Applications are invited for the following a PhD studentship for the following project:

The role of endogenous skeletal stem cells in regulating biomaterial mediated bone regeneration

The position will be based within the Hoey Lab at the Trinity Centre for Bioengineering, Trinity College Dublin and will be part of the Materials for Health platform within the Advanced Materials and Bioengineering Research Centre (AMBER) centre.

Summary of project: Despite decades of research, there have been relatively few examples of successful tissue and organ regeneration in humans using biomaterial scaffolds. Due to a lack of mechanistic understanding of material mediated regeneration, this phenomenon is challenging to explain. One hypothesis, may be because such bioscaffolds are designed to modulate the later stages of the healing process such as stem cell differentiation, with less focus placed on the acute and chronic immune responses to such implants. Engineering an appropriate immune response is integral to successful tissue regeneration given its importance to clearing damaged cells and tissue, recruiting host stem cells and inducing vascularization. *The goal of this project is therefore to explore how the stiffness and composition of extracellular matrix (ECM) based scaffolds and hydrogels determines immune cell recruitment, macrophage polarization, and vascularization, which will ultimately dictate endogenous stem cell recruitment, differentiation and functional tissue regeneration within* ***traumatic large bone tissue defects****.*

Previously developed biomaterials, with varying composition and mechanical properties, which have been shown to enhance bone regeneration will be transplanted into a critically sized bone defects within a transgenic mouse which contains a fluorescently labelled skeletal stem cell (SSC) population. At varying timepoints post injury, the expression of a panel of known immunomodulatory and repair cytokines in response to scaffold implantation will be assessed. Flow cytometry will be used to determine the proportions of myeloid and lymphoid populations, including innate lymphoid cell (ILC) subsets, in the regenerating bone. The *in situ* macrophage phenotype within regenerating tissue will be further assessed using immunohistochemical staining. Vascularization will be determined by contrast enhanced µCT scanning. SSC recruitment in response to scaffold implantation will also be assessed using flow cytometry. Functional bone regeneration will be determined by mechanical testing, histology and µCT scanning. Furthermore, immunohistochemistry (IHC) will be performed to evaluate the location, number, and stage of lineage commitment of labelled SSCs.

The ideal applicants will have a 1st Class Honours Bachelor's degree in the Biomedical Sciences or Biomedical, Chemical or Mechanical Engineering (or related disciplines).

The researcher will work closely with other members of a multidisciplinary project team. Excellent written and oral communication skills are essential.

How to apply:

CVs with the names and addresses of three referees should be e-mailed to:

Prof. David Hoey,

E-mail: dahoey@tcd.ie

Positions will remain opened until filled but preferred start date is *September 2 2019*. Only short-listed applications will be acknowledged.

This position is funded by the SFI-research centre AMBER.

The AMBER research centre, as a community of researchers, welcomes its responsibility to provide equal opportunities for all. We are actively seeking diversity in our research teams and particularly encourage applications from underrepresented groups.