Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

TRINITY CENTRE FOR BIOENGINEERING SEMINAR SERIES 2018

Mechanically-driven growth and remodeling of native and tissue-engineered heart valves

Speaker: **Sandra Loerakker, Assistant professor in Modeling in Mechanobiology, Department of Biomedical Engineering, Eindhoven University of Technology**

When: **11am on Wednesday 31st of January 2018**

Where: **B2.73, Trinity Biomedical Sciences Institute**

Tissue-engineered heart valves (TEHVs) have the intrinsic capacity to grow and remodel with time, and hence the principal ability to last for a life-time. The major challenges for developing TEHVs with long-term functionality are to (1) understand the underlying growth and remodeling mechanisms, and (2) design TEHVs such that these mechanisms lead to physiological development and adaptation. Computational modeling plays an important role in addressing both challenges. At TU/e, we have developed a computational framework of soft tissue remodeling, inspired by experimental data on the individual mechanisms. We will demonstrate how this modeling framework has contributed to obtaining a mechanistic understanding of valve remodeling. Moreover, via a one-year pre-clinical follow-up in collaboration with clinical partners, we recently confirmed that the long-term functionality and remodeling of TEHVs can indeed be predicted and, importantly, also guided towards a successful outcome via design optimization. Besides focusing on TEHVs, we also aim to improve our understanding of the development of human native heart valves, as these present the benchmark for TEHVs. Using computational-experimental analyses, we investigated the presence of mechanical homeostasis in human heart valves, and dissected the individual contributions of growth and remodeling in preserving mechanical homeostasis.

Sandra Loerakker is assistant professor in Modeling in Mechanobiology at the Department of Biomedical Engineering, Eindhoven University of Technology (TU/e), The Netherlands. She obtained her MSc degree in Biomedical Engineering in the field of computational fluid dynamics in 2007 (cum laude), and defended her PhD thesis in the field of pressure ulcer etiology in 2011, both at TU/e. Her PhD work was awarded with the Best Doctoral Thesis in Biomechanics Awards of the European Society of Biomechanics and the Novice Investigator Award of the European Pressure Ulcer Advisory Panel. From 2011 till 2014, she worked as postdoctoral researcher in the field of heart valve mechanobiology at TU/e, after which she was promoted to her current position of assistant professor. From 2016 till 2017, she spent one year as visiting assistant professor at Stanford University, supported by a Marie Curie Individual Fellowship. The aim of her research is to integrate computational and experimental methods to understand the biological mechanisms responsible for soft tissue development, adaptation, and disease, and ultimately translate those findings into applications in the field of regenerative medicine.