



**KY NSF EPSCoR
Strategic Planning Session
NSF Visit**

Bioengineering: Engineering Platforms for Exploring Cellular and
Molecular Signaling Processes

December 2, 2008

Vision

- ▶ To develop a regionally and nationally recognized center in which we develop new technology to further elucidate cellular and molecular signaling processes with real-time spatial and temporal resolution.
- ▶ Center is based upon an interdisciplinary, multi-institutional research team
 - ▶ Bioengineering/Biomedical Engineering
 - ▶ Electrical and Computer Engineering
 - ▶ Mechanical Engineering
 - ▶ Physics
 - ▶ Microbiology and Immunology



Vision

- ▶ Research - new tools developed will aid in enhancing knowledge in biological sciences
- ▶ Education - student (from HS to graduate) participation both within and outside the labs will aid in the growth of scholars and professionals in the fields of engineering, technology and biological sciences
- ▶ Outreach – programs involving K-12 will promote appreciation and education for math, sciences and technology



Consortium Organization

Advisory Board

A. Atala (Wake Forest – Tissue Regeneration), **D. Beebe** (Univ. of Wisconsin - BioMEMS), **H. Craighead** (Cornell Univ. - BioNEMS), **P. Dechatelets** (Potentia – SBIR Drug Development), **J. Eaton** (UofL – pharmacology, toxicology), **G. Gerhardt** (UK - Microelectrodes), **J. West** (Rice Univ. – Tissue Engr, Nanoparticles), **M. Wilhelm** (UofL – Upper Administration)

PROGRAM ADMINISTRATION:

Executive Committee

Gobin, Saunders, Sethu, Lee, Harnett

Faculty Mentors

UofL: R. Keynton, R. Cohn,
B. Alphenaar, K. Walsh
UK: D. Puleo

Communication

- ▶ **Goals**
 - ▶ Team Meetings
 - ▶ Reporting
 - ▶ KY EPSCoR
 - ▶ NSF
 - ▶ EAB
 - Yearly
 - ▶ Seminar Series
 - ▶ Monthly
 - ▶ Website
 - ▶ Conference Series
 - ▶ Yearly



Communication: Seminar Series

- ▶ **Objective:**
 - ▶ To enhance the research opportunity through dissemination of information, broadening participation, and gaining exposure
- ▶ **Goal:**
 - ▶ Monthly
 - ▶ Video conference between UofL and UK
- ▶ **Progress to Date**
 - ▶ Mostly organizational
 - ▶ Will start in Spring semester with current members of team



Communication: Seminar Series

▶ Milestones

- ▶ Expand to other colleagues within members departments who would fit in the program by the end of the 1st year
- ▶ Expand to colleagues in other departments by 2nd and 3rd year
- ▶ Expand to researchers in regional institutions by 4th year

▶ Probable Situations and Solutions

- ▶ Departmental seminars conflict
 - ▶ Work with departments to collaborate on seminars
- ▶ Scheduling/Participation
 - ▶ Move to a bimonthly series
- ▶ Funding for outside speakers
 - ▶ Explore funding opportunities from Universities and supplemental funding from agencies with which members have financial support.



Communication: Website

▶ Objective

- ▶ To keep all participants apprised of meetings, seminars, and research progress
- ▶ To serve to advertise the seminar series, outreach events, open houses, to post instructions for applications for summer fellows program and conference abstract submission
- ▶ To feature program research and showcase accomplishments

▶ Goals

- ▶ To maintain website on UofL server
- ▶ Keep updated on a monthly basis

▶ Milestones

- ▶ To have basic information setup through the KY EPSCoR site in 1st year
 - ▶ To have basic independent setup on UofL server in 2nd year
 - ▶ To have fully operational site by 3rd year
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Communication: Conference Series

▶ Objective

- ▶ Provide a forum to disseminate information, network with leaders in the field, and showcase summer fellows

▶ Milestones

- ▶ Year 1 – 1 day, local
- ▶ Year 2 & 3 – 1 day, local, expand participation of students and new members
- ▶ Year 4 – 1 day, regional
- ▶ Year 5 – 2 days, national

▶ Probable Situations and Solutions

- ▶ Funding – nothing in EPSCoR budget
 - ▶ Plans to seek funding from
 - KY EPSCoR Collaborative Research Initiative Grant
 - Collaborative Planning and Development Awards at UofL
 - Conference and Workshop Awards at UK
 - NSF Conference and Workshops Awards
-



Research: Goals and Objectives

- ▶ Develop new technology to further elucidate cellular and molecular signaling processes with real-time spatial and temporal resolution
 - ▶ enhancing knowledge in biological sciences
 - ▶ facilitate better understanding in biological processes
 - ▶ promote innovation in development of tools
- ▶ Vascular and Orthopedic Biology



Research

▶ Progress to Date

- ▶ Ongoing and potential collaborations continuing
- ▶ Submissions for funding ongoing
- ▶ Quotes for scheduled equipment
- ▶ Hire of Dr. Totten
 - ▶ Reporting, budgeting and technical help within labs
 - ▶ Experience in managing large grants and has a biology background

▶ Goals for year one

- ▶ Training of students (undergraduate and graduate)
- ▶ Presentations of current research (regionally or nationally)
- ▶ Proposal submissions to federal agencies
- ▶ Initiation of summer fellow program and training of K-12 teachers



Comprehensive Competitiveness Goals

- ▶ Excellence in interdisciplinary research
 - ▶ Goals & Metrics
 - ▶ Performance
 - Disclosures
 - Trained graduate students
 - ▶ Recognition
 - Presentations & Publications
 - ▶ Sustainability
 - Undergraduate students & K-12 teachers trained
 - Submitted proposals
 - ▶ Growth
 - Partnerships (academic, governmental, industrial)
 - Center proposal submission



Evaluation and Assessment

Milestones	Year 1	Year 2	Year 3	Year 4	Year 5
Disclosures	0	1	2	3	4
# Ph.D. students	7	10	14	14	14
# Master's students	7	14	14	14	14
Presentations	7	14	14	14	14
Publications	0	7	14	14	14
# Undergraduate students	7	14	21	21	21
K-12 teachers trained	7	7	7	7	7
# Proposals submitted	3	7	7	7	7
Partnerships (academic)	1	4	7	7	7
Partnerships (industrial)	0	1	2	3	4
Proposal for NSF ERC or NIH BRP	0	0	0	0	1

- Evaluation based upon metrics and milestones.
- Evaluation of progress by EAB.
- Suggestions from FM & EAB



Research: Equipment Schedule

Equipment	Year				
	1	2	3	4	5
Low Pressure Chemical Vapor Deposition (additions and installations)	█				
Flow Cytometer	█		█		
Dimatix Materials Printer	█	█	█		
Laser Scanning Confocal Microscope		█	█	█	
Ion Milling System		█	█		
Ultracentrifuge		█			
Microscope for AFM		█	█		
RF Magnetron Sputtering System				█	█
Sensitive IR Detection System				█	█
HPLC Workstation					█
Real-Time PCR					█



Research: Personnel

- ▶ **Graduate students**
 - ▶ 7 students (5 at UofL; 2 at UK)
- ▶ **Technicians**
 - ▶ 0.5 at UK (in discussion)
 - ▶ 1 at UofL (Lee)
 - ▶ 0.5 at UofL (Totten)
 - ▶ 0.5 at UofL (in discussion)



Outreach Activities

- ▶ **Objectives**

- ▶ K-12 programs to promote appreciation and education in math, sciences and technology

- ▶ **Goals**

- ▶ Develop programs to aim at both primary and secondary education levels
- ▶ Develop programs to increase diversity in STEM fields



Outreach Activities

▶ Programs

- ▶ Summer high school teachers fellows program
- ▶ Open houses
- ▶ Nanotechnology Day at local science museums
- ▶ High school and undergraduate research experiences

▶ Progress to Date

- ▶ Open house at UK – as discussed by Dr. Saunders
- ▶ Summer Fellows committee assembled
- ▶ Discussion with Micro-Nano-Net Initiative on outreach collaborations



Summer Fellows Program

- ▶ **Committee**

- ▶ Drs. McNamara, Mendes, Cohn and Saunders

- ▶ **Goals**

- ▶ Slated to start summer 2009
- ▶ To develop criteria for fellows
- ▶ To develop application and evaluation process of applicants
- ▶ To develop means of advertising and recruitment

- ▶ **Potential discussion with Dr. Tretter from the College of Education and Human Development**



Summer Fellows Program

▶ Milestones

- ▶ Slated to start summer 2009
 - ▶ EPSCoR funding for at least 7 teachers each year
- ▶ Incorporate research accomplished by fellows in yearly conference in 1st year

▶ Potential Issues and Alternative Strategies

- ▶ 1st year may be slow start
 - ▶ Plan to approach teachers at math and science magnet schools
- ▶ Participant stipend may be seen as too low
 - ▶ Plan to find supplemental funding to cover shortage
- ▶ Future years – may expand quicker than expected
 - ▶ Plan to submit proposals for supplemental funding from research grants and submission of educational grants



Outreach Activities

- ▶ High school and undergraduate student research experience
 - ▶ Currently all members already have either or both students working in labs.
 - ▶ Plan to submit for funding to include students from regional institutions
 - ▶ Plan to also obtain supplemental funding from current or future grants



Outreach Activities

- ▶ **Open houses and exhibits at museums**
 - ▶ Expand outreach to elementary and middle school students
 - ▶ Involvement of student organizations for planning, organization and participation
 - ▶ BMES, IEEE
 - ▶ Involvement of university outreach program to help increase diversity



Outreach Activities

▶ Evaluation

- ▶ Number of teachers trained
- ▶ Number of high school and undergraduate students trained
- ▶ Number of attendees to open houses and other exhibits
- ▶ Surveys of teachers and students

▶ Assessment

- ▶ To determine amount of impact on education and appreciation in the fields of science, technology, engineering and math



▶ Questions?

