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
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 25,000 sq. 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
Cross-disciplinary 3 Plane ERC-RMB Strategic Framework with Barriers
Cohesive and Effective Research and Economic Development Management Team

University Economic Development Officers and Medical & Non-Medical R&D Leaders

FOCUSED Mission driven 20 Project Activities - Still Same Key Leaders
IMPACTFUL Education and Outreach Strategic Plan

Trans-ERC Courses

Fall 2013
“Advanced Imaging Techniques” by Dr. Linsey Phillips/NIH SPIRE Fellow

Fall 2014
“Regenerative Engineering” by Dr. Y. Yun

Sp 2014/Sp 2015
“Principles of Metallic Alloys for Biological Applications” by Dr. Prashant Kumta

Education & Outreach Plan

- **Curricular Education**
  - Device Modeling
  - Toxicology
  - Functional Biocompatibility
  - Biosensors
  - Processing

- **Seminars Workshops**
- **Extramural Training**
  - Internships
  - Clinical Rotations
  - Study Abroad

Human Resources Pipeline Development

**Outreach**
- **K-12 Students**: Bioinstitute, YSP, school visitations
- **K-12 Teachers**: RET
- **Parents, Counselors**: University Day
- **Informal Education**: Scouts, NISE

**Diversity**
- **MSI Partnerships**: REU
- **Community College**: REU, RET
- **NSF Programs**: OPT-ED, AGEP, LSAMP, HBCU-UP
- **Post-Doc Mentoring**

Stakeholder input: Students, Faculty, IAB, EAB, K-14 Community
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%
<table>
<thead>
<tr>
<th>SIGNIFICANCE:</th>
<th>CONTINUATION PLAN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Describe specific unmet need that project addresses (scientific, clinical, commercial)</td>
<td>• Present project plan for next reporting period</td>
</tr>
<tr>
<td>• Describe technical challenges standing in the way of proving the concept</td>
<td>• Identify milestones and SMART* deliverables</td>
</tr>
<tr>
<td>• Describe approach to address this need (hypothesis to be tested, investigative pathway)</td>
<td>• Describe any impediments to project progress and plans to address them</td>
</tr>
<tr>
<td>• Verify significance of unmet need and reasonableness of approach (consultation with scientific/clinical/industrial advisors and thorough literature search)</td>
<td>• Define internal and external collaborations required to achieve success</td>
</tr>
<tr>
<td>• Define measures of success</td>
<td>• Review Budget status</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PROGRESS:</th>
<th>PROJECT EXTENSION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Present pertinent data and results of the current reporting period</td>
<td>• Provide IP status (invention disclosures, provisional patent applications)</td>
</tr>
<tr>
<td>• Identify SMART deliverables met during this reporting period (on target, on time, on budget)</td>
<td>• Describe clinical and commercial interactions (current, planned)</td>
</tr>
<tr>
<td>• Describe impediments to project progress and plans to address them</td>
<td>• Identify potential spinoff applications</td>
</tr>
<tr>
<td>• Highlight any deviations from plan and, the corrective actions taken to address the deviation</td>
<td>• Publications and presentations</td>
</tr>
<tr>
<td>• Describe mutual benefits resulting from collaborations with other ERC projects</td>
<td>• Students involved/educational activities</td>
</tr>
<tr>
<td></td>
<td>• Identify future and ongoing funding plans</td>
</tr>
</tbody>
</table>
GOING GLOBAL with FDA, ISO, ASTM and AC 87

BioMg “Think-Tank”

Dr. Frank Witte, Charite, Berlin. Global Coordinator
Reconstructions of X-ray nano-CT 3-D of stents under the (a) static and (b) dynamic degradation condition for 7 days.
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**
One Team... One Dream...