The University Of Sheffield.

Automatic Control and Systems Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Brains, bones and bacteria: Multidisciplinary research using biomaterials for healthcare

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Wednesday, 18 November 2020 at 14:00
Via Google Meet

Host Academic: Professor Ivan Minev, ACSE

Abstract

A tour of my previous biomaterials research that has led me to my current work in ACSE, alongside early results working on the IntegraBrain project. From designing porous cell microcarriers for bone tissue engineering, using biomaterials in dental research, testing antimicrobial properties in *in-vitro* biofilm models and now developing biomaterials for implantable bioelectrical devices.

Electrode arrays are essential tools for enabling neural signal recording and stimulation. Traditionally they are made from rigid and stiff materials such as metals and silicon, which while offering excellent electrical properties are several orders of magnitude stiffer than neural tissue. This mechanical mismatch is implicated in causing tissue injury, triggering of glial scar formations, implant encapsulation and reduction of the signal to noise ratio (SNR) in neural recordings. Recent approaches have used the additive manufacturing technology direct ink writing to produce elastic electrodes formed from lower modulus materials with the ability to accommodate tensile strains while maintaining their conductivity. This novel approach reduces the physical and mechanical mismatches between probes and native tissue and is expected to contribute to improved biointegration of the implanted device. The approach is to develop conductive composite materials that retain electrical conductivity and mechanical elasticity. Here we test conductive graphite composite materials and their electromechanical properties under tension.

Biography

Dr Thomas Paterson is a PDRA in Automatic Control & Systems Engineering at Sheffield University. He received his PhD in bone tissue engineering in the Materials Science and Engineering, also at Sheffield University in 2017, before moving to the School of Clinical Dentistry. There he first worked on biomaterials for bone implantation in the UK research consortium, MeDe. Following this was work on antimicrobial testing of nanoparticles with the EU wide consortium, MOZART. He has worked on several small projects internationally, spending time at universities in both India and China. He started working with Professor Ivan Minev on the IntegraBrain project in February 2020, and when lockdown has permitted, he has been working towards the development of a bioelectronic implant