FLORIDA INTERNATIONAL UNIVERSITY
DEPARTMENT OF BIOMEDICAL ENGINEERING

Annual Report

July 2006

Submitted by
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Executive Highlights

- A new faculty member was added to the Department. Chengzhong Li was hired as a new Assistant Professor of Biomedical Engineering. He was most recently an assistant research officer in the Nanobiotechnology/Biosensor group at the Biotechnology Research Institute, Canada National Research Council.
- The biomedical engineering enrollment continues to climb, with a total enrollment this year of 118 undergraduate students and 45 graduate students.
- The undergraduate program was site visited by ABET for accreditation. A final decision by ABET is expected in late August/early September.
- The research productivity of the biomedical engineering faculty continues to be strong. The BME tenure-track faculty produced an average of 5 journal publications, 7 conference presentations, and almost $270,000 of external funding for research per person.
- The Department submitted a proposal for a $9.6 million grant from the National Institutes of Health under the Research Centers in Minority Institutions (RCMI) program. A site visit will occur on August 15, with a final funding decision in late 2006 or early 2007.
- Several BME faculty won national awards for their research.
- The Young Inventor Program, funded by the Coulter Endowment, was implemented this past year. The first recipient of the award is Banghe Zhu.
- Three major pieces of equipment were purchased by the Department with funding jointly from the College and the Coulter endowment. This equipment will be housed in the Nanofabrication Facility and used for research in the area of bionanotechnology.

Endowment Funded Activities in 2005-2006

- Excellence Fund $100,000/year
  Faculty start-up funds
  General support for department research
  Major equipment purchases (joint with College funds)
    - Malvern Zetasizer Nano-ZS for the measurement of size, molecular weight and zeta potential of dispersed particles and molecules in solution. Size range: 0.6nm to 6microns. Size range for zeta potential 5nm to 10microns. Concentration range for size measurement 0.1ppm to 40wt% maximum. Molecular weight range: 1x10E3 to 2x10E7.
    - Malvern SV-10 Viscometer Package for fast, continuous measurement of the viscosity of fluids from 0.3 to10,000mPa.s. Minimum sample volume 10mL, measurement repeatability 1%. Includes: Viscometer with display unit, temperature probe and 10 x 35mL polycarbonate sample cups, 10 x 10mL polycarbonate sample cups, 2 x 13mL glass sample cups, Thermostatted sample cup holder (Water bath required but not included), Data communication software for PC with RS232C cable, manual, universal power supply.
    - The Horiba Jovin Yvon Fluorolog3-11 Tau Steady State and Lifetime Research Spectrofluorometer includes a 450W ozone free Xe source and power supply. The optical design is in the form or a single Czerny Turner excitation spectrometer with 1200g/mm grating blazed at 330nm, single Czerny Turner emission spectrometer with 1200g/mm grating blazed at 500nm, continuously adjustable entrance and exit slits operated under computer control.

- Graduate Fellowships $50,000/year
  Funded stipend for five BME graduate students

- Undergraduate Scholarships $25,000/year
  Funded scholarship for five new high quality undergraduate students

- Research Initiation Program $50,000/year
  Provided seed funding to the four faculty members chosen for the RCMI Collaborative Pilot Projects. This was an internal competition including 13 faculty members from five different departments in the University. The four were chosen by the RCMI Advisory Committee. See attached RCMI main proposal for details.

- Research Center Fund $25,000/year
  Supports maintenance contracts and software licenses purchased by the Department.

- Young Inventor Program $75,000/year
  These funds were available for the first time this year and were used to fund a post-doc under the new FIU BME Young Inventor Award. This program awards stipend and research support to recent PhD's who want to come to FIU and work with a BME faculty mentor on development of new biomedical technology and the translation of that technology to clinical implementation. The first recipient of the award is Banghe Zhu,

who received his PhD from the Harbin Institute of Technology in China in 2002, and had most recently been a research fellow at the Center for Molecular Imaging Research, Massachusetts General Hospital/Harvard Medical School. See attached description for details.

- Eminent Scholars Chair $2,000,000 $100,000/year
  Held by the Department Chair
  General research support for the Chair, including a Post-doctoral trainee
  Secretarial support for the Department

- Professorship $50,000/year
  This position is currently vacant. No funds used.

- Lecture Series $25,000/year
  These funds were available for the first time this year and were used to fund the following speakers:

  2005-2006 Biomedical Lecture Series in Translational Research

  November 28, 2005
  The Current State of In Vivo Valve Replacement
  Richard W. Bianco, Assistant Professor of Surgery and Assist. VP for Regulatory Affairs
  Division of Experimental Surgery, University of Minnesota

  February 17, 2006
  Novel Biomaterials and Biotechnology Applications for the Improvement of Medical Procedures and Therapies
  Guillermo A. Ameer, Sc., Assistant Professor
  Department of Biomedical Engineering, Northwestern University

  March 03, 2006
  Biomedical Engineering in Modern Dentistry
  Dr. Theodore Herrmann, D.M.D, private practice

  March 13, 2006
  Rock and Rho in Colon Cancer: Patterns of Expression, Influence of Disease State, and the Role of the ECM Nanotopography on Tumor Cell Behavior
  Sarah C. Glover, DO, Assistant Professor of Medicine
  Section of Digestive Diseases and Nutrition, University of Illinois at Chicago

  March 17, 2006
  Funding Opportunities in Biomedical Engineering at NCI and NIH
  Houston Baker, Ph.D., Director
  Imaging Technology Development Branch, Cancer Imaging Program, Division of Cancer Treatment and Diagnosis, National Cancer Institute, National Institutes of Health

March 17, 2006
Biosensors For Chemical and Biological Warfare Agents
Ashok Mulchandani, Professor
Department of Chemical and Environmental Engineering, University of California

Friday, April 7th, 2006
The Revolution in Biomedicine and the Transformation in Biomedical Research and Education.
The Experience of Patras Biosignal Processing Group
Anastasios Bezerianos, Professor
Department of Medical Physics, School of Medicine, University of Patras, Greece

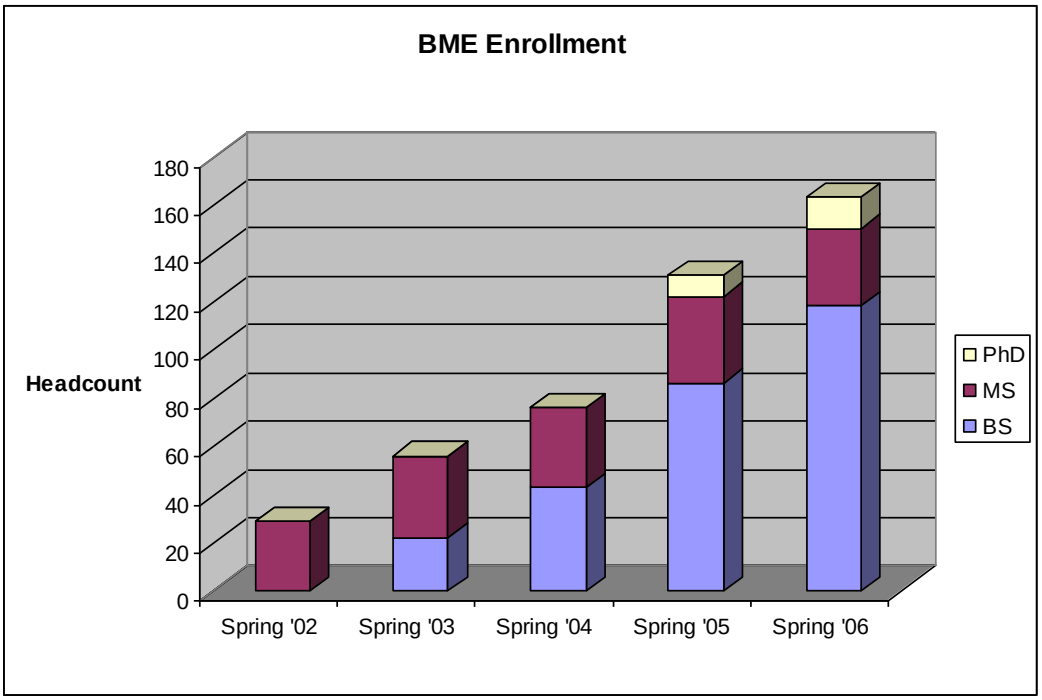
April 14, 2006
A Dynamical View of Epilepsy: Application to the Prediction and Adaptive Control of Epileptic Seizures
Leon D. Iasemidis, Ph.D., Associate Professor
The Harrington Department of Bioengineering, Arizona State University

Accomplishments of the Department for 2005-2006 Academic Year

1. Academic Programs

- Enrollment

The following chart shows the enrollment growth for biomedical engineering over the last five years. The MS program was implemented in Fall 1999 with an initial enrollment of 3 students in the Spring 2000 term. The BS program was added in Fall 2002, and the PhD program was implemented in the Fall of 2004, with an initial class of 9 students.



- Accreditation

The BME department submitted a Self-Study report to the Engineering Accreditation Commission (EAC) of the American Board of Engineering and Technology (ABET) on June 30, 2005, in application for accreditation of the BS program in Biomedical Engineering. On November 7-8 the ABET Site Visit occurred. The final decision from ABET will come at the end of August/early September 2006.

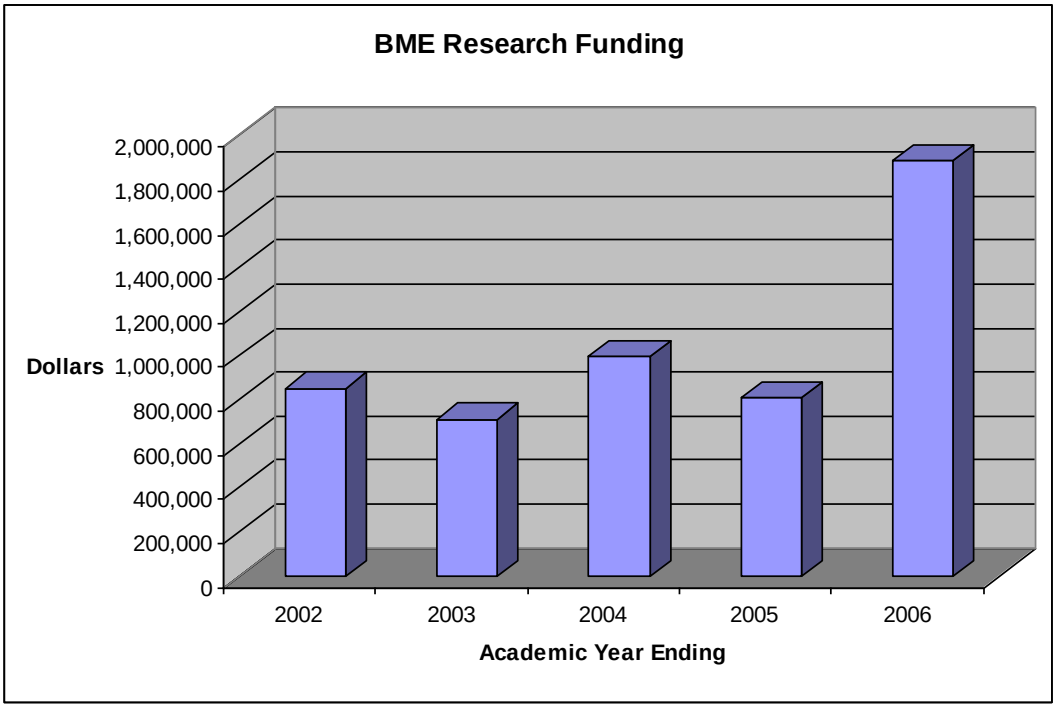
2. Research Programs

- Summary Data

The following tables and graphs depict the research data generated by the Department of Biomedical Engineering over the last five years.

Summary Research Data for the Last Five Years

DEPARTMENT OF BIOMEDICAL ENGINEERING	AWARD YEAR				
	2002	2003	2004	2005	2006
Number of:					
FTE Tenure-track faculty	6	5	7	7	7
Manuscripts published in major journals	6	14	30	38	36
Presentations at major scientific meetings	35	45	38	38	47
Research grant applications submitted	20	19	16	27	30
Research grant applications awarded	7	5	4	17	28



- RCMI Proposal

Florida International University is in the midst of a major expansion of its biomedical research and education programs. As we expand, we are also driven to produce a high quality product in the form of graduates of our programs and the research that we publish and that is eventually commercialized for clinical implementation. To that end, we plan to submit a proposal to the Research Centers in Minority Institutions (RCMI) Program of the National Center for Research Resources (NCRR) at the NIH. Funds from this program will be used to further improve our infrastructure for research related to cardiovascular and neural engineering, and increase our capacity to translate the results of our research to clinical implementation. In addition, the RCMI program funds will increase collaborative research between engineers, biomedical scientists, and clinicians at FIU and our clinical partners. Finally, since we serve a large population of students under-represented in the biomedical sciences or engineering, this will result in an infusion of minority graduates into the workforce with superior education and training in these critical areas

of biomedical research. For a full description of the RCMI program, see attached abstract and administrative portion of the full proposal. We are undergoing a Site Visit for this program on August 15, 2006. A decision for funding will be made in late 2006 or early 2007.

3. Faculty Activity and Accomplishments

- Anuradha Godavarty, Assistant Professor of Biomedical Engineering, received the Sylvia Sorkin Greenfield Award for the best paper (outside of radiation dosimetry) published in *Medical Physics* in 2004. Dr. Godavarty was chosen for her paper "Fluorescence-Enhanced Optical Imaging of Large Phantoms Using Single and Simultaneous Dual Point Illumination Geometries." The award was presented at the AAPM Meeting in Seattle on July 25, 2005. The article appears in the February 2004 issue of *Medical Physics*.

- Nicolaos Tsoukias, Assistant Professor of Biomedical Engineering, won the prestigious Arthur C. Guyton Award for Excellence in Integrative Physiology for 2006 from the American Physiology Society. One award is given annually to an independent investigator who holds an academic rank no higher than assistant professor and is pursuing research that utilizes quantitative and integrative approaches and feedback control system theory for the study of physiological functions.

- Wei-Chiang Lin, Assistant Professor of Biomedical Engineering, won the Boucek Award from the Florida/Puerto Rico Affiliate of the American Heart Association. This award is given to the grant applicant with the highest scientific merit score of all grants awarded by the Affiliate. The grant received was in the amount of $268,000.

- Anthony McGoron, Associate Professor of Biomedical Engineering, received an AREA award from the National Institutes of Health in the amount of $202,371 to study "Respiratory Motion Compensation in PET Molecular Imaging."

- Chengzhong Li was hired as a new Assistant Professor of Biomedical Engineering. He was an assistant research officer in the Nanobiotechnology/Biosensor group at the Biotechnology Research Institute, Canada National Research Council. He obtained his bachelor's degree in Materials Engineering from Heibei Polytechnic University Technology in China in 1986, Master of Engineering and PhD in Biochemical Engineering from Kumamoto University in Japan, in 1997 and 2000. His graduate work focused on the investigation of electron transfer properties of proteins using functional electrodes. In 2001, he was a postdoctoral fellow at the University of British Columbia in Canada. From 2002 to 2004, he joined the University of Saskatchewan as a professional research associate. He was involved in a joint project with Advance Technology Inc. for the development of DNA-based bioelectronic system. Since 2004, he has been a member of the nanobiotechnology group at the Biotechnology Research Institute of Canada, National Research Council as an assistant research officer. His current research interest is on the development and application of nano materials with biosensor chips. His research specialties are in the areas of electron transfer study of biomaterials, bio-electronics, and nanobiotechnology.

Plans and Goals for 2006-2007

- The Site Visit for the RCMI program will occur on August 15. If funded, the program is slated to start in April 2007.
- The Department is working with the Dean's office and the Advanced Materials Engineering Research Institute's Nanofabrication Facility to prepare a $10 million proposal to the Florida State Centers of Excellence Program. The preliminary title is The Florida Center of Excellence for Micro/Nano Bioinstrumentation. The research thrust areas will be in bionanosenors, bioimaging, enhanced drug delivery, and implantable systems.
- The Department will apply to the State's 21st Century World Class Scholars Program. This program provides up to $1 million in matching funds to attract high caliber researchers to Florida Universities.
- The Department will establish an FIU chapter of the BME honor society, Alpha Eta Mu Beta.
- The Department will continue to work with the Provost's office in the further planning for the College of Medicine at FIU. The Department Chair, Richard Schoephoerster, is participating on the Search and Screen Committee for the Dean of the College of Medicine.
- The Department will continue to work with the pre-medical advising office in encouraging, supporting, and creating opportunities for BME BS majors intending to apply to medical school
- The Department's research funding goal for 2006-2007 is $2.5 million.
- By the end of the spring 2007 term, the Department should have 150 undergraduate students, 35 MS students, and 20 PhD students.