Proposed Establishment of an Intercollegiate Department of Biomedical Engineering

Intersection of Engineering, Science, Medicine and Technology to Improve Healthcare™
Department of BME
MISSION

To significantly impact and shape the delivery of healthcare by acquiring and applying, in an interdisciplinary manner, cutting edge new knowledge at the interface of engineering, science, medicine and technology
To create a fertile environment for productive interactions and collaborations between clinicians, engineers, life, and physical scientists to improve human health
Existing Biomedical Engineering Programs in the United States and FL

- 37 ABET accredited undergraduate Biomedical Engineering and/or Bioengineering programs in the US
  - [http://www.bmes.org/accreditation/accredited_eng_pgms.asp](http://www.bmes.org/accreditation/accredited_eng_pgms.asp)

- Four Biomedical Engineering Programs in Florida
  - **Florida International University, Miami, FL**
    - [http://www.bme.fiu.edu/BME_Deptartment.htm](http://www.bme.fiu.edu/BME_Deptartment.htm)
    - Academic Programs: Certificates, BS, MS, BS/MS, and PhD in Biomedical Engineering
  - **University of Florida, Gainesville, FL**
    - [http://www.bme.ufl.edu/about/index.php](http://www.bme.ufl.edu/about/index.php)
    - Academic Programs: ME, MS, PhD, and MD/PhD
Existing Biomedical Engineering Programs in FL

- **University of Miami, Miami, FL***
  - [http://www6.miami.edu/bme/](http://www6.miami.edu/bme/)
  - Academic Programs: BSBE (Bachelor of Science in Biomedical Engineering), MS, PhD

- **University of South Florida, Tampa, FL**
  - [http://www6.miami.edu/bme/](http://www6.miami.edu/bme/)
  - Academic Programs: UG Minor and Certification, MS, PhD, and MD/PhD

**Additional Notes:**

- **University of Central Florida, Orlando, FL**
  - Offers BME Courses, no formal program

- **Florida Atlantic University**
  - Offers BME courses, no formal program

*the only ABET-accredited program in the State*
History of BME Program @ USF - I

- **Academic Department:**
  - As yet, **NO** organized Department of Biomedical Engineering

- **Academic Home of Existing Faculty in Program:**
  - Primary: College of Engineering
  - Secondary: College of Medicine, College of Nursing, Moffitt Cancer Center, James Haley VA Medical Center

- **Academic Courses/Degrees:**
  - **Undergraduate:** ([http://che.eng.usf.edu/BioMed/undregrad.html](http://che.eng.usf.edu/BioMed/undregrad.html))
    - **NO** BS program offered at the present time in BME
    - Minor in BME
    - Undergraduate Enhancement Certification in BME
History of BME Program @ USF - II

Academic Courses/Degrees:

- **Graduate:**
    - Courses offered since 1991, formally initiated in 1998
    - Thesis & Non-thesis options
    - Areas of concentration include:
      - Biomechanics/Biomaterials, Rehabilitation Engineering, Medical Imaging, and Cardiovascular Engineering
    - Enrollment History
      - ~45 M.S. students have graduated since 1998
      - 20% have continued to pursue M.D. degree
      - 20% have continued to pursue PhD degree (50% @ USF)
      - 60% are employed in biomedical industries (such as Baxter Healthcare, Lineate, Smith & Nephew, etc.)
      - 30 students currently enrolled in this program
History of BME Program @ USF - III

- Academic Courses/Degrees:

  **Graduate:**
  
  - Doctoral - PhD: [http://che.eng.usf.edu/BioMed/phd2.html](http://che.eng.usf.edu/BioMed/phd2.html)
    - Approved by Board of Governors in 2004
    - Areas of concentration include:
      - Biomechanics/Biomaterials, Rehabilitation Engineering, Medical Imaging, and Cardiovascular Engineering
  
  - Enrollment History
    - 10 students currently enrolled
    - Students are being supported by federal fellowships, research grants and other sources:
      - NSF IGERT Program
      - NSF Bridge to Doctorate Fellowships
      - Sloan Fellowship Program
      - H. Lee Moffitt Cancer Hospital and Research Institute
      - Research grants from NSF, NIH and private physician groups
Academic Courses/Degrees:

Graduate:

- Dual Degree - MD/PhD:
  - Initiated in Fall 2005, Approval anticipated in Fall 2006
  - Areas of concentration include:
    - Biomechanics/Biomaterials, Rehabilitation Engineering, Medical Imaging, and Cardiovascular Engineering
  - Seven year articulated program leading to an MS, Biomedical Engineering, MD and PhD Biomedical Engineering
  - 33 hour Masters, required GPA, non-thesis
  - Medical School – 3 years
  - 2 years to complete doctoral work
  - 4th year medical school (opportunity for 3 months additional research)
  - Focus on “translational research”

Enrollment
- 2005-06: 1 student (already has Masters)
Take Home Message:

Many on-going collaborative EDUCATIONAL programs exist at USF and USF Health which will form the basis for the establishment of an Interdisciplinary and Intercollegiate Department of Biomedical Engineering.

USF is now ONE OF SEVERAL players in the State and we must proceed URGENTLY to attain a leadership status in selected areas in this discipline.
Other Areas of Intercollegiate Collaborations Between USF and USF Health
USF Health/COE Collaborations - I

- 1st synergy social hour organized on March 23, 2005: 85 attendees

- Seed Projects: 10 proposals submitted; 2 funded @ $20,000 each:
  - Development of Novel Non-invasive RF Device for Transdermal Drug Delivery
    - Dr. Shyam Mohapatra (PI), Dr. Michael Kovac, Dr. S. Bhansali, and Dr. J. Bumgarner (co-investigators)
  - The Pathophysiology of Aortic Valve Disease: Relations Between Mechanical Stress and Cellular Function
    - Dr. Michael Van Auker (PI), Dr. Leo Ondrovic, Dr. Anna Plaas, and Dr. Joel Strom (co-investigators)
Demonstration Project on Prosthetics and Orthotics

- Collaborative three-year $1 million Federal award supporting

- Co-PI’s are:
  - Dr. Sandy Quillen, Associate Dean, COM and Director of Physical Therapy & Rehabilitation Sciences
  - Dr. Rajiv Dubey, Chairman, Dept. of Mechanical Engineering, College of Engineering

- Purpose/Goals
  - Build educational and research capacity in prosthetics and orthotics
  - Provide a seamless continuum of educational opportunity for prosthetic and orthotic professionals in Tampa Bay Region and throughout Florida
  - Produce state of the art educational materials to support practicing health care professionals
  - Collaborate with and complement the planned undergraduate educational program in prosthetics and orthotics currently in development at St. Petersburg College
USF Health/COE Collaborations - III

- Multi-year DOD funded program in the area of cardiovascular trauma ($2.5 M)
  - Investigators from Colleges of Engineering & Medicine

- NSF Bio-Skins IGERT grant – base project investigates noninvasive biomedical monitoring ($2.5 M)
  - Investigators from Colleges of Engineering, Medicine and Arts & Sciences

- VA Patient Safety Center collaborations
  - Investigators from Colleges of Engineering, Medicine, Nursing, Public Health, and the School of Physical Therapy

- Biomotion Analysis Laboratory collaborations
  - School of Physical Therapy PI, College of Medicine financial support, Consultation from College of Engineering, and Laboratory located in the College of Education
Take Home Message:

Many on-going RESEARCH collaborations exist between USF Health and USF which will form the basis for the establishment of an Interdisciplinary and Intercollegiate Department of Biomedical Engineering
A Proposal

for

the establishment of

an Interdisciplinary and Intercollegiate

Department of Biomedical Engineering
Colleges/Institutions Involved

- Department of Biomedical Engineering
- Colleges/Institutions Involved
  - College of Engineering
  - College of Arts & Sciences
  - College of Medicine
  - College of Nursing
  - College of Public Health
  - Moffitt Cancer Center
  - James Haley VA Hospital
  - Shriners Hospital
  - Local Industry and Affiliate Health Partners
WHY ESTABLISH A DEPT. OF BME AT USF - I

- To capitalize on existing EDUCATIONAL and RESEARCH opportunities and collaborations between USF Health and its Affiliate Partners and USF in an organized manner.

- To effectively integrate engineering, applied sciences, medicine and technology to improve human health.

- To meet a growing regional and global need of technically skilled workforce in this discipline.

- To effectively compete for rapidly growing extramural sources of funding in Biomedical Engineering - facilitate accomplishment of the President’s goal to reach top 50 public research university in the U.S.
WHY ESTABLISH A DEPT. OF BME AT USF - II

- To support and enhance University-Industry partnership in the area of biomedical engineering in the existing Research Incubator and in the upcoming Center for Advanced Medical Simulation

- To facilitate recruitment and retention of outstanding faculty, staff, and students in this discipline

- To facilitate relocation, establishment, and retention of biomedical-intensive industry in Tampa Bay region

- To enhance the national and international reputation of USF and USF Health in this discipline
PROPOSED AREAS OF RESEARCH CONCENTRATIONS

- Biomechanics and Biomaterials*
- Rehabilitation Engineering*
- Biomedical and Biological Imaging*
- Cardiovascular Engineering*
- Nano and Regenerative Medicine*
- Molecular and Cellular Engineering*
- Biomedical Sensors
- Medical Bioinformatics
- Health Systems Management

*aligned with “signature” and “emerging” research programs at USF Health
IDEAL DEPARTMENT OF BME

Chairman

- A NSF/NIH-funded recognized leader in the field of biomedical engineering
- 16-18 NIH or NSF-funded core (tenure track) faculty
- ~$5-7 million/year in Federal awards
- ~$3-4 million/year in non-Federal/Industry awards
- 80-100 upper level undergraduates with majors in BME
- 40-50 Master-level students
- 40-60 doctoral students
- 5-10 Post-doctoral fellows
KEY CHALLENGES

- Space

- Financial Resources
  - Recruitment of the chair and faculty
  - Establishment of adequate core facilities and administrative infrastructure
  - Purchase of required equipment
  - Stipends for doctoral students, etc.

- Faculty appointment, promotion and tenure

- Assignment of grants and contracts

- Distribution of indirect rebates
Space

- Assign existing space in the Interdisciplinary Research Building @ USF Research Park
- Further expansion or re-location in the Center for Advanced Medical Learning and Simulations (Spring 2008)
- Potential space in the new Interdisciplinary Teaching & Research Facility

Financial Resources - Chair/Faculty Recruitment

- Identify existing funded faculty at USF Health and USF who can be reassigned to the Department of BME
- Both USF and USF Health make a commitment to recruit two-three new faculty each in FY 06-07
- Both USF and USF Health make a commitment to recruit two-three new faculty each in FY 07-08
- Both USF and USF Health provide equal resources to support the recruitment of an internationally-recognized Chair
Financial Resources - Core Facilities/Equipment

- Both USF and USF Health provide equal resources to support the establishment of core facilities and purchase of required equipment
- This can be obtained from the following:
  - Reallocation of existing resources by USF Health and USF
  - Legislative Budget Requests supported by USF and USF Health
  - Federal Appropriations
  - Philanthropy

Faculty Appointment, Promotions, and Tenure

- Primary appointment of core faculty must be in one College with secondary appointments in other college(s)
- The policies and procedures of P&T of the College of primary appointment would be applicable to the faculty
- Compensation of faculty in the Department of BME (with the exception of physician scientists) must be equalized to prevent any unwarranted variability
Assignment of Extramural Grants and Contracts

- To the college with faculty’s primary appointment
- Credit could however, be taken by the college in which the faculty has a secondary appointment
- In case of multiple P.I.’s, appropriate level of credit must be given to the college with faculty’s primary appointment

Distribution of Indirect Rebates

- To the college with faculty’s primary appointment
- The colleges involved in this endeavor must have a previously agreed distribution formula thus preventing any perceived or real financial inequality and/or incentive
- In case of multiple P.I.’s, rebates should follow the effort and contribution of the involved faculty
WHAT NEXT?

- Convince the senior management at USF and USF Health of the value of creation of a new Department of BME (Phase I)
- Develop a five-year business plan (Phase I)
- Establish a Joint USF-USF Health Steering Committee to facilitate the establishment of this department (Phase I)
- Seek input from and buy-in of relevant faculty at USF Health and USF and modify the proposed plan accordingly – organize a joint Town Hall Meeting (Phase II)
- Identify space (~15-20K ft² NAS) for the establishment of the Department (Phase III)
- Identify resources to support the establishment of the Department (Phase III)
- Create an internal and external asset map (Phase III)
TIMELINE

- **FALL 2006:**
  - Phase I
  - Phase II

- **SPRING 2007**
  - Phase III
  - Establish a Department of Biomedical Engineering
  - Appoint Interim Chair (internal)
  - Start search for an external continuing Chair

- **Fall 2007**
  - Department is fully functional offering UG and graduate education and research opportunities
IT IS IMPORTANT TO RECOGNIZE THAT DESPITE ALL OUR GOODWILL AND EFFORT, EACH AND EVERY ASPECT OF THIS COLLABORATION CANNOT BE LEGISLATED. FOR THIS TO BE ACCOMPLISHED, THERE NEEDS TO BE MUTUAL TRUST AND RESPECT FOR ALL INVOLVED
Acknowledgements/References - I

- Department of Biomedical Engineering, School of Engineering, UAB (Visited August 24-26, 2006)

- Department of Bioengineering, College of Engineering, University of Washington, Seattle, WA¹
  - http://depts.washington.edu/bioe/

- Department of Biomedical Engineering, The Whitaker Institute, John Hopkins University, Baltimore, MD
  - http://www.bme.jhu.edu/

- Department of Biomedical Engineering, Lerner Research Institute, The Cleveland Clinic, Cleveland, OH
  - http://www.lerner.ccf.org/bme/

- Department of Bioengineering, Stanford University, Stanford, CA
  - http://bioengineering.stanford.edu/

- Biomedical Engineering Society, Landover, MD
  - http://www.bmes.org/default.asp

¹the only true intercollegiate program in the US between Medicine and Engineering
Acknowledgements/References - II

- Accreditation Board for Engineering & Technology, Inc. (ABET)

- The ABC of ABET Accreditation of Biomedical Engineering Programs

- Department of Biomedical Engineering, College of Engineering, University of Miami, Miami, FL
  - [http://www6.miami.edu/bme/](http://www6.miami.edu/bme/)

- Department of Bioengineering, University of Illinois at Chicago, Chicago, IL
  - [http://www.uic.edu/depts/bioe/](http://www.uic.edu/depts/bioe/)

- School of Biomedical Engineering, Science, & Health Systems, Drexel University, Philadelphia, PA
  - [http://www.biomed.drexel.edu/new04/](http://www.biomed.drexel.edu/new04/)

- Department of Bioengineering, School of Engineering, UCSD, San Diego, CA
  - [http://www-bioeng.ucsd.edu/](http://www-bioeng.ucsd.edu/)