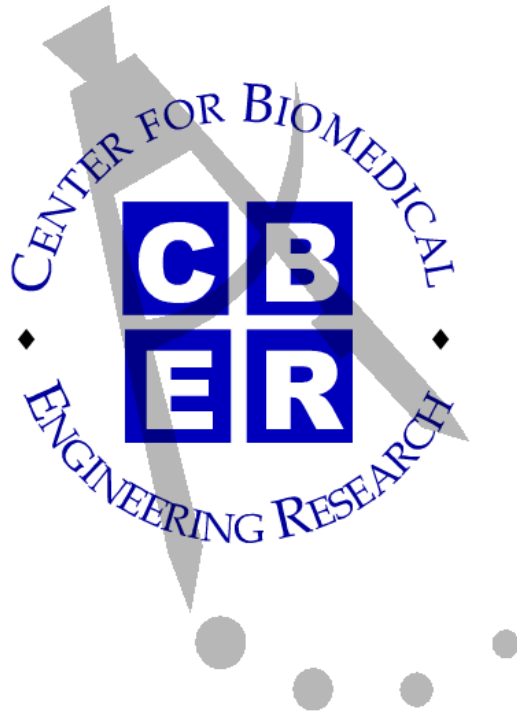


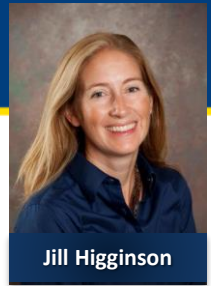


UNIVERSITY *of* DELAWARE

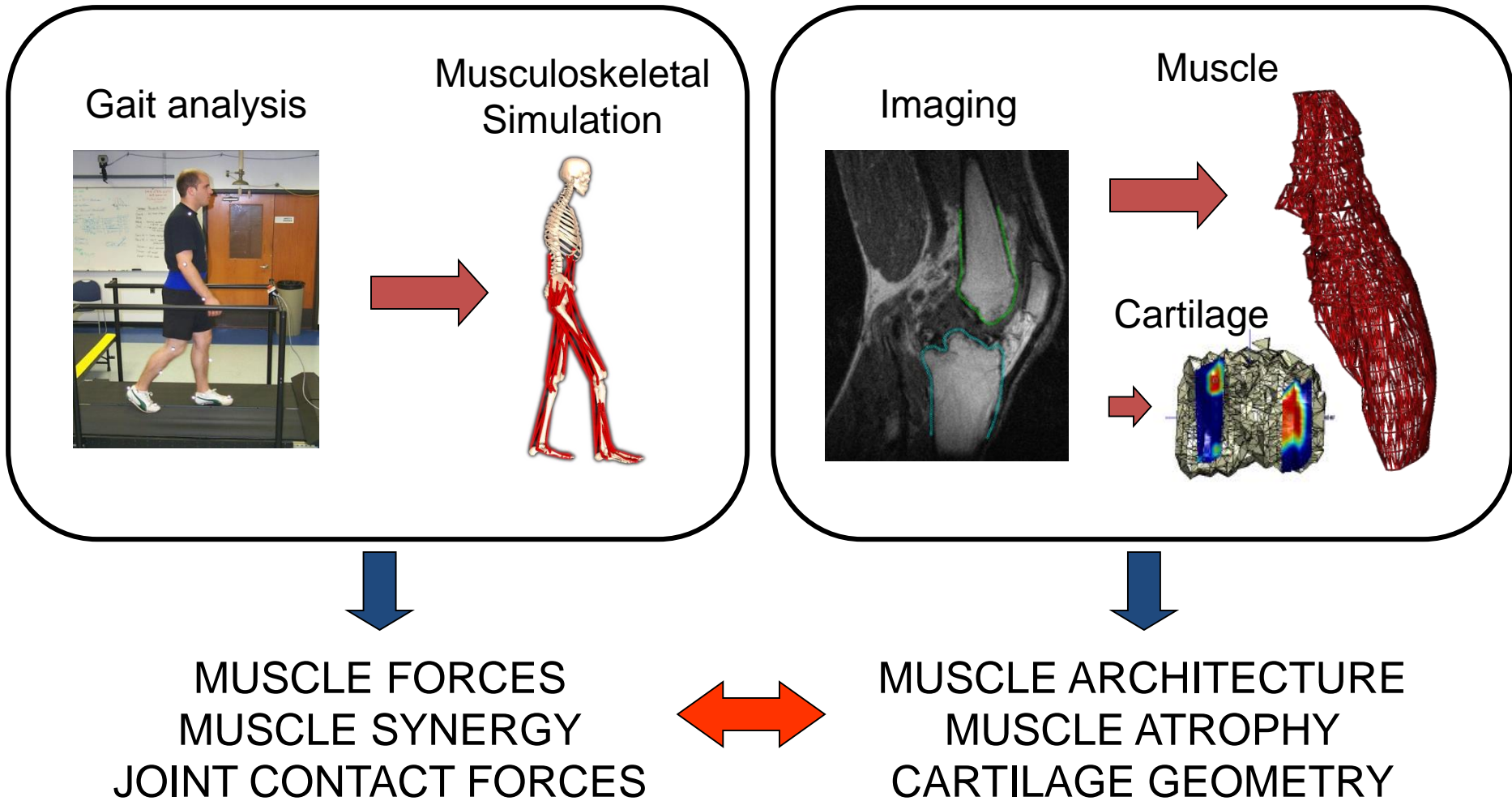
Biomedical Engineering Research

Mechanical Engineering
University of Delaware





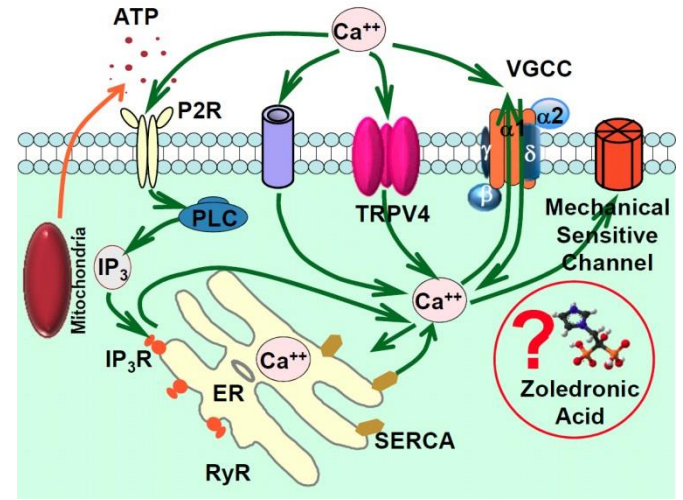
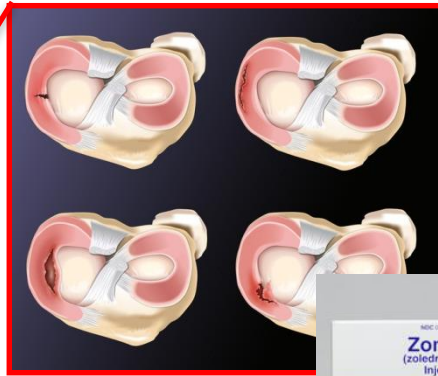
Patient-Specific Modeling Core





Xin (Lucas) Lu

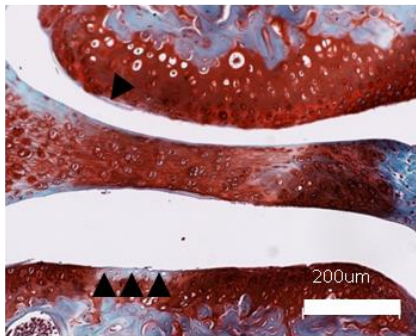
Post-Traumatic Osteoarthritis



A. DMM+Veh

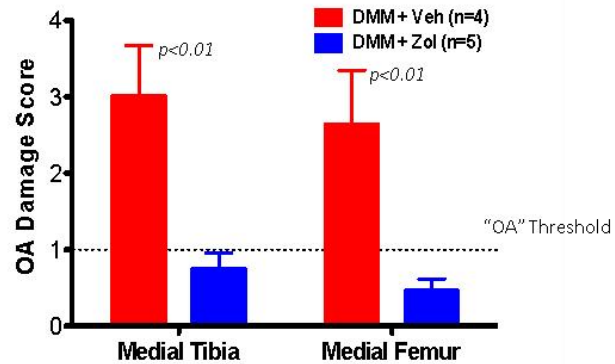


B. DMM+ZA



C.

Average OA Damage Score

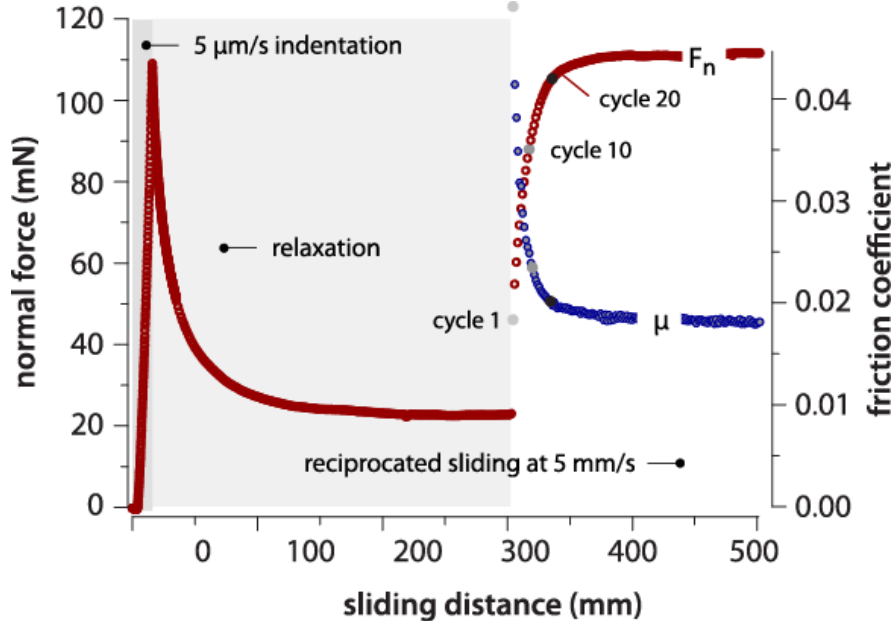


▲ - Indicates loss of PG, fibrillations, and/or erosions



Osteoarthritis and Cartilage Response

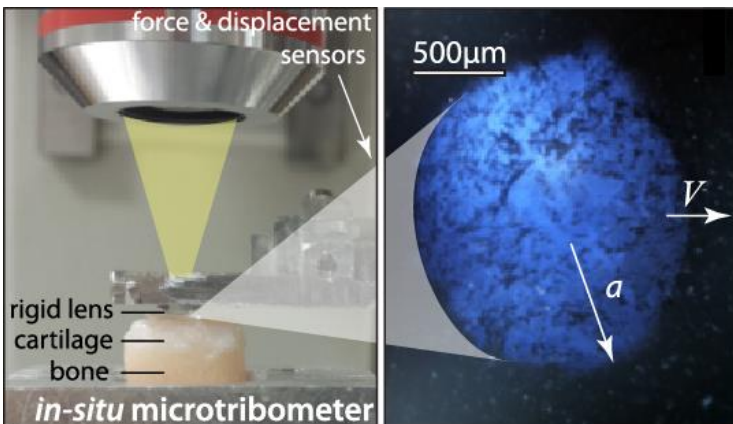
Typical pressurization response



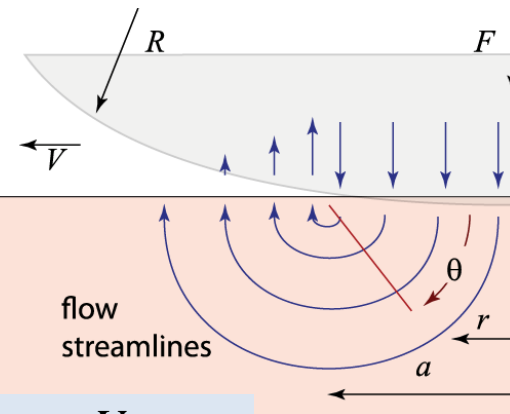
Does OA affect the fluid pressurization and lubrication response of cartilage?

1. Low friction due to poorly understood biphasic tissue mechanics
2. Does local degradation reduce pressure → higher friction, higher matrix stresses → unfavorable cell response → damage progression → OA
3. **Goal: model the response, predict outcomes**

In-situ area and stress measurements

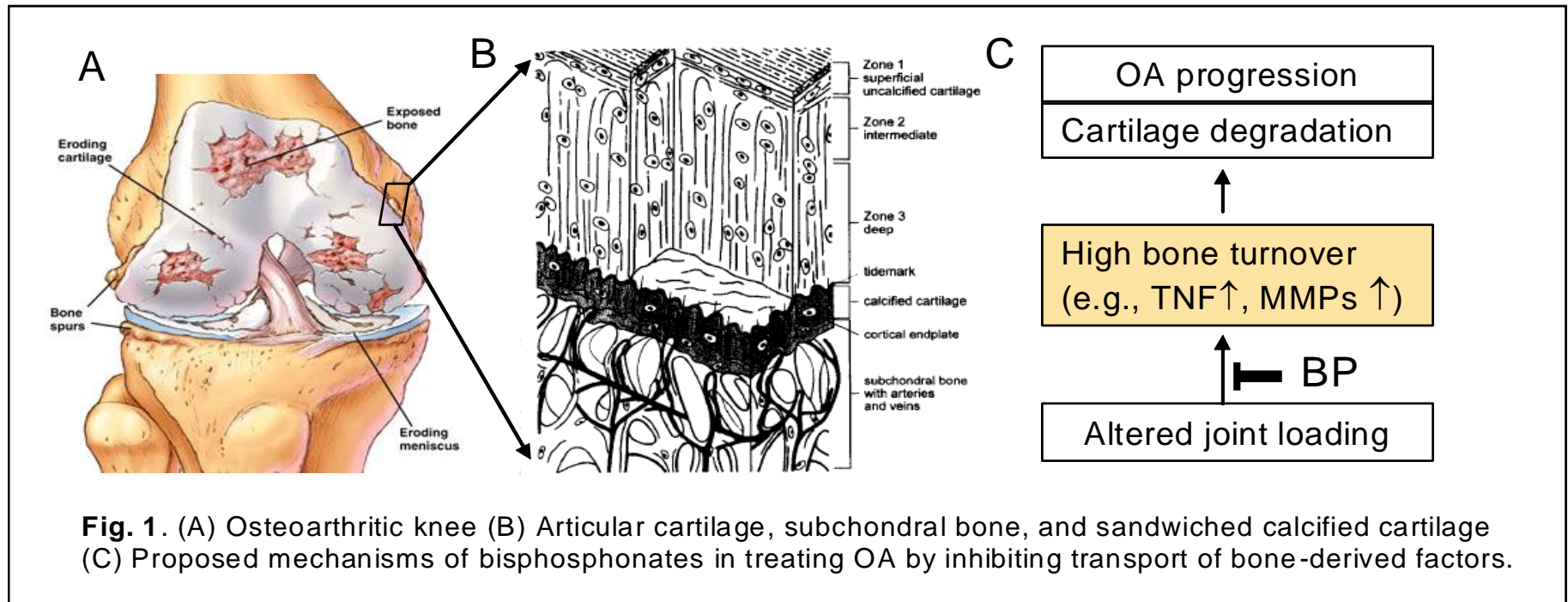


Modeling: Hertz & Darcy



$$F' = \frac{P}{P + \sigma_c} = \frac{E_t}{E_t + E_c} \cdot \frac{V \cdot a}{V \cdot a + E_c \cdot k}$$

Osteoarthritis and Treatments



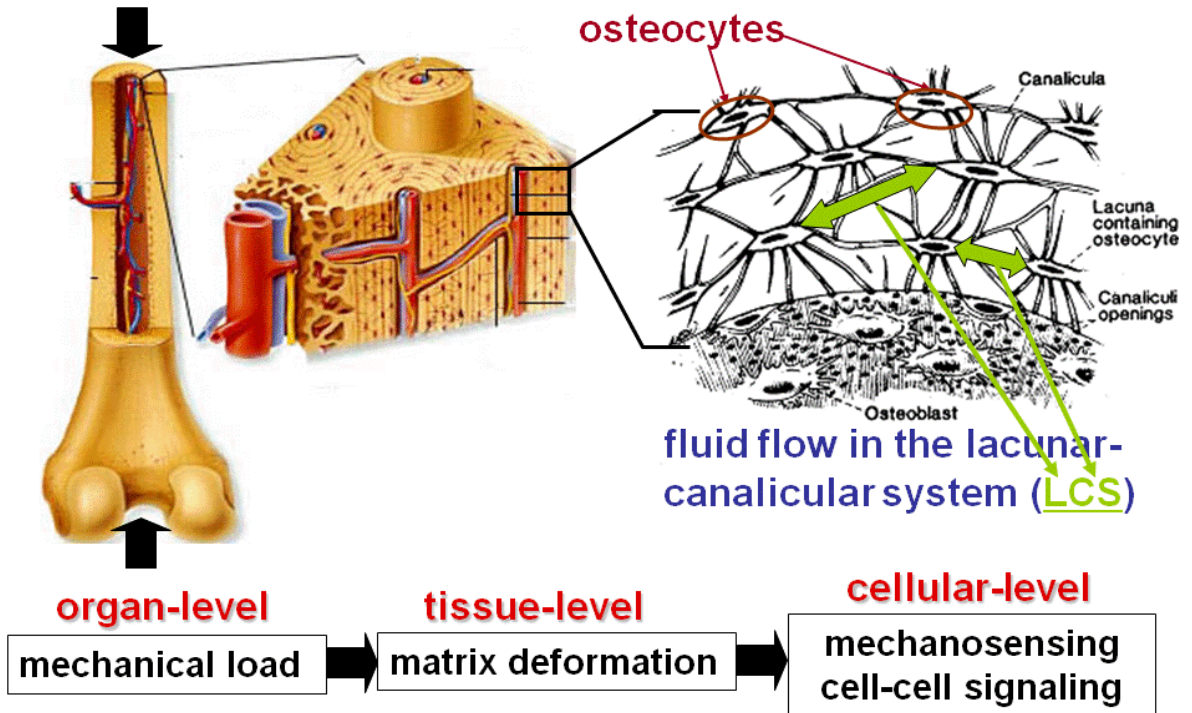
Is OA a bone disease?

Can we inhibit bone remodeling to delay and treat OA?



Liyun Wang

Osteoporosis and Bone Adaptation



How is the mechanosensing capability altered in osteocytes during aging and osteoporosis?



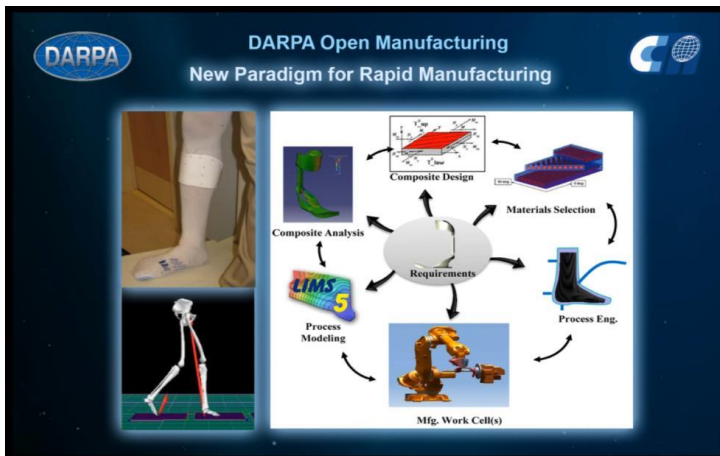
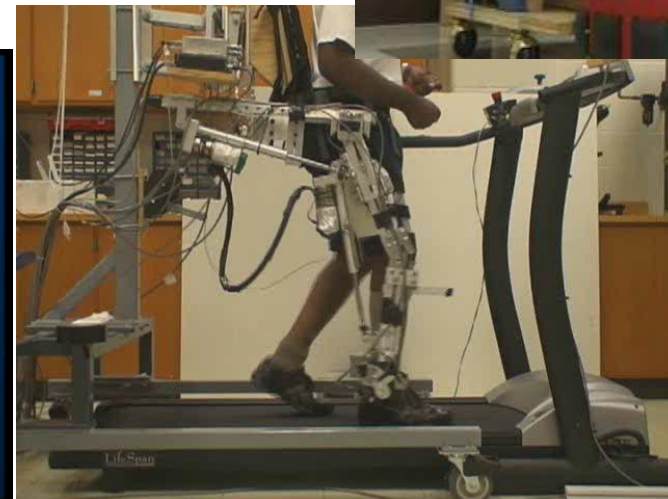
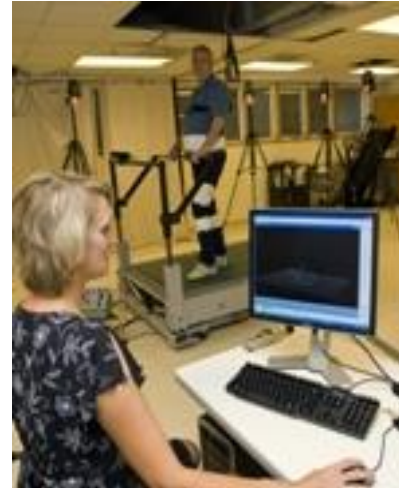
Collaborative Research

FastFES: post-stroke treadmill training with Functional Electrical Stimulation

Mobility training: with novel robots and interfaces for children aged 6 – 24 months

Robotic exoskeletons: powered and passive devices to assist with gait and upper extremity rehabilitation

Composite AFOs: lightweight customized AFOs





UD-ACCEL



Dr. Buchanan is UD PI on the NIH CTR grant (Dr. Binder-Macleod is overall grant PI). This large, UD-led grant provides \$20 million from the NIH and \$5 million from the State of Delaware to support Clinical & Translational Research to UD, Christiana Hospital, A.I. DuPont, and the Medical University of South Carolina.