NJIT New Jersey Institute of Technology

BME

Department of Biomedical Engineering

Graduate Seminar

Dr. Kyoko Yoshida, Ph.D.

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University of Virginia

Subject: The mechanics behind the miracle of life: Maternal soft tissue growth and remodeling

Abstract:

Pregnancy stands at the interface of mechanics and biology. The growing fetus continuously loads the maternal organs while circulating hormones surge. In response to these dynamic mechanical and biological cues, virtually all maternal soft tissues grow and remodel. For example, a mother's uterus will increase its cavity volume by 1000-fold, and her heart will pump 50% more blood over nine months of pregnancy. Precise mechanical function of the maternal reproductive tract and heart is critical for supporting a healthy pregnancy. If a mother's uterus contracts or her cervix dilates too early, the pregnancy can result in preterm birth. If her heart fails to remodel correctly, she can develop heart failure towards the end of the pregnancy or immediately after giving birth. Alarmingly, rates of preterm birth and heart problems during pregnancy continue to rise. My research aims to uncover how mechanical and biological cues interact to drive pregnancy-induced soft tissue growth, remodeling, and mechanical function. I propose to achieve this goal by combining two emerging computational modeling approaches from the fields of biomechanics and systems biology: an organ-level mechanical model of how growth modifies stretch and contractility and a network model of the many intracellular signaling pathways that lead to growth.

This seminar will outline my Ph.D. work, which focused on experimental and computational pregnancy biomechanics, and my motivations to focus on heart growth mechanics for my postdoctoral research. Finally, I will outline how I will combine the skills I learned during my Ph.D. and postdoc to pursue my independent work, where I seek to answer the question: How does the uterus grow and stretch by 1000-fold but not contract until labor?

Bio:

Dr. Kyoko Yoshida, Ph.D., is a Senior Scientist in the Department of Biomedical Engineering at the University of Virginia. She previously obtained her Ph.D. in Mechanical Engineering from Columbia University as an NSF Graduate Research Fellow and her B.S. in Mechanical Engineering from the University of Notre Dame. Her research focuses on the growth and remodeling biomechanics of soft tissues, including the cervix, uterus, and heart. Specifically, she is interested in how mechanical and hormonal signaling interact to control maternal soft tissue adaptations during pregnancy to support both mother and baby for a healthy pregnancy.

Date and time: Friday, December 18th, 2020 at 11:30 a.m.

WebEx Link: https://njit.webex.com/njit/j.php?MTID=m0048ff6ecbdc0a53f4cecf1cc5e894ee