



Nicolas Aristokleous

Technology Centre:	Irish Manufacturing Research (IMR)
Academic Mentor:	Dr. Eoin O' Cearbhaill
Company Partner:	FIRE1
Company Mentor:	Mr. Fiachra Sweeney

Nicolas is a Career-FIT Fellow in the School of Mechanical and Materials Engineering (SMME) at University College Dublin (UCD). His research interests are based mainly in Biomedical Engineering, Medical Image Processing, Computational Biomechanics, Modelling in Biomedical Systems, and Medical Devices. Nicolas has previously worked as a postdoc at: a) the Department of Clinical Physiology, Cardiac MR Group at Lund University; b) Department of Mechanical, Aeronautical & Biomedical Engineering of the University of Limerick; and c) the School of the University of Dundee.

Dr. Eoin O'Cearbhaill

Dr. Eoin O'Cearbhaill is an Associate Professor at the UCD SMME and Director of the UCD Centre for Biomedical Engineering. Dr. O'Cearbhaill is an expert in medical devices, having over a decade's experience working in both industry and academia developing medical devices, including vascular stents and paediatric-specific growth accommodating vascular devices and orthopaedic devices. He has 10 relevant pending and granted medical device patents, 30 peer reviewed contributions in high impact factor journals, including Nature Communications, Nature Biomedical Engineering. He was formerly a postdoctoral fellow at Harvard Medical School (Harvard-MIT Health Sciences & Technology Division) and MSCA-IF awardee (2015-17) and has to date secured €5 million in research funding for his lab. Dr. O'Cearbhaill's UCD Medical Device Design Group (MDDG) currently includes 6 postdoctoral fellows/research engineers and 4 PhD students, with 25 alumni working in the medical device industry in Ireland.

Mr. Fiachra Sweeney

Mr. Fiachra Sweeney holds a BEng from National University of Ireland, Galway, an MBA from the Australian Graduate School of Management in Sydney, Australia and is a Chartered Engineer. He has over 20 years experience in medical device development, sales and marketing and is currently Chief Technical Officer with FIRE1.

He has extensive experience in medical device development with a specialization in cardiovascular implants and the development of innovative technologies from initial concept through to commercialisation. He has held leadership roles in research and development with Medtronic while also having sales and marketing experience with Johnson & Johnson.

Fiachra has led multiple industry - academia collaborations with NUIG, UCD, CRANN and Tyndall in Cork. He has been a functional manager for many years and has extensive experience in coaching and mentoring. Specifically, he has mentored reports from academic interns to PhD students.

He has led and performed multiple clinical and pre-clinical research investigations and currently has a total of 23 issued patents to his name. He also previously served on the industry steering committee for the Competence Centre for Applied Nanotechnology.

Irish Manufacturing Research (IMR)

IMR is a leading Research and Technology Organisation providing a portfolio of research, training and consultancy services to Industry across 4 thematic pillars: Digitisation, Sustainable Manufacturing, Design for Manufacturing, Automation and Advanced Control.

Host Institution: University College Dublin (UCD)

UCD is the largest University in Ireland with over 1,500 academic staff across a range of disciplines and over 33,000 students. It is one of Europe's leading research-intensive universities. The number of funded research projects at UCD has increased significantly over the last few years, peaking at 672 in the year 2013/2014. Over the last five years, UCD has won €525 million in research contracts, with the highest value of funding emanating from national agencies such as Science Foundation Ireland and from the European Commission. UCD plays a leading role in pioneering knowledge transfer (Nova 2003-2016) with: €8 million generated from commercialisation of research invention; €200 in equity funding raised by NovaUCD companies; 40 new UCD spin-outs incorporated; 675 invention disclosures; and 460 patent applications.

FIRE1

FIRE1 is a connected medical device solutions company dedicated to improving outcomes for people suffering with chronic diseases. Its first product is a novel remote monitoring solution to improve outcomes for Heart Failure patients. The FIRE1 team is led by an experienced medical devices team who are working closely with researchers, clinicians, patients and payors to help reduce the burden of heart failure. This team have developed their product through extensive research, development and innovation across clinical data, engineering (bio-mechanical, electronics and software), regulatory and quality spheres. The FIRE1 facility includes state of the art laboratories for the development of mechanical and electronic devices as well as test facilities to complete mechanical testing such as tensile and fatigue testing.

Nicolas' project

“Computational and experimental methods to create 3D printed compliance matched synthetic blood vessels for more accurate simulation of interventional procedures”

For the development of the new generation of implantable medical devices, it is crucial to be tested and evaluated under physiological conditions before the pre-clinical stage. This new generation of tissue-like material needs to mimic the behaviour of native vessels, a difficult task to achieve with the common synthetic materials, as vessels consist of a complex morphology and physiology.

The aim of this study is to develop a novel patient-based numerical and experimental framework to construct compliance matched blood synthetic structures created by 3D printing. Moreover, the goal is to test and validate these synthetic structures across a range of medical applications. The study's ambition is to deliver a patient-tailored 3D printed synthetic vessels suitable for benchtop testing of implantable endovascular medical devices.