

Next Generation Medical Devices

Theme Champion

Bruce Murphy

Theme Aim

Realise Trinity's potential as a centre of excellence for utilising scientific understanding, scientific discovery and engineering development as underpinning core knowledge for the translation of the next generation medical devices to clinical reality.

Context of TCD Theme and Ireland



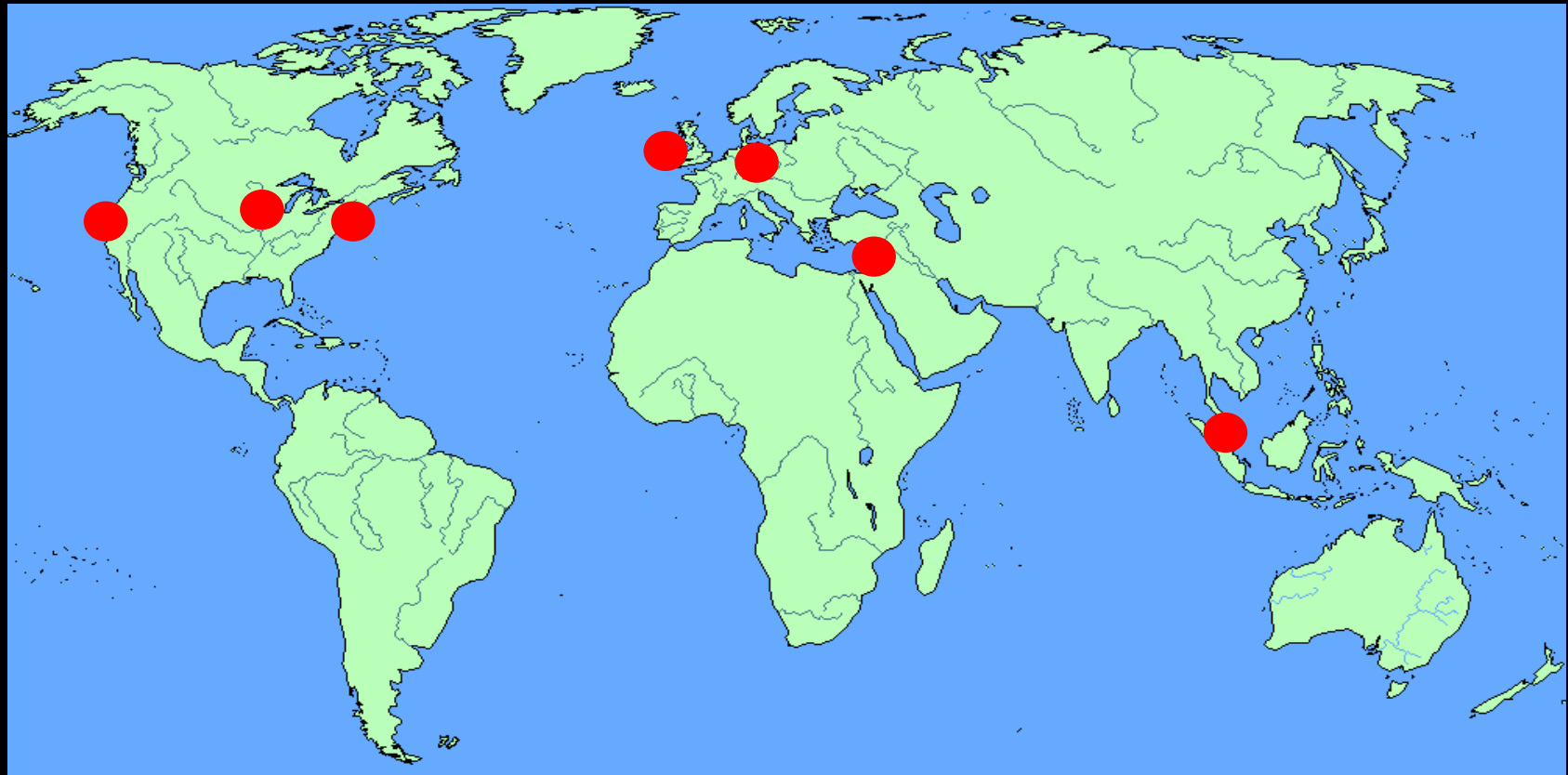
Research Prioritisation exercise
Nov 2011
Priority Area E
Medical Devices



Irish Medical Device Sector Key facts figures:

- Current annual exports €8.5Bn
- Ireland has the highest number of people working in the sector in Europe, per capita, at 27,000
- Ireland is home to 18 of the world's top 25 companies
- 2nd largest medical device company in the world's HQ is less than 1 mile from TCD

Context of Medical Devices and Ireland/TCD Globally



Context of TCD Theme in H2020

- Horizon 2020 themes

– Excellent science



– Industrial leadership



– Societal challenges



- Advanced manufacturing and processing
- Progress made by core
- Health, demographic change and well-being
- Advanced materials
- Device/bioengineering staff members
- Biotechnology
- With a budget of circa €1 billion per year until 2020, the SC1 takes a bottom-up approach to encourage closer cooperation between academic and industrial sectors.
- Space



Unique opportunity to create truly multidisciplinary medical devices in TCD

Teaching Hospitals
Hospital incorporating the
Hospital
y's Hospital
ty Hospital

- Internal Collaborations**
- Trinity School of Engineering
 - Trinity Dental School and
 - CRANN Institute for nanotechnology
 - Trinity College Institute of Technology
 - TILDA
 - CRF

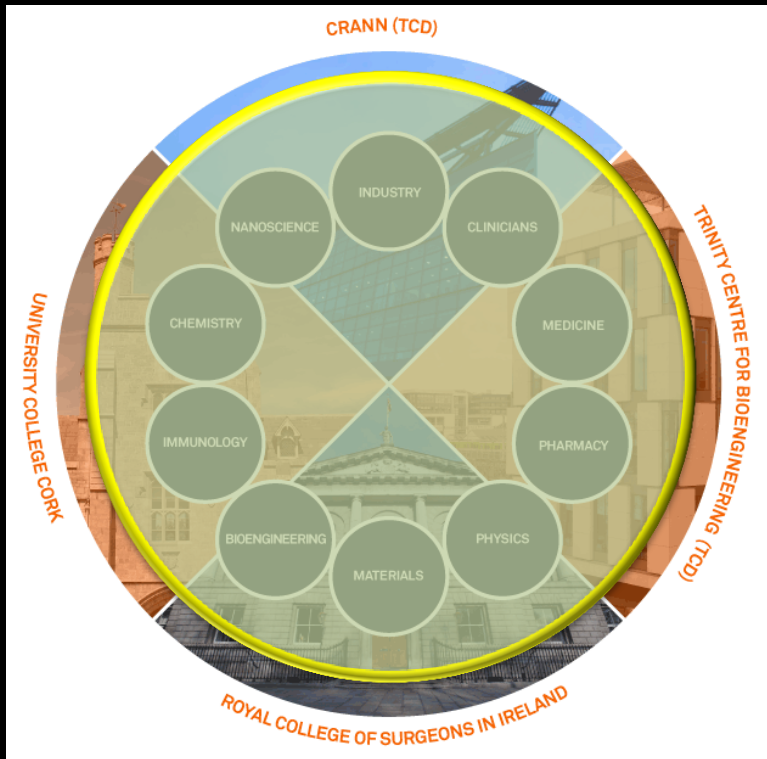
- Affiliated Hospitals**
- Sport Surgery Clinic, Santry
 - St Vincent's Hospital, Fairview
 - National Rehabilitation Hospital
 - Peamount Hospital
 - Dublin Neurological Institute



Advanced Materials and BioEngineering Research



- Industry level projects
 - Spokes
- Targeted projects
- Platform level projects
 - Multidisciplinary
 - Breakthrough science...



IP outputs by theme members



Prof Richard Reilly
License agreed in Dec 2010

Vitolograph quote:

“Relatively pain-free
and straightforward
process”

Licensed to Vasocare 2014
Prof Bruce Murphy's lab (student/clinical project)



Physics

Pharmacy

Physics

Physics

Immunology

Engineering

Example medical device theme members

Prof Ramesh Babu (Physics/Chemistry)



The aim of his current research is the development of superior materials for medical devices using low dimensional nanomaterials for mechanical reinforcement of polymers.



Example medical device theme members

Prof Garret O'Donnell (Manufacturing Engineering)



- Characterising manufacturing processes in medical devices
- Cut Quality- Interocular lenses
- Energy efficiency in compressed air systems in medical devices



Example medical device project: Transcatheter Mitral Valve Replacement

- Market precedence based on success in the aortic field
 - Approximately €5bn un-met market
- To date approximately 60 - 70 procedures completed globally
 - Start-ups + Established heart valve multinationals
- 25 -40% failure rate to date
- Multinationals struggling to innovate and succeed
 - Edwards Lifesciences pauses Fortis program May 2015
- Only one company currently delivering a truly percutaneous product

Transcatheter Mitral Valve Replacement

Exciting/Exiting times:

- 2 Sep 2015
 - Valtech acquired by Heartware (\$927m)
- 25 Aug 2015
 - Twelve acquired by Medtronic (\$458m)
- 30 Jul 2015
 - Tendyne acquired by Abbott (\$250m)
- 10 Jul 2015
 - CardiAQ acquired by Edwards (\$400m)



- Funded by Enterprise Ireland (€700k)
- TCD use proven tech for fixation
- Transeptal “truly” percutaneous approach
- Next phase Spin-out or H2020 Fast Track to Innovation consortium (€3m required)

Teaching and research interaction

- Undergraduate programme
 - 25 students enrolling in *new* Bioengineering stream per annum (Established 2012)
 - **Medical Device design** course interacts with hospital /dental research groups
- MSc level
 - 30 students enrolled in Bioengineering MSc
 - 5 Medical Device Design specialisation students
- PhD Graduate program in medical devices
 - 10 studentships awarded (2010)

Example student Projects 2015/16

- Pediatric plastic surgery (TCD + Temple St)
 - Bioengineering MSc + MAI projects
- Pulmonary Hypertension (UHG + TCD)
 - 5BIO1 student group
- Pediatric cardiology (Crumlin +TCD)
 - MSc student project
- Dentistry sensor (Dental School + TCD)
 - 5BIO1 student group
- + others

2016/17 MSc MAI medical Device projects



- Please feel free to suggest potential medical device projects....
- bruce.murphy@tcd.ie Ext: 8503