FIU Engineering & Computing
Biomedical Engineering

Wallace H. Coulter Foundation
Biomedical Engineering Seminar Series

CARLIJN BOUTEN, PHD is full professor of Cell-Matrix Interaction at the Department of Biomedical Engineering of the Eindhoven University of Technology (TU/e), The Netherlands. Her research concentrates on new engineering approaches to regenerate tissues and organs inside the human body, in particular for the cardiovascular system. A prominent example is the development of a synthetic, bio-degradable heart valve prosthesis that 'seduces' the body to create a new, living heart valve at the site of implantation. She performs her research in close collaboration with material scientists, life scientists and clinicians, mainly within large (inter)national public-private partnerships. From 2007-2009 she was visiting professor at the dept. of Cardiothoracic Surgery, UMC Utrecht; and in 2013 she was visiting professor at Harvard Medical School to further the translational aspects of her research. Since 2017 she spearheads the national gravitation program 'Materials-Driven Regeneration'. Prof. Bouten serves on several professional organizations and boards, including the board of the Netherlands Organization for Health Research and Development and the board of directors of the international Heart Valve Society. Bouten is elected member of AcademiaNet for Outstanding Female Scientists and Scholars in Europe.

DR. CARLIJN BOUTEN

Professor of Cell-Matrix Interactions in Cardiovascular Regeneration

Eindhoven University of Technology, The Netherlands

MATERIALS-DRIVEN IN-SITU CARDIOVASCULAR TISSUE ENGINEERING

ABSTRACT: We investigate and design in situ cardiovascular tissue engineering technologies using instructive, cell-free, biodegradable scaffolds as an approach to create living heart valves and vessels. This lecture addresses the challenges to design scaffolds that function upon implantation and during the process of tissue formation and scaffold degradation; are capable of harnessing the natural host response; and provide the necessary cues for a stable and organized load-bearing extracellular matrix under in vivo hemodynamic conditions. I will describe how biomimetic in vitro models and computational analyses are used in direct comparison with in vivo small-animal experiments (orthotopic aorta implantations) to provide handles for the optimization of scaffold immunomodulatory and degradation properties, where immunomodulation is introduced via biophysical or bioactive properties of the scaffold. Based on the outcomes of these studies, electrospun microporous scaffolds made from highly tunable supramolecular biomaterials are tested as valvular and vascular replacements in large animals. Long-term studies in sheep demonstrate sustained valvular mechanical and biological functionality during long-term orthotopic (12-month follow up) and transcatheter (6-month follow up) implantations as pulmonary valve, while studies on aortic implants are ongoing. Current studies concentrate on advancing clinical translation of the technology by analyzing the influence of patient characteristics and comorbidities on neo-tissue formation, as well as compliance with minimally invasive strategies. The outcomes will offer new perspectives for patient-specific, readily available grafts that will transform into living, endogenous cardiovascular replacements at the site of destination.

FRIDAY, FEBRUARY 26 / 9:00 AM / VIA ZOOM

▸ Zoom Registration https://bme.fiu.edu/seminars

Wallace H. Coulter Foundation

Through the generous support of the Wallace H. Coulter Foundation the Department of Biomedical Engineering facilitates weekly lectures each year during academic terms. Experts in all areas of Biomedical Engineering are invited to campus to provide a research seminar and to meet with faculty and students and to tour our academic and research facilities.

Friday, February 26, 2021

9:00AM-10:00AM | https://bme.fiu.edu/seminars