

Engineering the Heart

Jianyi (Jay) Zhang, M.D., Ph.D., F.A.H.A.

Chair, Department of Biomedical Engineering
T. Michael and Gillian Goodrich Endowed Chair of
Engineering Leadership

Professor of Medicine, of Engineering
School of Medicine, School of Engineering

- **BME History**
- **New Joint Department**
- **Faculty body and their respective research interests**
- **Strategic plan and operating principle**
- **Vision**

BME Department - History

- Established in 1979
- 1979 – MS BME approved
- 1983 – PhD approved
- 2000 – BS BME approved
- 2007 – Accredited; re-accredited in 2012
- Degrees awarded:
 - 110 PhD
 - 313 MS
 - 248 Bachelor's
- **2014 – Established Joint Department of BME:
School of Engineering & School of Medicine**

BME Mission

- The Department of Biomedical Engineering (BME) provides leadership in teaching the principles of engineering and biology, and in conducting impactful research that will translate new discoveries in biological engineering science to the fields of public health and clinical medicine.

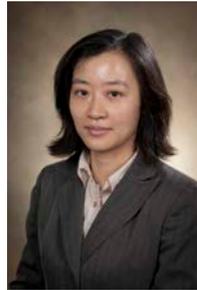
STRATEGIES

To perform **impactful and cutting-edge research** in biomedical engineering that aims to **address significant unmet clinical needs** through the development and use of innovations in engineering.

Faculty

- **Core Faculty :**
 - **N= 20 (7 joined within last 12 months)**
- **Secondary Faculty : N= 48**

Cardiovascular Sciences, Tissue Engineering & Chemical Engineering



Jianyi (Jay) Zhang, MD, PhD, FAHA – Professor and Chair, Dept. of BME
Cardiovascular Tissue Engineering, Heart Failure, Regeneration, Stem Cells,

Prasanna Krishnamurthy, MVSc, PhD – Associate Professor
Cardiac Regeneration, Exosome & miRNA Therapeutics, Stem Cells, Molecular Cardiology

X. Margaret Liu, PhD – Associate Professor
Chemical Engineering & Manufactory

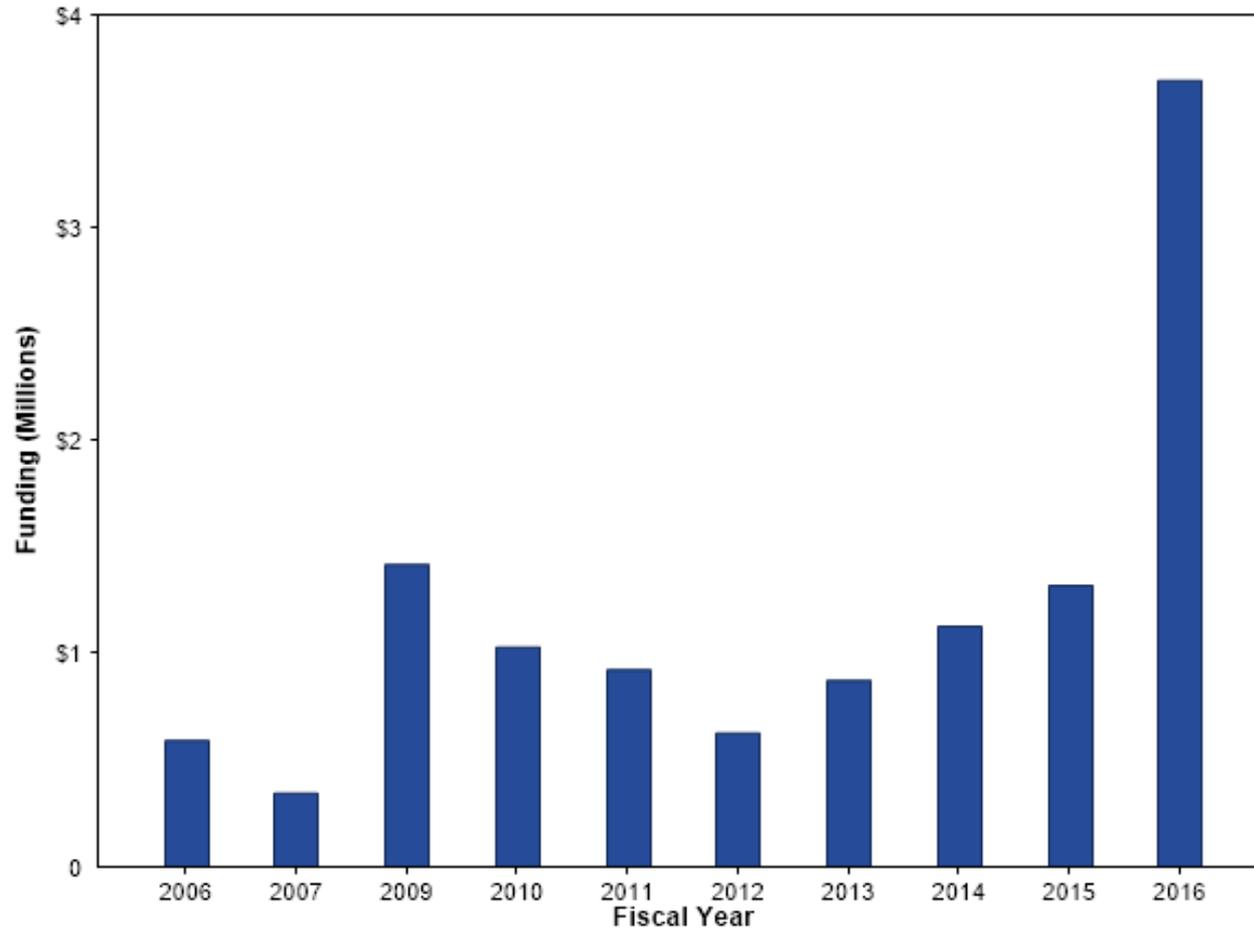
Gangjian (GQ) Qin, MD, FAHA – Professor
Stem Cell Biology, Genetics, Epigenetics, Metabolism, Tissue Repair

Chunxiang (Kevin) Zhang, MD, PhD – Professor
Stem Cells, Cardiovascular Regeneration, Metabolic Disease, Wound Healing

Ramaswamy (Ram) Kannappan, PhD – Research Assistant Professor
Stem Cells, Cardiac Regeneration, Molecular Signaling

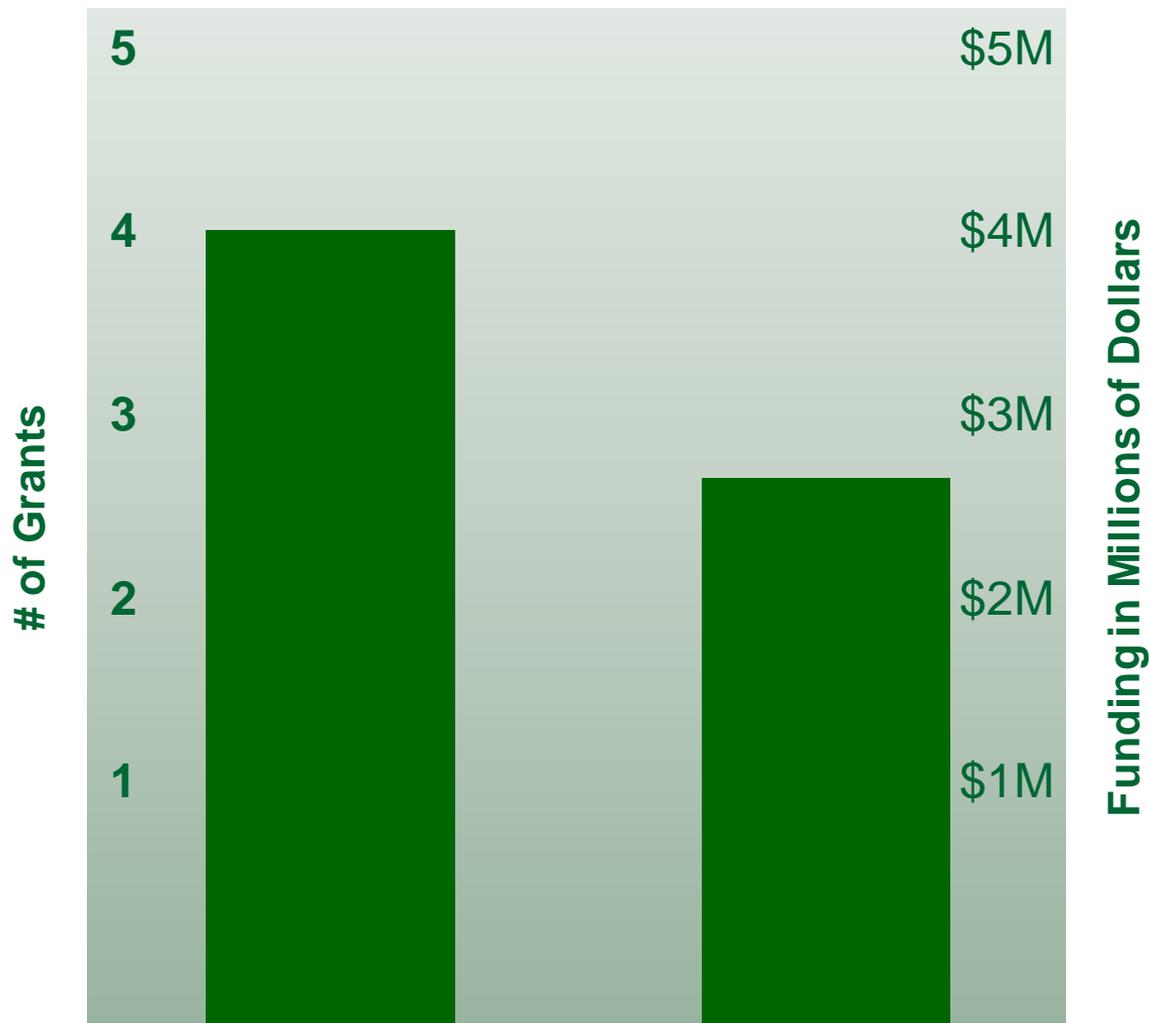
Wuqiang (Wuk) Zhu, MD, PhD – Research Assistant Professor
Stem Cells, Cardiovascular Tissue Engineering, Cardiomyocyte Cell Cycle

BME RESEARCH NIH Funding Summary by Fiscal Year



NIH Funding 2016

Jianyi (Jay) Zhang, MD, PhD



NIH R01 HL131017 (J. Zhang) 7/01/2016 – 4/30/2020
(3 million, total award)

The proposed studies will use submicron 3D printing to fabricate human myocardial tissue equivalent patch (hiMTE).



1 U01HL134764 (J. Zhang, contact PI)

10/01/16 – 9/30/2023

Total award = 8 million

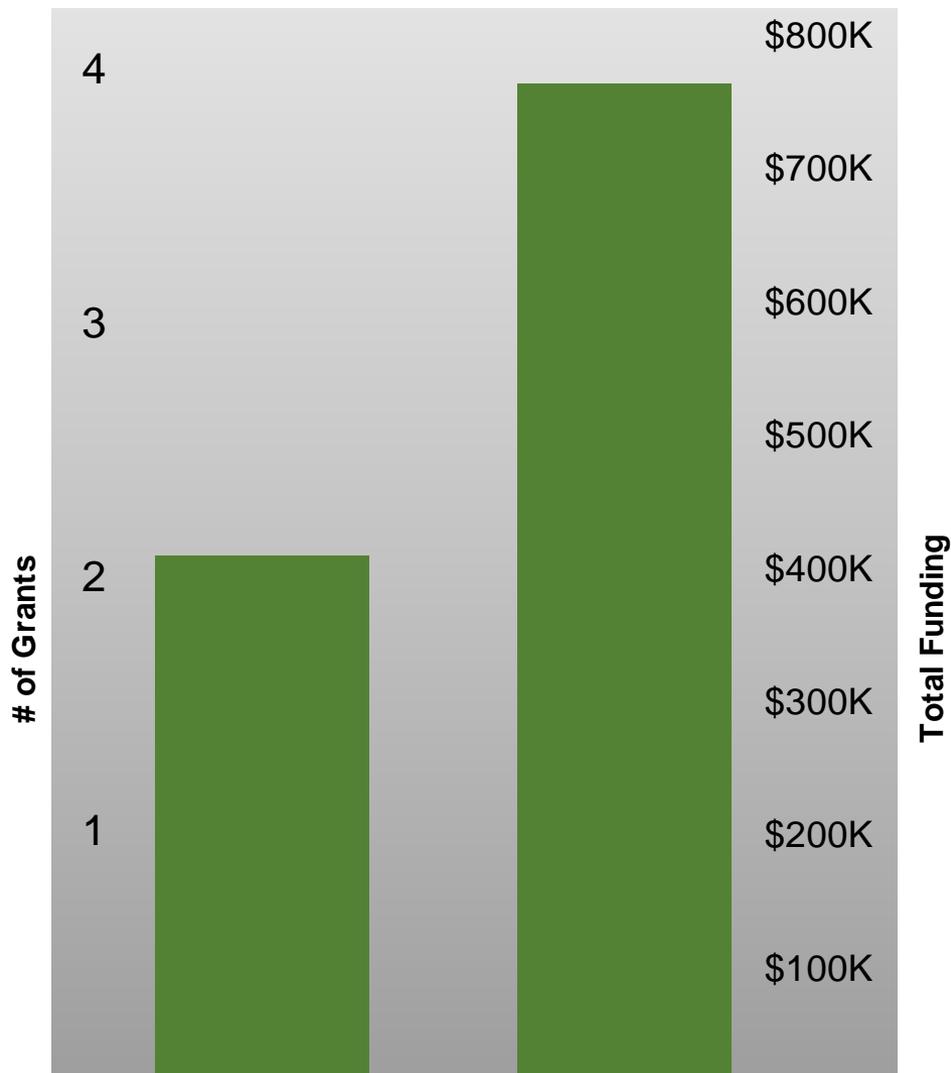
NIH NHLBI Progenitor Cell Translational Consortium (PCTC)

(Phase II) after NIH PCBC (Phase I , 2009-2006)

Integrated Cellular and Tissue Engineering for Ischemic Heart Disease. The consortium will develop clinical sized human myocardial tissue equivalents (“patches”) fabricated from pluripotent stem cells with engineered immunoprivilege. This pre-clinical research will result in new clinical trials leading to better therapeutic modalities for patients with ischemic heart disease.

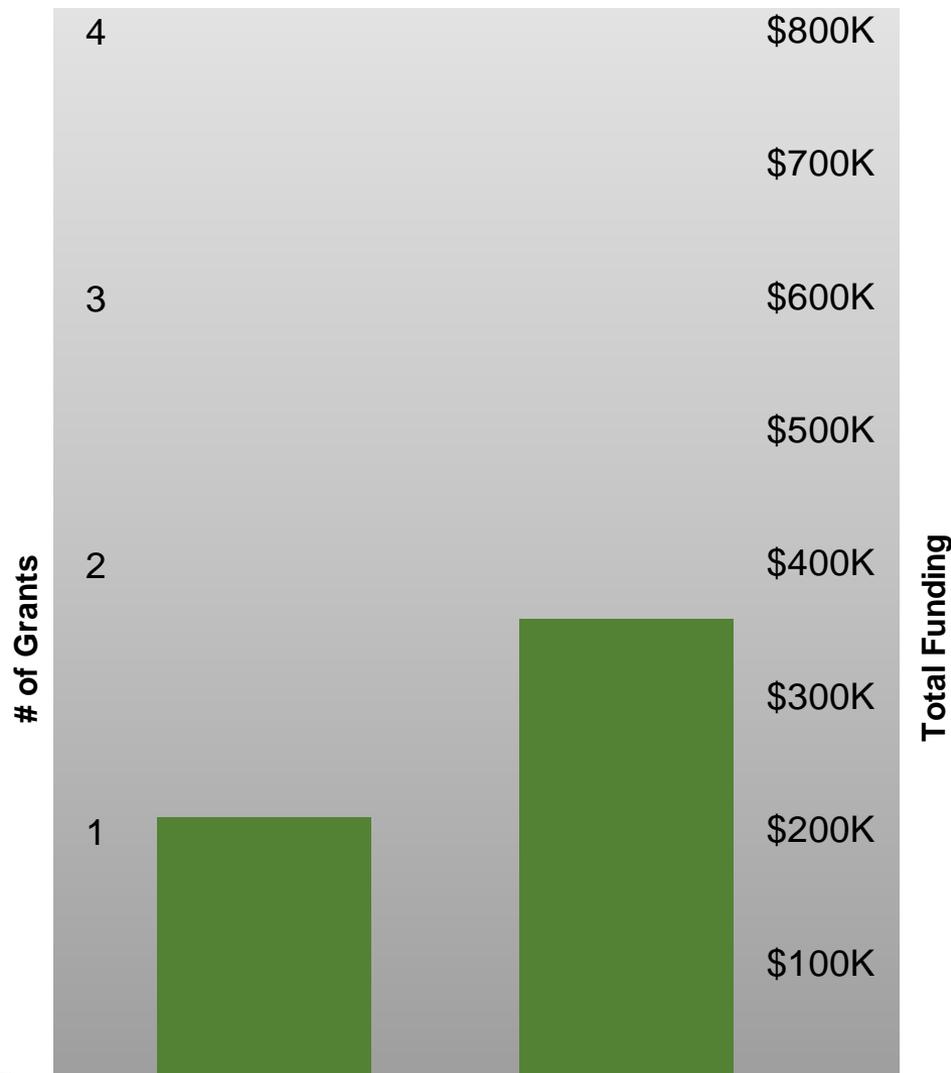
NIH Funding 2016

Gangjian (GQ) Qin, MD



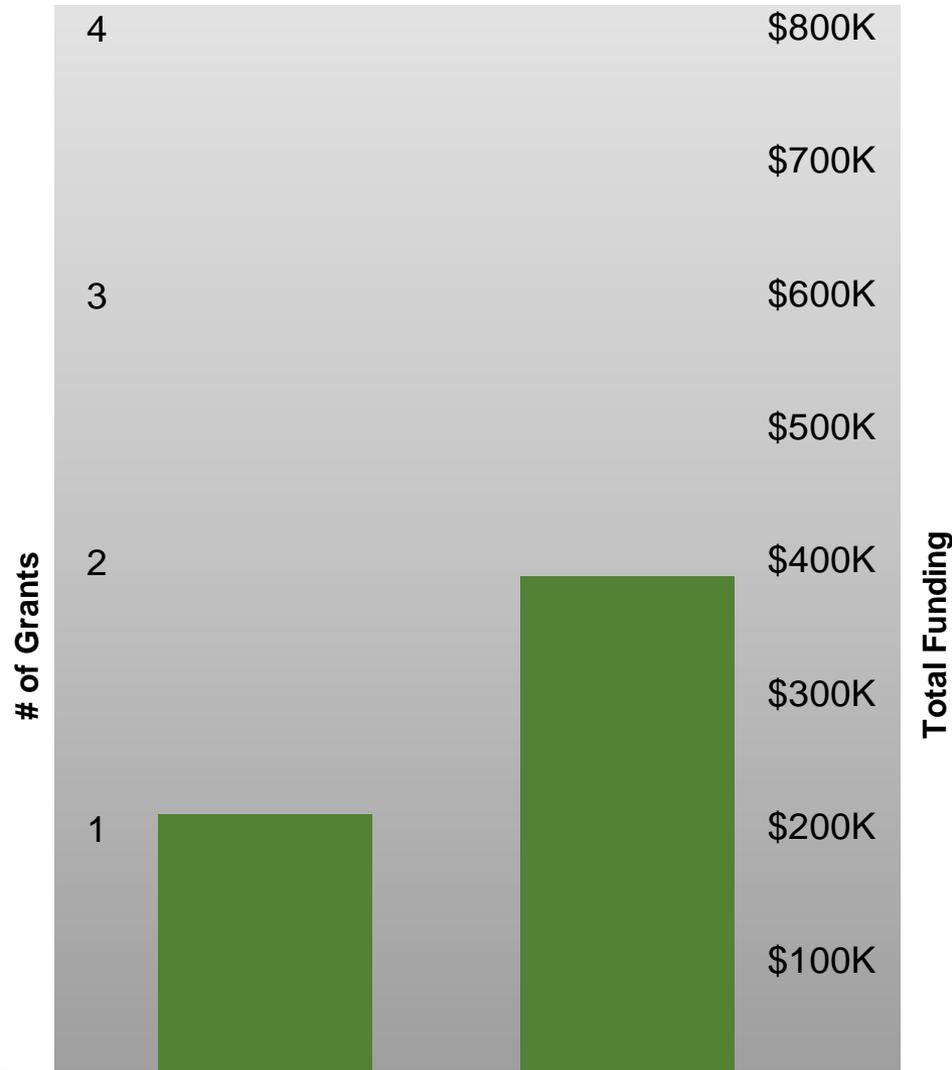
NIH Funding 2016

Chunxiang (Kevin) Zhang, MD, PhD



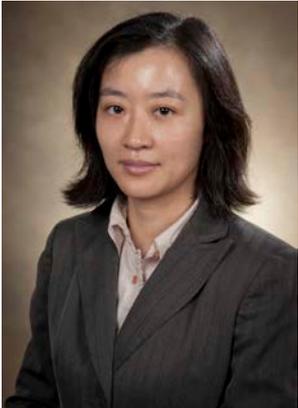
NIH Funding 2016

Prasanna Krishnamurthy, MVSc, PhD



Funding 2016

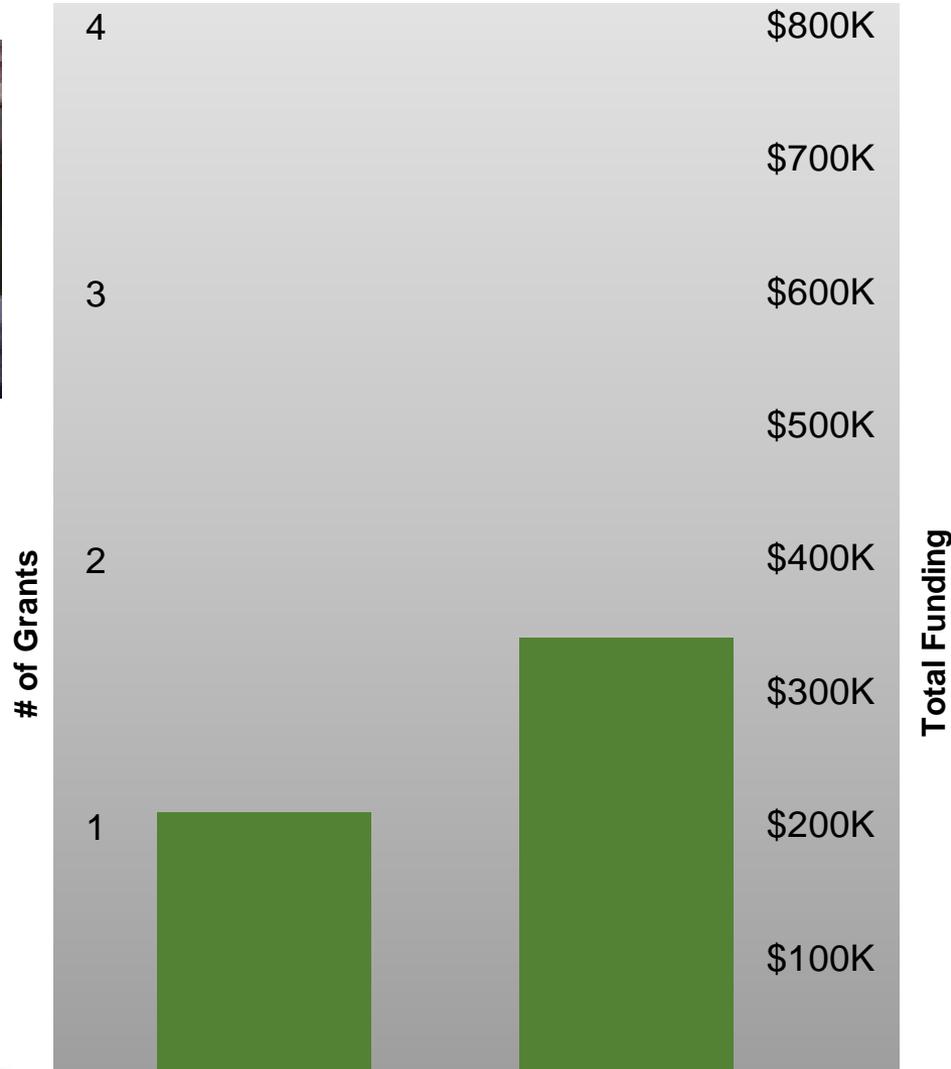
X. Margaret Liu, PhD



- **NSF Biomedical Engineering** **01/01/17 – 12/31/18**
(total award: 0.3 Million)
- **DOE EERE DE-EE0007005** **10/01/15 – 12/31/17**
(total award: 1.5 Million)
- **NIH/NHLBI R21HL127599** **4/01/16 – 3/31/18**
(total award: 0.3 Million)

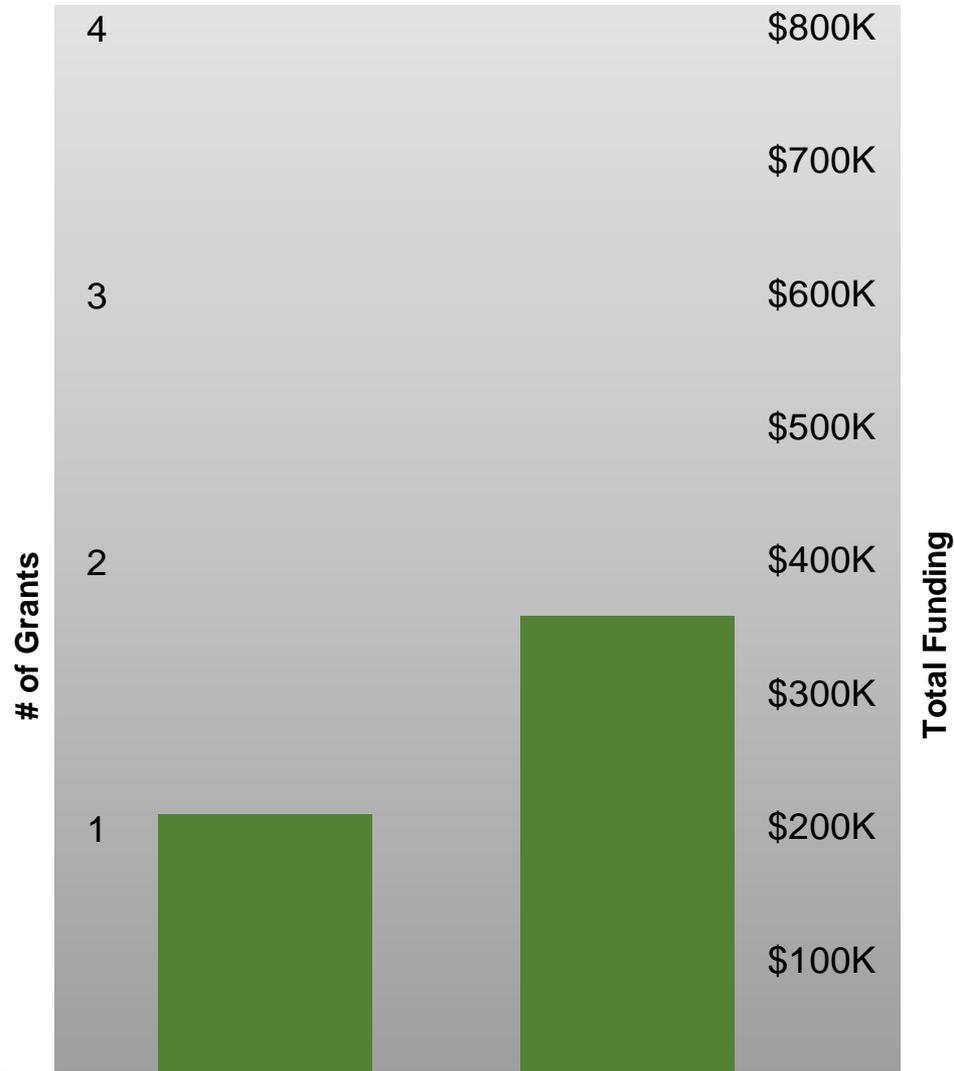
NIH Funding 2016

Ho-Wook Jun, PhD



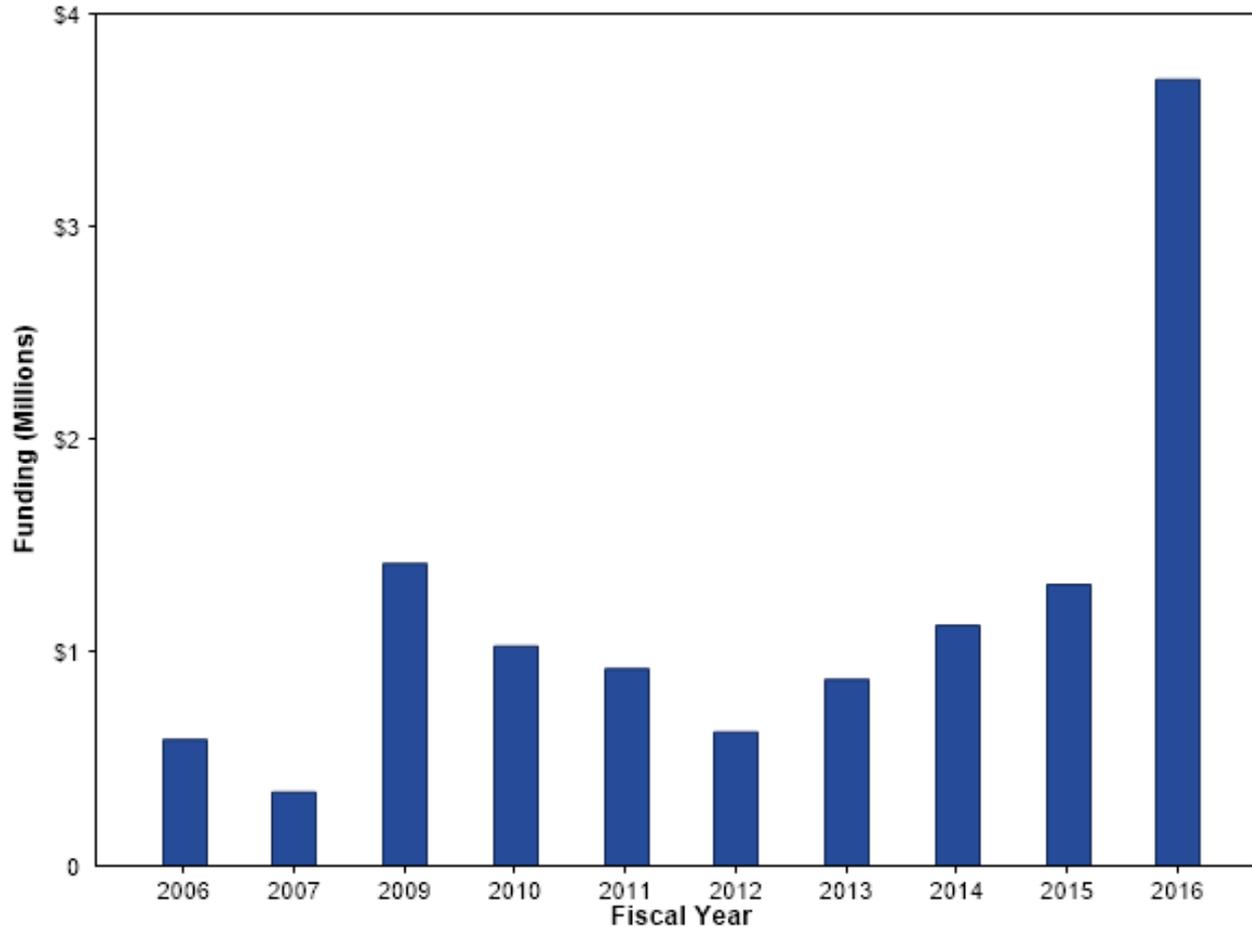
NIH Funding 2016

Jack Rogers, PhD



RESEARCH

Summary by Fiscal Year NIH Funding



Cardiac Electrophysiology



Vladimir Fast, PhD – Professor
Optical Mapping, Arrhythmias & Defibrillation,
Patterned-Growth Cell Culture



Andrew Pollard, PhD – Professor
Microscopic conduction and impedance,
Microfabrication,
Computer Simulations



Jack Rogers, PhD – Professor
Fibrillation, Video Imaging, Mathematical Modeling,
Finite Element Analysis

Biomedical Implants and Devices



Alan Eberhardt, PhD – Professor, Associate Chair for Education
Orthopedic and Injury Biomechanics,
Experimental and Computational Methods



Dale Feldman, PhD – Professor
Biomaterial Enhanced Regeneration,
Tissue Engineering,
Wound Healing,
Polymeric Biomaterials



Jack Lemons, PhD – Professor
Biocompatibility,
Implants,
Biomaterials-Tissue Interface

Scaffold and Tissue Engineering



Joel Berry, PhD – Associate Professor
Nanomedicine, Cardiovascular Mechanics,
Medical Devices, Bioreactors, Biofluid Dynamics



Ho-Wook Jun, PhD – Professor
Biomimetic Biomaterials, Tissue Regeneration,
Nanobiotechnology



Timothy Wick, PhD – Professor
Cartilage, Blood Vessels, Bioreactors,
Bioprocess Engineering, Biofluid Dynamics



Palaniappan Sethu, PhD – Associate Professor
Cardiovascular Biomechanics, Bioreactors,
Medical Device Design, Biofluid Dynamics

Computational Biology & Neuroscience

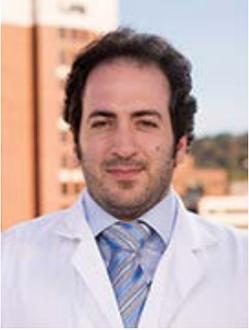


Allan Dobbins, PhD – Associate Professor
Computational Neuroscience, Vision,
Functional Imaging



Yuhua Song, PhD – Associate Professor
Computational Biology & Biomechanics,
Multi-scale Modeling

Ocular Biomechanics



Massimo Fazio, PhD – Associate Professor
Intraocular Pressure (IOP) and Structural Changes
in the Eye in Relationship to Age, Race, and Ocular
Diseases such as Glaucoma

Medical Device Development



Bob Hergenrother, PhD – Professor
Director, Alliance for Innovative Medical Technology
(AIMTech),
Patient-centric Medical Technology Development

Graduate Program Annual Admission

	PhD	MS
	New Students Enrolled	New Students Enrolled
2013	8	7
2014	7	4
2015	7	3
2016	9	5

Total Graduate Program Enrollment

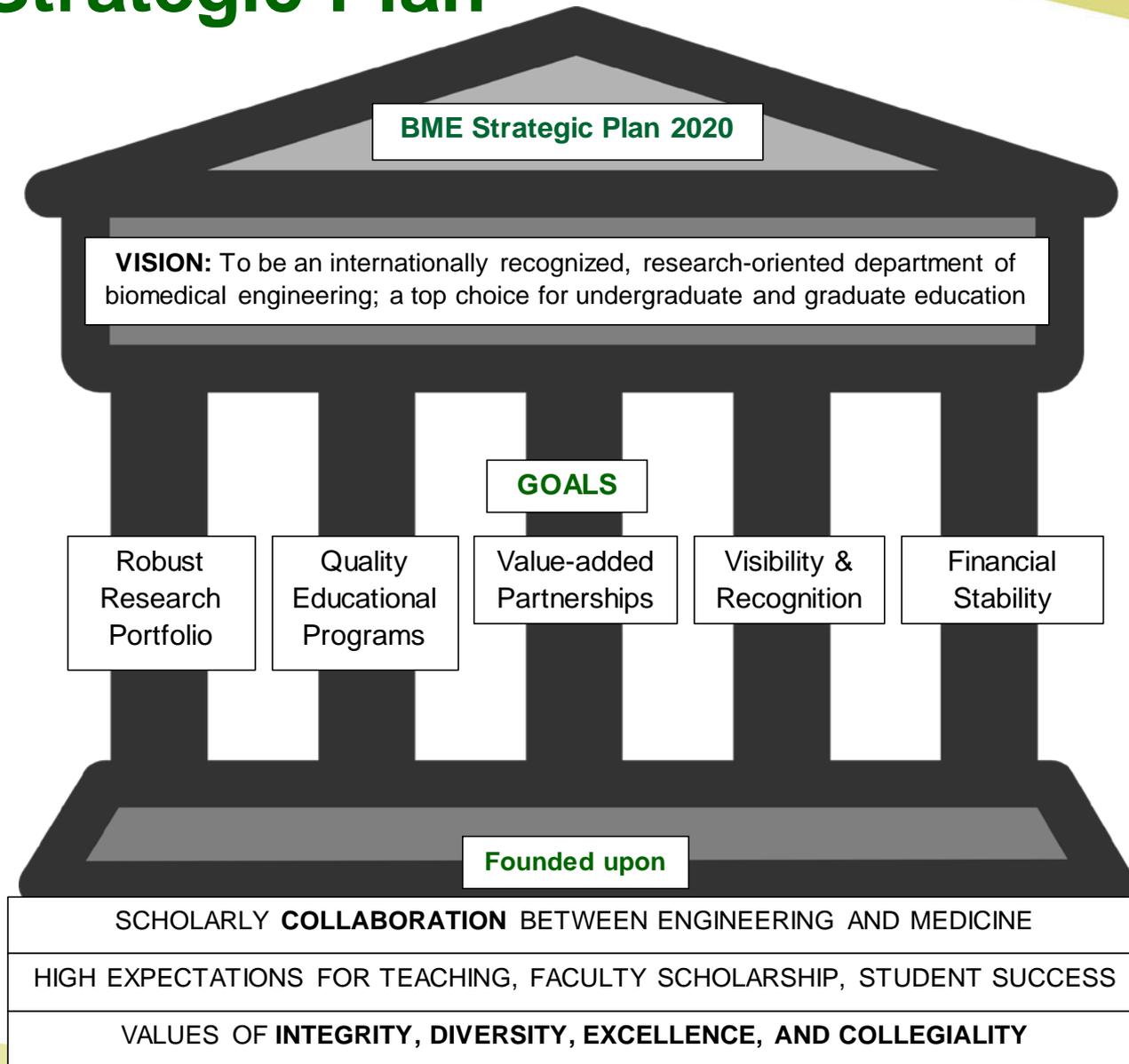
	PhD	MS
2016	27	14

Undergraduate Student Enrollment

Fall 2016

Freshman	49
Sophomore	45
Junior	28
Senior	65
TOTAL	187

BME Strategic Plan



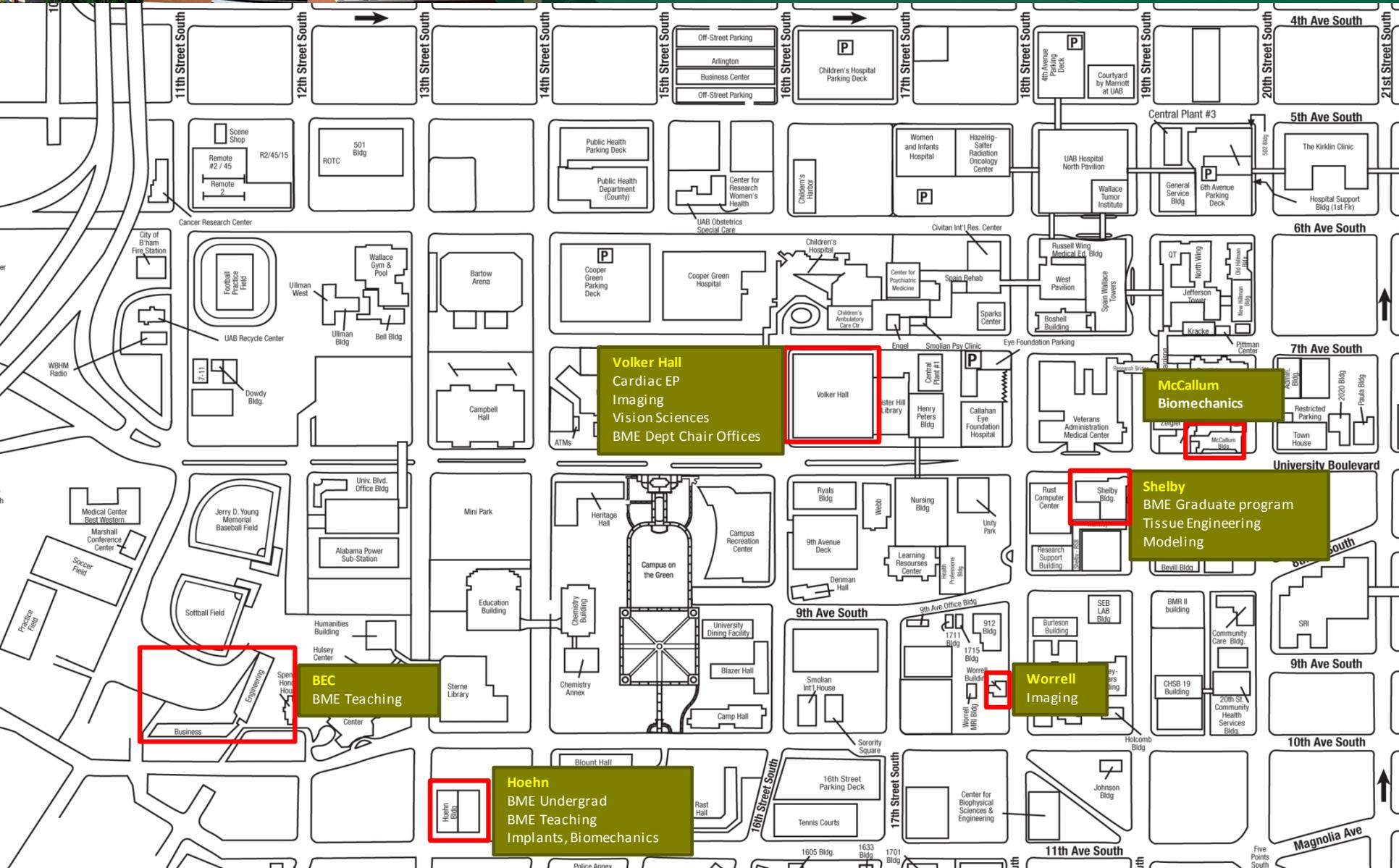
OPERATING PRINCIPLES

- Foster a culture of **collegiality, integrity, and direct communication**
- Promote **achievement, fairness, and recognition**
- Develop a **team spirit** that is based on **each individual member's commitment and dedication**
- Encourage **creativity and innovation**
- Honor **diversity and respect differences**

BME Vision

- To be an internationally recognized research-oriented Department of Biomedical Engineering: a top choice for undergraduate and graduate education

BME is everywhere



Thank you!