Impactful Mission

Will create biodegradable metals *(Mg based)* with the promise that new kinds of implants can adapt to the human body and eventually dissolve when no longer needed, eliminating multiple surgery and reduce health care costs.

“Imagine Implants with their own intelligence that adapt to biological changes of the patient and are automatically eliminated from the body after healing”

Value of Degradable Metal Implant Systems - PRICELESS

Orthopedic Injuries: Dr. Jimenez

Facial and Head Injuries: Dr. Braun
Biodegradable metal for various stenting areas


Industry standard Ti Alloys (Ti6Al4V & cpTi) covered w/ thrombus after rocker test in ovine blood.
The Center’s integrated wisdom and operational excellence to become a global leader

NEED
Dynamic, Agile and Innovative Performance
TEAM’S Togetherness, TRUST & Passion

Other Critical Requirement
“Sustainable Infrastructure”

Physical Infrastructure
Human (Scientists) Infrastructure
Intellectual Infrastructure
Next Generation Workforce Development Infrastructure
Interconnected 25,000sq.ft Space

$14 M Materials Facility and Knowledge Without Boundaries

**Ecosystem**
- Pulsed Laser Deposition Facility
- Coatings Synthesis Laboratory
- Bio/Polymer Laboratory
- Materials Processing and Sample Preparation Laboratory
- Microscopy and Surface Analysis Facility
- Computational modeling and Visualization Lab
- Nanoindentation Facility
- Mechanical Testing /High-Temperature Testing Facility
- X-ray Diffraction Facility
- Physical Property Measurement Lab
- Catalysis Facility
- Magnetron Deposition Facility
- Clean Room with Ink Jet, High Speed Camera and Nanolithography
- Micro-Raman facility
- Bioengineering ERC facility
- FSEM, AFM, Nanotomography CT
- Mg Processing and Device Fabrication Facility
- Bioreactor with mechanical loadings – 100k,
- Multi-photon, confocal optical microscope system – 700k,
- Laser Ablation (LA) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)- 500K,
- *In vivo* Micro CT with XRF -$600K
Cohesive and Effective Research and Economic Development Management Team

FOCUSED Mission driven 20 Project Activities - Still Same Key Leaders
Figure 2a: Research Project Investigators by Discipline

- Animal sciences - 1.1%
- Bioengineering and biomedical engineering - 51.1%
- Cell and molecular biology - 6.5%
- Chemical engineering - 6.5%
- Chemistry - 2.2%
- Genetics, animal and plant - 1.1%
- Health/medical sciences - 2.2%
- Industrial engineering - 2.2%
- Materials engineering, including ceramics and textiles - 5.4%
- Mechanical engineering - 17.4%
- Mechanical engineering-related technologies - 1.1%
- Medicine (e.g., dentistry, optometry, osteopathic, veterinary) - 1.1%
- Metallurgical engineering - 2.2%
**Thrust Areas: Quad Chart Approach**

**SIGNIFICANCE:**
- Describe specific unmet need that project addresses (scientific, clinical, commercial)
- Describe technical challenges standing in the way of proving the concept
- Describe approach to address this need (hypothesis to be tested, investigative pathway)
- Verify significance of unmet need and reasonableness of approach (consultation with scientific/clinical/industrial advisors and thorough literature search)
- Define measures of success

**CONTINUATION PLAN:**
- Present project plan for next reporting period
- Identify milestones and SMART* deliverables
- Describe any impediments to project progress and plans to address them
- Define internal and external collaborations required to achieve success
- Review Budget status

*SMART = Specific, Measureable, Attainable, Relevant, Timely

**PROGRESS:**
- Present pertinent data and results of the current reporting period
- Identify SMART deliverables met during this reporting period (on target, on time, on budget)
- Describe impediments to project progress and plans to address them
- Highlight any deviations from plan and, the corrective actions taken to address the deviation
- Define measures of success

**PROJECT EXTENSION:**
- Provide IP status (invention disclosures, provisional patent applications)
- Describe clinical and commercial interactions (current, planned)
- Identify potential spinoff applications
- Publications and presentations
- Students involved/educational activities
- Identify future and ongoing funding plans

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**NSF-ERC for Revolutionizing Metallic Biomaterials**
GOING GLOBAL with FDA, ISO, ASTM and AC 87

Global View on Biodegradable Metals

Research & Development

Standardization

Dr. Frank Witte, Charite, Berlin. Global Coordinator

BioMg “Think-Tank”

Workshop at the FDA
“State of the Art in Biodegradable Metals - A Think-Tank Workshop”
March 30, 2012

The aim of the conference is to bring the current knowledge in this field especially Mg based systems through presentations by a select group of experts spanning academic, large industries, small entrepreneurial networks, and the FDA. A panel discussion will take place regarding current views on this emerging technology. The proposed workshop will be ONE full day. The conference aims to summarize current literature through presentations by established world experts in the field. The speakers have been carefully selected and asked to write the published lectures for their reviews.

Organizers: Louk Economou, National Science Foundation (NSF) Frank Witte, MLI MBB Bonn, Germany Jay Sanitar, NCAAET SUNY Steven Pollock, FDA William Herman, FDA

To learn more or to register, please go to: http://erc.msu.edu/biodegradablemetals

Contact: Lois Bollin, NSF Administrative Director, Engineering Research Center, North Carolina A & T State University Email: rbollin@ncat.edu Tel: 336-334-2601 Ext. 2006
Reconstructions of X-ray nano-CT 3-D of stents under the (a) static and (b) dynamic degradation condition for 7 days.

Corrosion of Mg stent: Static vs. Dynamic for Global standards Development
NSF-ERC for Revolutionizing Metallic Biomaterials

Global Student Exchanges-ERC-RMB Satellite

http://erc.ncat.edu

Workshop on Disruptive Innovation in Healthcare
October 14-19, 2012

Venkatesh Balasubramanian, Ph.D.
Rehabilitation Bioengineering Group
Department of Engineering Design
IIT Madras, Chennai 600036

VB – Workshop Overview, Oct 4, 2012

Every Step of the Way...
Diversity Impact of ERC-RMB
Female and African American Students

Similar exceptional diversity impact in REU, RET, and YS
and
seamless connectivity with NCAT-NSF-EHR Programs
Powerful Communication Across ERC

• Routine FRIDAY 4:00 pm **Teleconferencing and Webinar** activities with CSAB, IAB in all Thrust areas in addition to individual communications
• Friday am leadership discussion
• Student Retreats, Website, Newsletters
• Student Journal Club
• **Trans ERC Graduate courses** taken simultaneously by NCAT, PITT and UC students.
• Dynamic Student/scientists exchanges for research
• **Seminar Series with video broadcast** on various scientific topics including innovation ecosystems, entrepreneurship, business models, compliance, ethics and global leadership
Innovative Public- Private Partnership model for Innovation and Translation (examples)

- **aCell**: Trachea Stent Contract Funded
- **Boston Scientific**: NDA and Membership Agreement to move on contracts.
- **Cook Medical**: Demonstration project met via CT imaging; SOW and Pricing for multiple contracts to move forward
- **Dentsply**: Continuous funded projects /each 3 months/$25K
- **Fort Wayne**: Joint processing and wire drawing work, Jt Proposals, AC 87
- **inCube**: Coulter project support and Indirect support through inCube
- **Jet-Hot**: Fully funded and embedded Senior scientists in ERC-RMB
- **nanoMag**: SBIR, STTR, request for casting / extrusion.($)
- **OrthoKinetics**: SBIR, Support for mechanical testing.
- **UNC System**: 5 year strategic Plan on DOD Materials Applications
- **Innovation and Incubation and Translational Hub (Ongoing - User fee for ERC Infrastructure)**
- **Satellite of Light Weight Manufacturing Hub – with the OSU**