MEDICINE + ENGINEERING
TOWN HALL MEETING

Wednesday, April 1, 2015
4:30-5:30 p.m. | Great Hall, Trent Semans Center
VISION for a Medicine + Engineering Initiative:

*Strengthening connections to enhance our mutual goals*
The promise of collaboration...

“They’re harmless when they’re alone, but get a bunch of them together with a research grant and watch out.”
Our Common Goals

• Shared focus on 21st Century Challenges & Cures
  – NAE Grand Challenges to Advance Health Informatics, Engineer Better Meds, Reverse-Engineer the Brain, Congressional 21st Century Cures and Presidential Precision Medicine initiatives highlight growing need for engineering + medicine solutions

• Enhancing translation: Developing better technologies & therapies and efficiently delivering them to patients

• Improving education of MDs, scientists & engineers

• Improving health: Keeping people healthy; delivering better patient care in better ways
The Duke Advantage: Key Assets

- Top 10 medical school and top-tier hospitals
- Top 5 BME program + fastest-rising engineering school (Top 20 UG, Top 30 grad)
- $20M Duke-Coulter Translational Partnership
- Strong clinical, research & IT infrastructure
- Interdisciplinary hubs: DGHI, iiD, DTRI, I&E, DIBS
- Physical proximity & culture of collaboration
The Duke Advantage: Strong Ties

- History of groundbreaking collaborations
  - First accredited biomedical engineering major
  - Development of clinical ultrasound
  - First bio-absorbable stent
  - Bioengineered vasculature
  - The list goes on!
The Duke Advantage: Strong Ties

In recent years we have typically had about $38 million in collaborative research awards between Pratt and the SoM – $21M with SOM PIs, $17M with Pratt PIs

2015 Pratt-SoM Survey:

- 31% have current externally funded collaboration
- 52% have submitted or are working on joint proposals
- 42% have collaborated on education, outreach, other projects

Chief benefit of collaboration?

- “Access to scientific/engineering expertise”
Collaborations in Health Informatics

• Early autism screening at scale (Sapiro/Egger)

• Duke-Stanford/GoogleX disease prediction

• Pre-symptomatic diagnosis (Ginsburg/Carin)
Collaborations: Drug & Device Innovation

- OCT development incl. first heads-up, 3D display to guide eye surgery (Izatt/Toth)
- Optical detection of breast cancer margins (Ramanujam/Dewhirst/Lee)
- Drug delivery depots for glucose control (Chilkoti/Feinglos)
- 3D mammography with lower radiation exposure (Tornai/Brady)
Collaborations: Tissue/Genetic Engineering

- Cartilage repair and regeneration (Guilak, Setton, Chilkoti, Gersbach)
- 3-D engineered human muscle (Kraus, Bursac, Truskey)
- Gene editing to cure genetic diseases (Gersbach, Reddy, Crawford)
Collaborations: Reverse-Engineering the Brain

- Improving Deep Brain Stimulation (Grill/Turner; Sapiro...)

- Brain-machine interfaces & neuroprostheses (Nicolelis/Henriquez)

- Obama BRAIN Initiative award to develop next-generation MRIs (Song, Sapiro et al)
Collaborations: Basic Science

- 2-D and 3-D structure of engineered biological materials (Chilkoti/Zauscher/Oas)
- Atomic force microscopy for protein folding (Marszalek/Bennett)
- Gene editing of chondrocytes (Guilak/Gersbach)
- Human microphysiological systems for drug testing (Kraus/Muoio/Koves/Bursac/Truskey)
Collaborations: Education & Training

- Duke Biosciences Collaborative for Research Engagement (BioCoRE) to increase diversity
- MD/PhD dual-degree training
- Faculty Grant Writing-Mentoring Program
- Research leadership, culture of engagement between faculty (SoM LEADER Program)
- Research readiness/development for junior faculty
- Grant-writing & agency-specific funding workshops
Collaborations: Shared Resources

Dozens of core facilities (e.g., Proteomics, Shared Materials Instrumentation Facility, Light Microscopy) for technology and technological innovations; where engineers, core scientists, and biomedical investigators with specific needs can come together to collaborate.
What You Said

- We need to do it!
- Critical in the state of our contracting research enterprise
- Tremendous opportunity in this area
- Potential for wide-ranging benefits
- Critically important
- The strengths of the schools would nearly guarantee success
- Extremely valuable in terms of stimulating innovation
- Terrific idea
- Range of possibilities for collaboration are exciting
- Very promising
- Win-win
- Go for it!
Opportunities Ahead

How can we build on our strong foundation?

• Seed funding
  – And, more coordinated efforts for external funding
• Facilitating & supporting new collaborations
• Development of new joint research areas
• Joint philanthropic development efforts
• Improving patient care
• Joint educational opportunities
  – MD/MEng “physician inventor” training program
  – More promotion of MD/PhD in Engineering
  – Seminar series & other intellectual programming
• Shared core facilities
• Joint searches—not just joint hires
Envisioning a Med+Eng Initiative

- Name of initiative or institute
- Director
- Structure (Emphasize inclusiveness; broad affiliations)
- Themes/thrust areas
  - Diagnostics, therapeutic devices, data-mining (tied to iiD), regenerative medicine, genetics, synthetic biology
- Funding (Current resources + philanthropy)
- Physical space (FCIEMAS, downtown Chesterfield expansion)
- Timing of launch
Envisioning Ideal Results

- Duke as #1 place in the world for biomedical engineering translation
- Leader in use of Big Data as transformative tool to improve health
- Model for best in joint Eng + Med education (MD/MEng; MD/PhD)
- New start-ups, tech transfer, follow-on funding
- Leader in addressing Grand Challenges for human health
Today’s Panelists

Larry Carin, Vice Provost for Research

Tosh Chilkoti, Chair, Biomedical Engineering Dept.

Mark Stacy, Vice Dean for Clinical Research

George Truskey, Senior Associate Dean for Research

Raphael Valdivia, Vice Dean for Basic Sciences
Thank you!