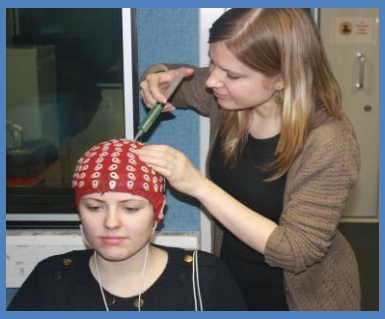
Hanni Kiiski is a PhD researcher in the Neural group in Trinity Centre for Bioengineering.

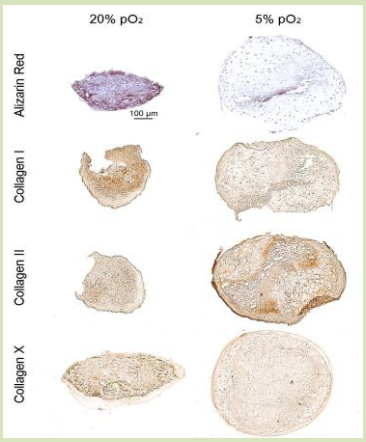


Hanni's research focuses on electrophysiological measures of cognitive function in multiple sclerosis involving both cross-sectional and longitudinal studies. Since starting her PhD in 2010 on an IRCSET award, Hanni has published peer reviewed journal papers and presented her research at international and national conferences.

"I truly enjoy my time in TCBE where I have excellent opportunities to learn and deepen my knowledge on Neural Engineering and related areas. Especially, I have been able to advance my research skills and acquire more information on my main interest, the cognitive functions in neurological conditions. The excellent contact network of TCBE has enabled my PhD project to involve close collaboration with experts in TCBE, Department of Neurology of St. Vincent's University Hospital, and School of Psychology in University College Dublin, and therefore provided an excellent working environment."

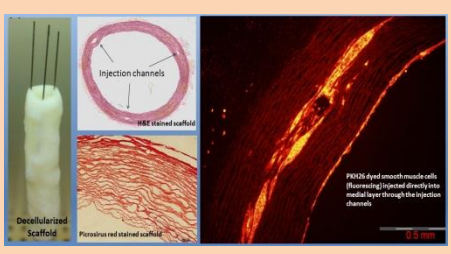
My name is Eamon Sheehy and I am a final year PhD student in the Regenerative Medicine group.

My research focuses on cartilage and bone tissue engineering applications and in particular how environmental cues can modulate the fate of mesenchymal stem cells for use in such applications. A major challenge in MSC- based cartilage repair therapies in the prevention of hypertrophy and terminal differentiation. Since bone is vascularised and cartilage is not the local oxygen environment may be a regulatory factor in determining MSC phenotype. The study below demonstrates that low oxygen conditioning of chondrogenically primed MSCs promotes a more stable chondrogenic phenotype whereas normoxic conditioning promotes a hypertrophic phenotype This has consequences for tissue engineering strategies when attempting to engineer grafts for either cartilage regeneration or bone regeneration via endochondral ossification.



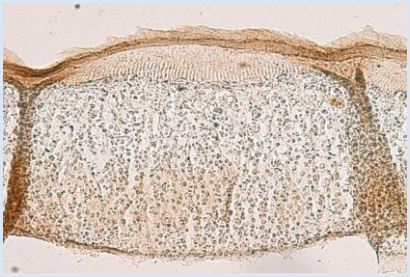
Stephen Sheridan is a PhD researcher in the Cardiovascular group and tells us of his goals.

Tissue engineered arteries have the potential to be used as an alternative source to the limited available autologous bypass grafts. The objective of my research is to create such a tissue engineered artery, in a quick and efficient manner, using decellularized porcine tissue as a scaffold. Decellularization is the process of removing all the cellular components from a tissue which leaves a porous 3D architecture which is ideal for cell attachment and growth. The scaffold that remains consists of extracellular matrix, namely collagen and elastin, which offers ideal mechanical properties, similar to the native artery. The main limitation of this scaffold is its highly dense nature which to date has proved difficult to infiltrate with cells. I have developed customisation techniques which increase the porosity of the scaffold and create a means of directly injecting cells within the scaffold to produce a fully repopulated scaffold quickly without compromising its mechanical integrity. The long term goal of this research to produce a tissue engineered artery *in vitro*, created from a patients' own cells that can be translated to a patient in a clinically feasible time frame.

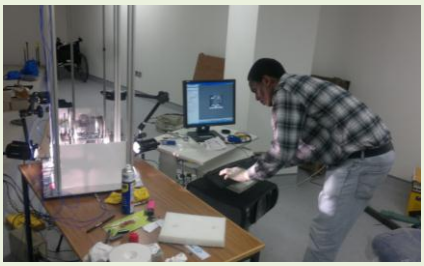


My name is Tariq Mesallati, and I am a third year PhD student in the Regenerative Medicine group of the TCBE.

I started my post-graduate research in October 2009, after receiving my B.A., B.A.I. in Mechanical Engineering from TCD. My research is focused on generating up-scaled cartilage grafts with clinically relevant dimensions suitable for treating large cartilage defects. Currently, the standard procedure for treating Osteoarthritis (OA) is total joint replacement, with the replacement joint degenerating over time. The aim of this study is to scale up current tissue engineering treatments to larger approaches to successfully engineer an anatomically accurate, osteochondral construct, which could potentially be used to treat OA. I am currently investigating the potential of using infrapatellar fat pad derived mesenchymal stem cells (FPSCs) to engineer the cartilaginous component of the osteochondral construct. This image is a close up shot of such engineered cartilage, formed using FPSCs self-assembled onto transwell inserts.



My name is Michael Takaza, and I am a mature student doing a PhD at the Centre for Bioengineering. I started my PhD in September 2010, after receiving my B.Eng. from NUIG (National University of Ireland, Galway) and M.Sc. (Bioengineering) from Trinity College Dublin. I worked for Zerusa Medical (Now Vascular Solutions Galway) and Vivasure Medical in Galway before I came to Trinity to enrol for post-graduate full time studies. My PhD research work is on the microstructural characterisation of muscle tissue during external loading.



Constitutive models of skeletal muscle tissue are vital tools in impact biomechanics, medical engineering, rehabilitation engineering and surgical simulation. For practical reasons most current models are derived from experimental work on animal tissue, but existing models are limited. My study aims to use experimental techniques to characterise the 3D mechanical behaviour of skeletal muscle. The limitations of our current understanding of how skeletal muscle behaves at a micro-structural level inhibit the proper development of skeletal muscle models with good predictive capabilities. After the completion of the 3D mechanical analysis of skeletal muscle (which will include detailed microscopic work), the aim is to develop a micro-structural based skeletal muscle model.

PhD Student Alanna Gannon is researching the depth dependent properties of articular cartilage in the Regenerative Medicine Group.

Alanna tells us of her research: Osteochondral sections stained with picrosirius red (for collagen) and safranin O (for proteoglycans) from the femoral trochlear ridge. The reason this histology was carried out was to look at the depth dependent structure of articular cartilage, specifically collagen and glycosaminoglycan content and structure and to correlate this to the tissues mechanical properties and its biochemical content. The objective of this study was to elucidate the role of the superficial region in determining the dynamic properties of articular cartilage. Specifically we have shown that removal of the superficial region will influence both the flow dependent and independent properties of articular cartilage, leading to a reduction the dynamic modulus of the tissue.