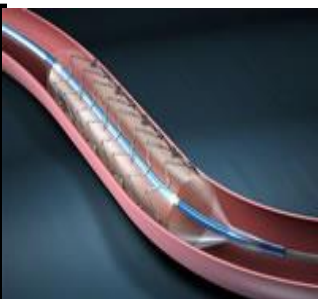
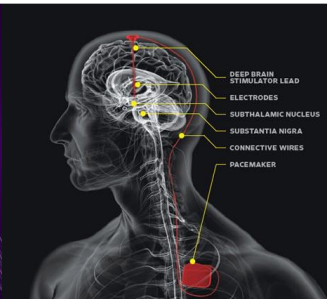
ME Biomedical Engineering

Madeleine Lowery

UCD School of Electrical and Electronic Engineering

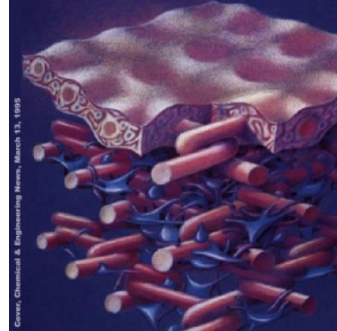
Eoin O'Cearbhaill

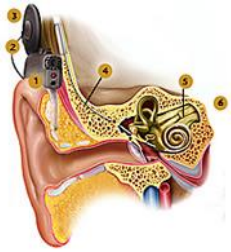
UCD School of Mechanical and Materials Engineering



Biomedical Engineering

- **Biomedical Engineering**
'The application of engineering principles to understand, modify or control biological systems'
- **Wide variety of application areas**
 - Medical device industry
 - Biosignal and bioimage processing
 - Rehabilitation engineering, orthopaedics...
- **Foundation in Electrical/Electronic or Mechanical Engineering**
 - Complemented with relevant physiology and anatomy
 - Brought together in specialised Biomedical Engineering modules





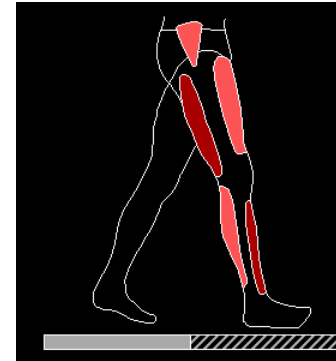
Cochlear implants



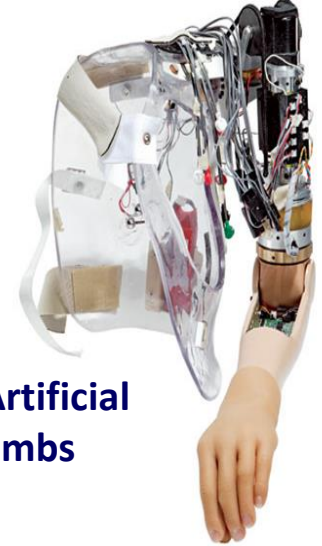
Pacemakers



Deep brain stimulation



Gait analysis



Artificial limbs



Rehabilitation robotics

Biomedical Engineering

The application of engineering principles to understand, modify or control biological systems



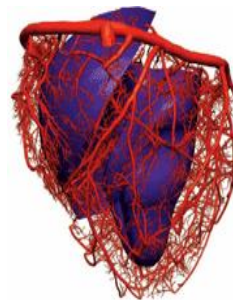
Hip implants



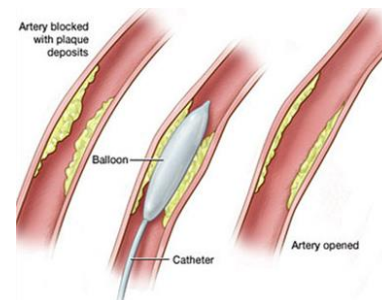
Biomedical signal processing



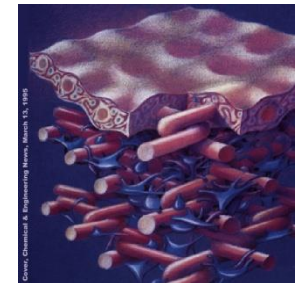
MR imaging



Physiological modelling



Angioplasty

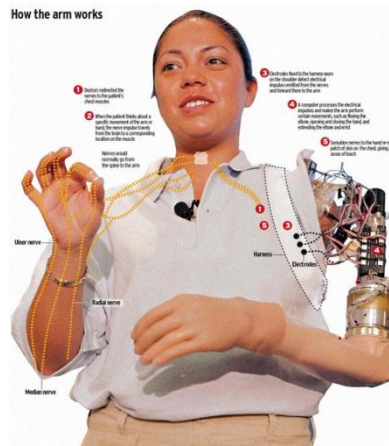


Tissue engineering

Applications of Neural Engineering



Rehabilitation Robotics



Prosthetics



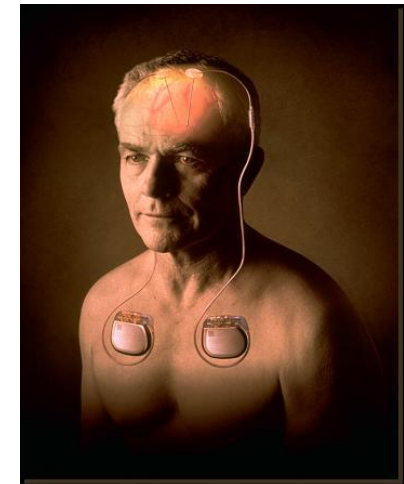
Neuromuscular
Stimulation



Cochlear implants

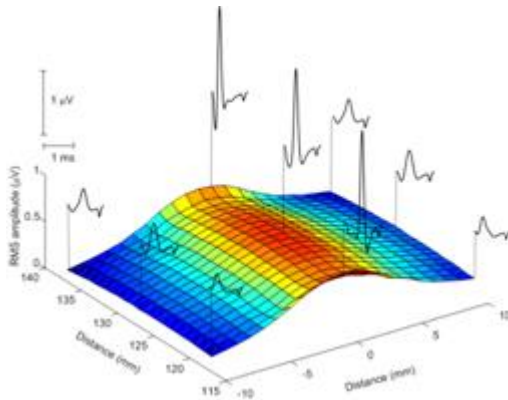
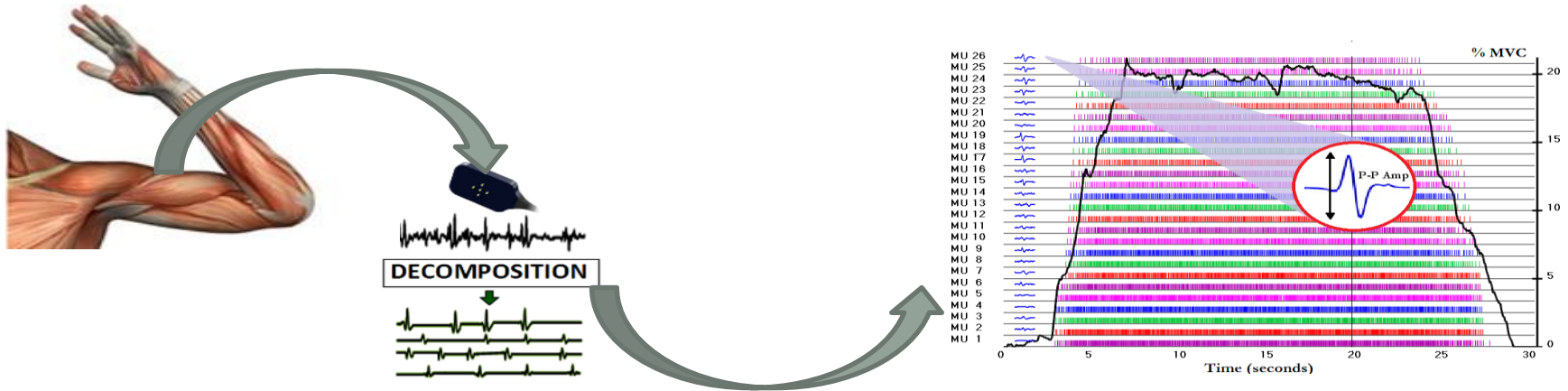


Brain Machine
Interfaces

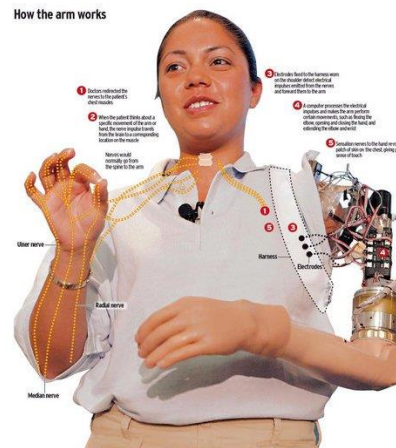


Deep brain
stimulation

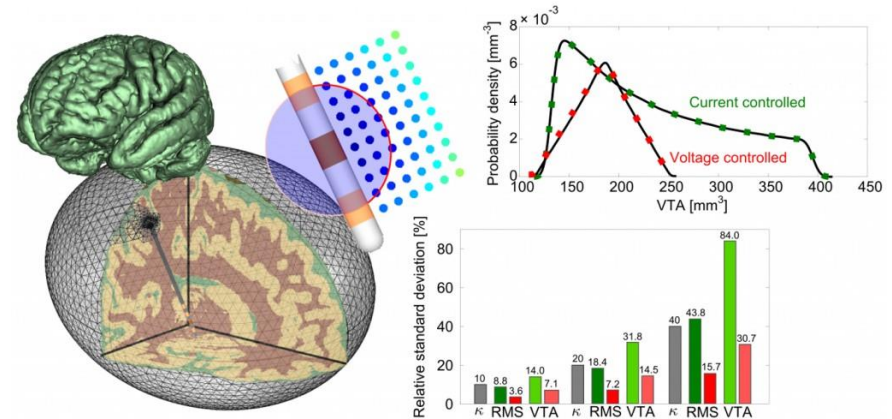
Sample research areas: Neural Control of Movement



How the arm works



Sample research areas: Deep Brain Stimulation

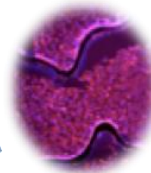


Sample research areas

Medical Device Design (E O'Cearbhaill)



Vascular Devices
Cardiac Patch Delivery
Growing Annuloplasty Ring
Right Ventricular Remodeling

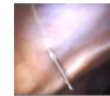


Ex vivo device models
Organ-on-chip and bioreactor device testing

Islet Transplantation Devices



Access & Closure Devices
Novel introducer and suture systems



Mechanical Clutch Needle
Safer laparoscopic access
1st Prize MIT-Sloan Bioinnovations Conference 2012



LATCHMEDICAL



Bioadhesives
Photocurable Adhesives
Microneedle Adhesive
IChemE's Innovative Product of the Year 2013

Aspiration Devices
Reducing pain of bone marrow aspiration

Venous Thrombus Extraction



Endoscopic Delivery Devices



Mater Hospital Dublin



SFA 3D Vascular Stent

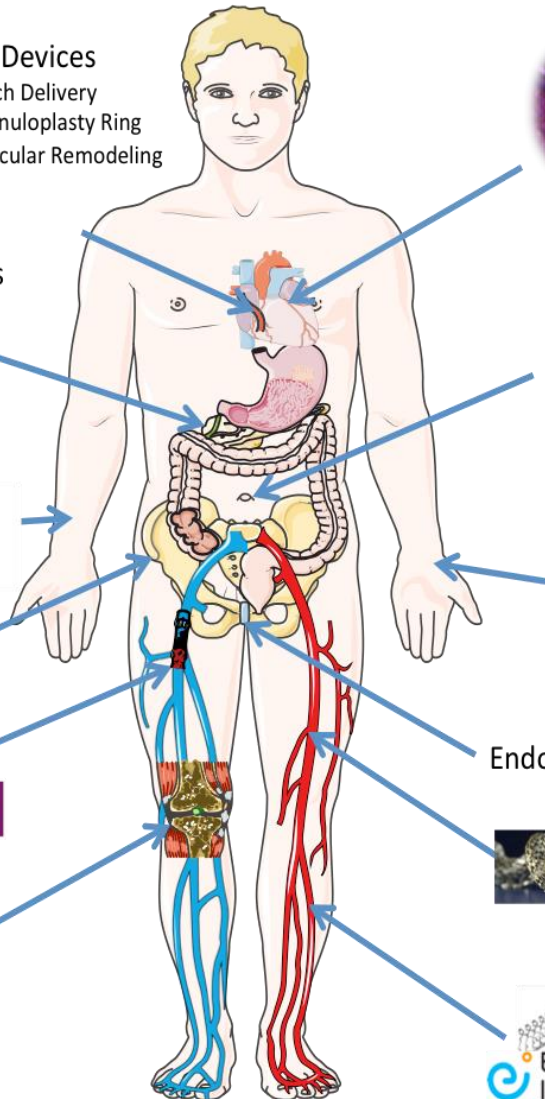
Minimally Invasive Cartilage Repair



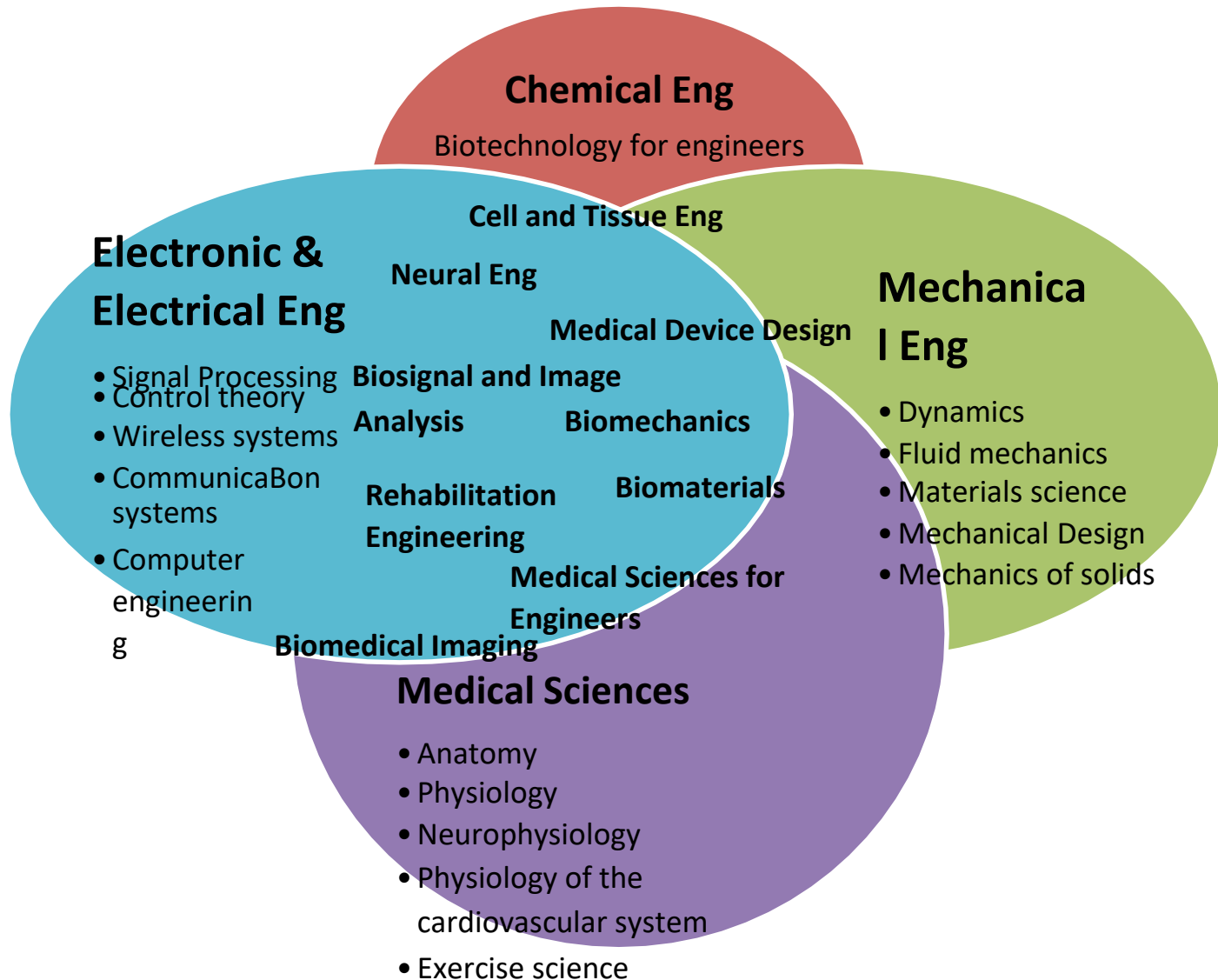
Infrapopliteal Segmented Stent



NUI Galway



UCD Biomedical Engineering





UCD Biomedical Engineering Taught Masters Degree

ME Biomedical Engineering

2 Year degree

120 Credit

GPA greater than 2.8 in Biomedical/Electronic/ Electrical or Mechanical Eng.

Accredited by Engineers Ireland

6-8 Month Professional Work Experience and 25 credit project

ME Biomedical Engineering Year 1

Semester 1

ANAT40010	Medical Sciences for Biomedical Engineers (unless already taken)
MEEN40620	Biomechanics
MEEN40630	Biomaterials
MEEN40600	Medical Device Design
<i>2 or 3 Modules From Below or Equivalent</i>	
Engineering Modules	
EEEN30160	Biomedical Signal and Image Analysis
EEEN30210	Biomedical Imaging
EEEN30110	Signals and Systems
EEEN40010	Control Theory
EEEN40050	Wireless Systems
EEEN40150	Radio Frequency Electronics
MEEN30030	Mechanical Engineering Design II
EEEN40030	Photonic Engineering
MEEN40060	Fracture Mechanics
MEEN40020	Mechanics of Fluids II
MEEN40050	Computational Continuum Mechanics I
MEEN40150	Computational Continuum Mechanics II
EEEN40580	Optimisation Techniques for Engineers
EEEN40300	Engineering Entrepreneurship
Modules from outside Engineering	
COMP41670	Software Engineering
PHYC40430	Nanomechanics - from single molecules to single cells
PHYS30010	Physiology of the Cardiovascular System
STAT30240	Linear Models I (Statistics)
STAT40400	Monte Carlo Inference



ME Biomedical Engineering Year 1

Semester 2 : 30-Credit Professional Work Placement

January – August



‘Also, just a note that we were blown away by the quality of the applications from UCD this year - it was very tough choosing between them at both interview and offer stages. The UCD students really stand out from the other candidates (and we had applicants from all over Ireland and around Europe).’

Shimmer Technologies

‘It’s rarely I feel the need to go into writing on feedback directly to Universities in relation to student placements we receive here in Boston Scientific, in fact this will be the first time. However, in the case of your Masters students who have just finished placements with us here in the past few weeks..., I feel the need to specifically highlight that these students were of a stand-out nature and not only developed considerably themselves during their placements, but contributed very well to our business – in fact to the extent that they will leave a vacuum behind them now that they have returned to college...As is the case with students of the standard, they are fast learners, very intelligent, constantly ask the right questions and always bring new perspectives. In addition to this, however, what really made these students stand-out for me was their level of enthusiasm, engagement, perseverance, thoroughness, ability to integrate within the team and their strong work ethic.’

Boston Scientific

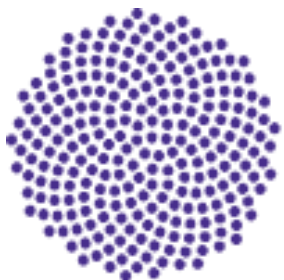
ME Biomedical Engineering Year 2

Semester 1		Semester 2	
MEEN40610	Research Project / Thesis	MEEN40610	Research Project / Thesis
MEEN40560	Research Skills and Techniques		
3 Modules From Below or Equivalent		3 Modules From Below or Equivalent	
<i>Engineering Modules</i>		MEEN41010	Biomechanics of Cells and Tissues
EEEN30110	Signals and Systems	CHEN40470	Cell Culture and Tissue Engineering
EEEN40010	Control Theory	EEEN40350	Rehabilitation Engineering
EEEN40050	Wireless Systems	EEEN40070	Neural Engineering
EEEN40150	Radio Frequency Electronics	EEEN 30180	Bioinstrumentation
MEEN30030	Mechanical Engineering Design II	<i>Engineering Modules</i>	
EEEN40030	Photonic Engineering	MEEN40040	Materials Science and Engineering III
MEEN40060	Fracture Mechanics	MEEN40180	Nanomaterials
MEEN40020	Mechanics of Fluids II	MEEN30010	Applied Dynamics II
MEEN40050	Computational Continuum Mechanics I	MEEN40070	Advanced Metals/Materials Processing
MEEN40150	Computational Continuum Mechanics II	EEEN40060	Digital Communications
MEEN40030	Manufacturing Engineering II	<i>Modules from outside Engineering</i>	
EEEN40580	Optimisation Techniques for Engineers	COMP40400	Bioinformatics
EEEN40300	Engineering Entrepreneurship	RDGY30440	Image Analysis in Matlab
<i>Modules from outside Engineering</i>		PHYS20030	Organ and Systems Physiology
COMP41670	Software Engineering	PHYS20020	Neurophysiology
NEUR30080	Neuromuscular and membrane biology		
PHYC40430	Nanomechanics - single molecules to single cells		
PHYS30010	Physiology of the Cardiovascular System		
STAT30240	Linear Models I (Statistics)		

Sample ME Projects 2017/2018

- Design of a rehabilitation aid to suppress hand tremor
- Analysis of the effect of compression garment on running gait
- Rugby Impact Biomechanics
- Does “putting on your game face” sharpen your selective sensory processing abilities?
- Chronic Ankle Instability
- Enabling ultra-low power IoT wearable sensors using data compression
- Determining the Mass and Inertial Properties of the Human Head
- Long-term monitoring of electromyography (EMG) using wearable sensors
- Investigating the effects of Stochastic Resonance Stimulation during Visuo-motor Adaptation Tasks
- Develop a 3D Printed PET-CT Phantom to Verify Registration and Segmentation Methods
- Effect of cobalt-aluminate face coat on grain size and microstructure of as-cast Co-Cr biomedical alloys for knee replacements
- Cortico-muscular coherence during mechanically-induced tremor
- Real-time Big Data Analysis using Machine learning/AI techniques for wearable health monitoring
- MicroNeedle
- Analysing the flow of bone cement in cannulated augmented fixation screws
- Integrated Interface using BCI (Brain Control Interfaces) for Independent Living
- Emotion Detection from Text Using Deep Learning Algorithms
- 3D printed soft robotic anatomical models
- Evaluation and redesign of a soft hand exoskeleton for rehabilitation
- Catheter-based Progressive Cavity Pump (PCP) for the delivery of highly viscous therapeutics
- The role of temporal integration in simple contrast decisions
- New neural indices of visual motion processing for brain-computer interface control
- 3D Printing of Soft Stretchable Sensors for Wearable Devices
- Evaluation of the Adhesive Performance of a Microneedle-based Tissue Adhesive
- Design of a dynamic braking system for a robot-assisted rehabilitation device





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Association
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Irish Medical Devices Association

diagnostic

hospital and/or homecare
products

Ophthalmic

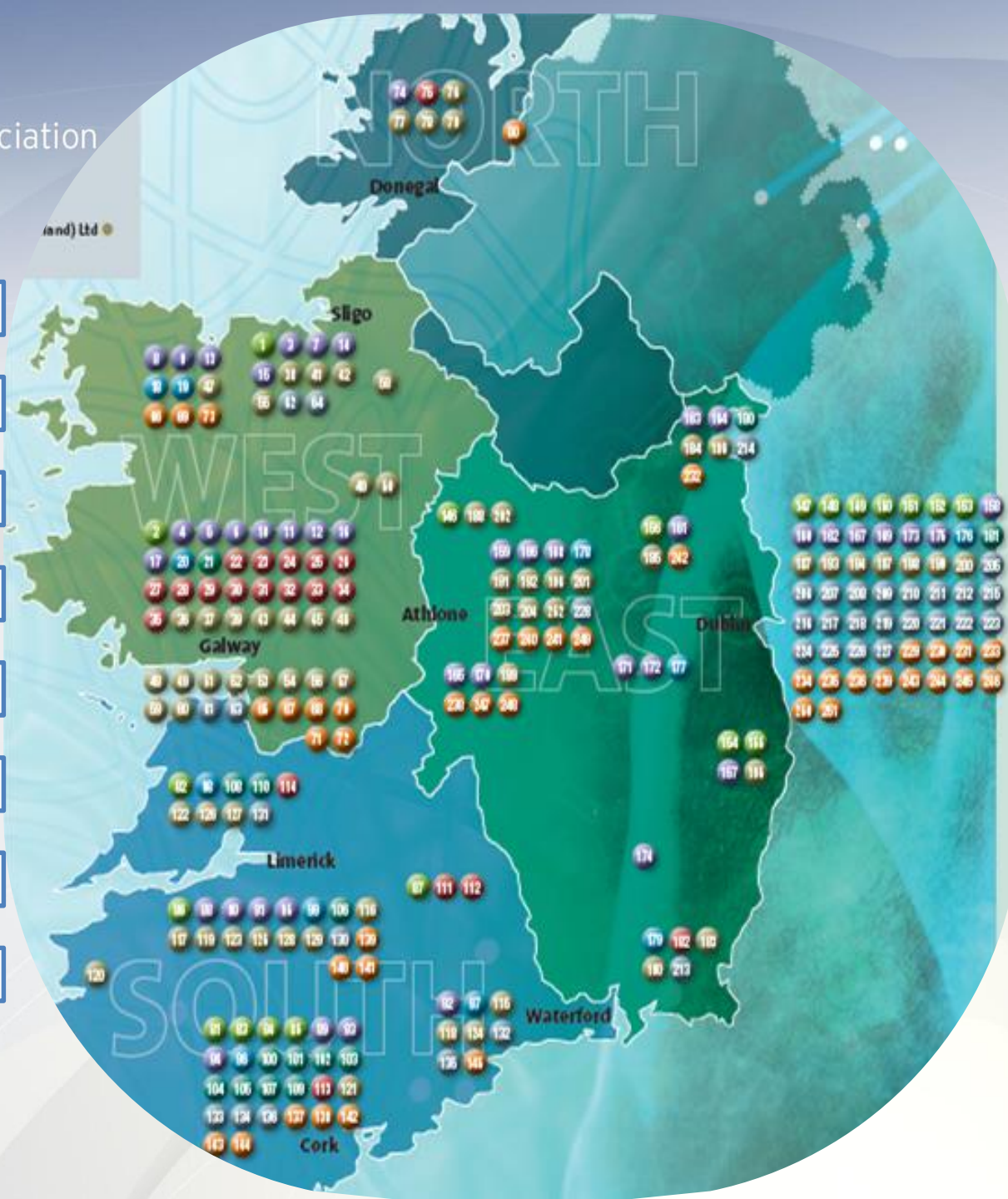
orthopaedic

vascular

contract research,
development,

connected health

service



<http://www.ucd.ie/biomedicalengineering/>

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People

Applying Interdisciplinary creativity to develop tomorrow's therapies

>> News & Events

Upcoming Events: >> [Click here](#)

Workshop: 'What is a real limb? Exploring boundaries between Art and Anatomy'

Published: 05 April 2016

The UCD School of Medicine in conjunction with the National College of Art & Design host an interdisciplinary workshop entitled 'What is a real limb? Exploring boundaries between Art and Anatomy'. This 'social/art' event will be taking place on Friday, 29th April 2016 at the National College of Art & Design. More details on the workshop itself and how to apply may be found [here](#).

UCD/NCAD/IADT Creative Research Funding Workshop

Published: 29 March 2016

Registration for the UCD/NCAD/IADT Creative Research Funding Workshop is now open. This half-day funding workshop is aimed at active academic researchers who are interested in exploring funding opportunities in creative disciplines (broadly defined), and who may be new to developing collaborative applications. Attendance is open to active academic staff from UCD, NCAD and IADT. The workshop will take place on April 20th and attendance is open to active academic staff from UCD, NCAD and IADT. Registration closes April 15th. More info on the workshop itself and how to register may be found [here](#).


SSRA 2016: Call for Projects

Published: 30 November 2015

The SSRA 2016 Committee are now accepting project proposals from Principal Investigators for 8-week supervised student projects during Summer 2016. The purpose of this scheme is to give

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Science
[@sciencemag](#)

Bionmechanics team discovers how insects repair their bones' [sciencemag.com/?p=1462630](#)



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>> Upcoming Events

April 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16