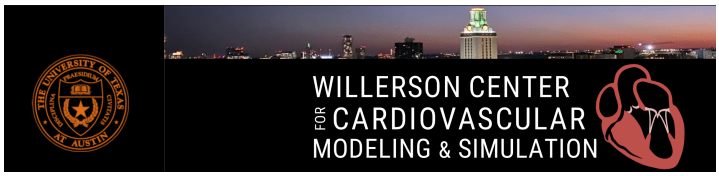

GRADUATE RESEARCH ASSISTANTSHIP

IN 3D ELASTOMERIC MATERIAL EXPERIMENTATION AND MODELING

The James T. Willerson Center for Cardiovascular Modeling and Simulation, Oden Institute, the University of Texas, has an immediate opening for highly motivated graduate research assistants to conduct novel studies on a novel family of gel-coated electrospun meshes for replacement heart valves. The work will involve develop of a novel opto-mechanical device for trileaflet valve material analysis, computational analysis of the resulting data and simulations using new Google JAX based finite element based software. A strong interest in elastomeric materials modeling is required.

Project Description

The ideal replacement heart valve (RHV) should have sufficient durability, resistance to thrombosis, and excellent hemodynamics that lasts the remaining patient lifetime, which does not yet exist. The majority of current RHV are 'bioprosthetic' heart valves (BHV), with leaflets fabricated from chemically treated pericardium, as originally developed in 1971. While providing for an initially effective therapy, all BHV continue to suffer from limited durability resultant from mineralization and mechanical fatigue. The growing use of minimally invasive transcutaneous designs that utilize thinner leaflets results in even greater leaflet mechanical demands and may suffer from more limited durability. In addition, all pericardial biomaterials have intrinsic structural variability that greatly limits their ability to be further improved for extended durability. This present lack of improved RHV biomaterials continues to limit our ability to adequately address RHV limited durability. We have developed a class of hydrogel-coated electrospun (HES) biomaterials for cardiovascular applications. HES biomaterials have been successfully utilized as vascular grafts, in which a luminal hydrogel provided thromboresistance and an electrospun mesh sleeve provided mechanical reinforcement. HES biomaterials can be fabricated over a wide range of mechanical behaviors that encompass RHV design requirements, which we have shown can be accurately modeled. When combined with our high speed RHV simulation methods, it is possible to identify optimal biomaterial and leaflet geometry characteristics, so that we can develop RHV with greater durability. To facilitate both HES biomaterial development and leaflet functional performance, we will extend a novel non-contacting optical method to sensitively detect fiber structures with pixel-level resolution and exploit our significant in vitro and large animal model evaluations. We thus hypothesize that the rational development of HES biomaterial-based RHVs will lead to a new generation of durable replacement heart valves.

The research setting is in the Willerson Center, with wet lab facilities in the EER building and start of the art computational faculties in the Oden Institute for Computational Engineering and Sciences. The Willerson Center has a long rich history of graduate training and competitive placement of trainees graduate and industrial positions.

Qualifications:

- An BS degree in engineering or physics.
- Experience/Interest in both optics and mechanical evaluations of materials.
- Experience/Interest in working developing advanced computational methods for data analysis and simulations.
- Interest/experience in Python programming, modeling fitting, and eventually machine learning methods

Position details:

- Full time with competitive stipend, tuition, and health benefits

- Five year funding.
- Paid travel to attend conferences..

Interested in joining world-class research team?

Please send a cover letter, resume, and any related experience materials via email to:

Professor Michael S. Sacks
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Austin, TX 78712
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With the subject “Graduate research assistantship in 3D elastomeric material experimentation and modeling”.