BRITISH COUNCIL

RESEARCHER LINKS

Newton Fund

Research Profile

Name: **Dr Peter Twigg**

Position: **Reader in Medical Engineering**

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SUMMARY OF MY RELEVANT RESEARCH AREAS:

Brief summary of your research areas, in English *just a short paragraph please*

Biomaterials, particularly hydrogels and cell-conducting materials for soft tissue repair
Biomechanics at human, tissue and cellular scales, particularly dynamic mechanical analysis
Surface engineering of medical devices

Brief summary of your research areas, in Chinese *we will translate this for non-Chinese speaking UK participants*

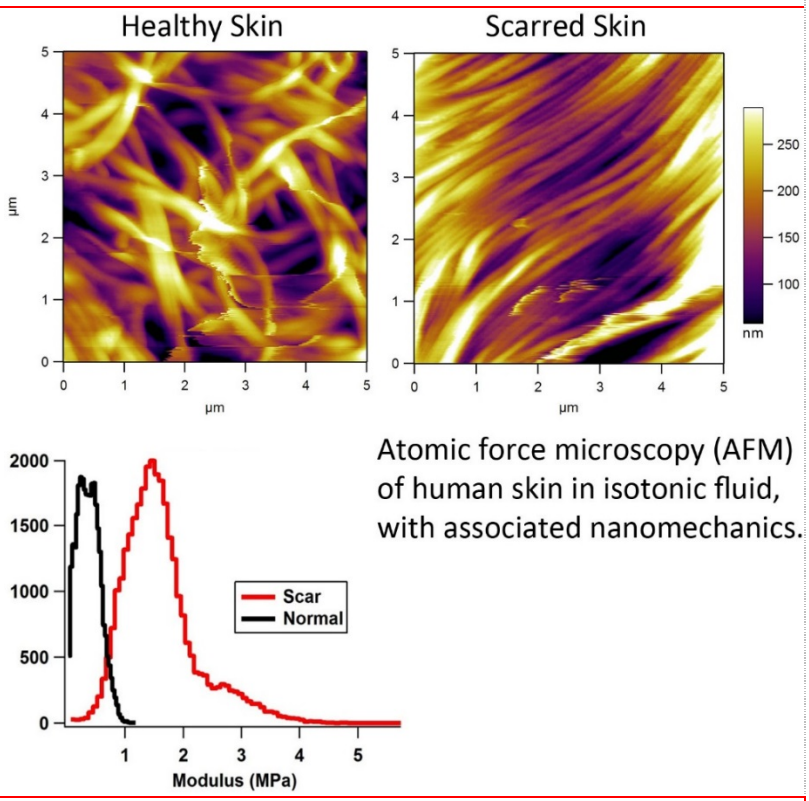
Primary Research interests:

Tissue mechanics - soft tissue characterisation, structure-property relationships, dynamic mechanical analysis, multi-scale modelling

Biomaterials - development of tissue replacement materials, biotribology, surface engineering, orthopaedics

Tissue engineering scaffold materials – electrospinning, hydrogel scaffolds, porous structures, functional scaffolds

Cell-surface interactions - surface characterisation, cell adhesion, cell guiding structures, anti-microbial surfaces, biofilm formation, bio-integration of implants



Atomic force microscopy (AFM) of human skin in isotonic fluid, with associated nanomechanics.

Topics in which you would like to develop collaborative research:

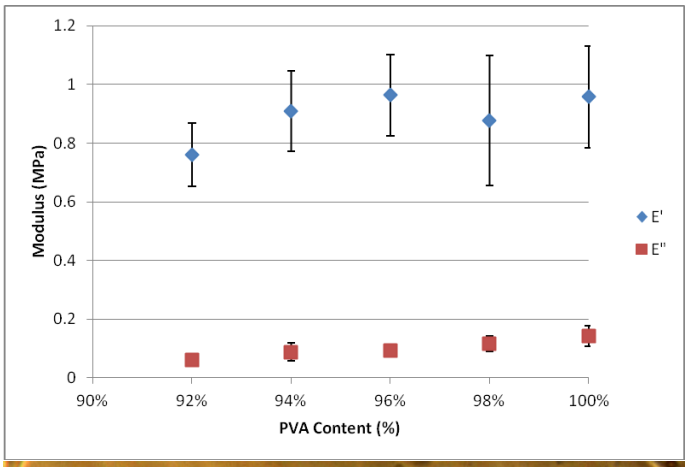
The use of biomaterials in tissue repair tends to rely on precision engineered implants that are very different to the tissues they replace or repair. This can involve procedures that remove significant amounts of healthy tissue, for example total hip replacement. A precision engineering approach can also lead to problems due to stress shielding, wear and immune response.

Our group has been working on alternative approaches that use materials with mechanical properties much closer to those of natural tissues. These open up possibilities for conservative repair and replacement treatments, and less disruption to the function of the surrounding tissues.

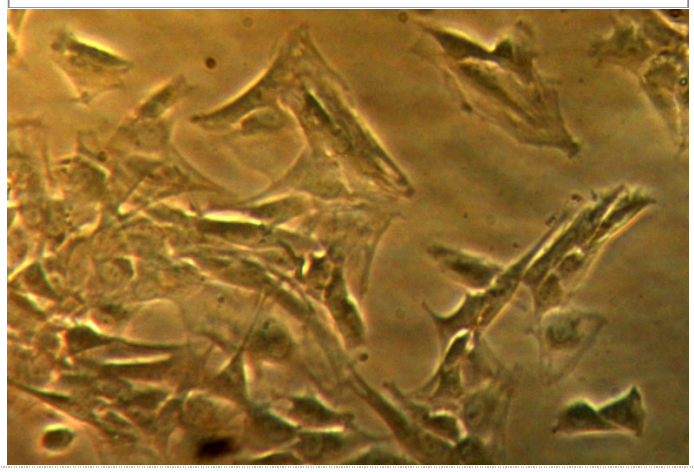
Relevant existing collaborations (academic/clinical/commercial) inside or outside China.

State Key Laboratory of Polymer Materials Engineering, Sichuan University – medical polymers
Institute of Chemistry, Chinese Academy of Sciences, Beijing – hydrogel development
Trauson Medical Instrument Co. (China) - development of orthopaedic implants
Finsbury Orthopaedics (UK) - collaborative work on joint replacement lubrication
DePuy (UK)- surface engineered joint replacements
Ion Bond (UK) - surface engineering medical devices

Relevant graphics, figures, pictures:



Variation of storage and loss modulus (at a physiologically relevant frequency and compressive stress) with PVA content for a PVA-PVP freeze-thaw hydrogel system.



Chondrocyte attachment on a PVA-PEG hydrogel after 6 hours. Cells show rapid surface spread and migration, with much slower migration into the hydrogel bulk.

Publications and other outputs relevant to your interest in this programme (up to 5)

'The Effect of Polysialic Acid Expression on Glioma Cell Nano-mechanics', C.A. Grant, P.C. Twigg, R.F. Saeed, G. Lawson, R.A. Falconer and S.D. Shnyder, BioNanoScience, 6 (2016) 81-84

'Tattoo Ink Nano-Particles in Skin Tissue and Fibroblasts', C.A. Grant , P.C. Twigg, R. Baker and D.J. Tobin, Journal of Nanotechnology, 6 (2015) 1183-1191

'Pseudo-Static and Dynamic Nano-Mechanics of the Tunica Adventitia in "Elastic" Arteries using Atomic Force Microscopy', C.A. Grant, P.C. Twigg, ACS Nano, 7 (2013) 456–464

'Static and dynamic nano-mechanical properties of human skin tissue using atomic force microscopy: Effect of scarring in the upper dermis', C.A. Grant, P.C. Twigg and D.J. Tobin, Acta Biomaterialia, 8 (2012) 4123-4129

'Polyvinyl alcohol hydrogel as a biocompatible visco-elastic mimetic for articular cartilage', C. Grant, P. Twigg, A. Egan, A. Moody, A. Smith, D. Eagland, N. Crowther and S. Britland, Biotechnology Progress 22 (2006)1400-1406