

CURRICULUM VITAE

ANAND RAMAMURTHI, PhD, FAHA

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EDUCATION and POST-GRADUATE TRAINING

- 1994 Bachelors in Engineering, Chemical Engineering, Bangalore University, India
1996 Masters of Science, Chemical Engineering, Oklahoma State University, Stillwater, OK
1999 Doctor of Philosophy, Chemical Engineering, Oklahoma State University, Stillwater, OK; Advisor: Randy S. Lewis, PhD
2001 American Heart Association (AHA) Postdoctoral Fellow, Biomedical Engineering, Cleveland Clinic; Supervisor: Ivan Vesely, PhD

POSITIONS AND HONORS

Professional Experience

- 1993 - 1994 Trainee Engineer, ICI (India) Ltd., Madras, India
1998 - 1998 Research Intern, Division of Biology, NitroMed, Inc., Boston, MA
2001 - 2003 Project Staff Scientist, Dept. of Biomedical Engineering, Cleveland Clinic
2003 - 2009 Assistant Professor (Tenure Track), Bioengineering, Clemson University, Clemson, SC
2003 - 2010 Adjunct Associate Professor, Regenerative Medicine and Cell Biology, Medical University of Carolina, Charleston, SC
2009 - 2010 Associate Professor with Tenure, Bioengineering, Clemson University, Clemson, SC
2010 - 2017 Associate Staff (Associate Professor), Biomedical Engineering, Cleveland Clinic, Cleveland, OH
2010 - 2017 Associate Professor, Biomedical Engineering (Secondary), Case Western Reserve U, Cleveland, OH
2018 - Present Visiting Professor, Universidad de Ingeniería y Tecnología, Lima, Peru
2014 - Present Graduate Faculty, Applied Biomedical Engineering, Cleveland State University, Cleveland, OH
2018 - Present Full Staff (Professor), Biomedical Engineering, Cleveland Clinic, Cleveland, OH
2018 - Present Professor, Biomedical Engineering (Secondary), Case Western Reserve University, Cleveland, OH
2018 - Present Professor of Molecular Medicine, Cleveland Clinic Lerner College of Medicine of CWRU
2019 - Present Director, BME Graduate Programs, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH

Honors and Awards

- 1991 - 1994 Academic Merit Award, RV College of Engineering, Bangalore University, India
1994 Silver Medalist, Chemical Engineering, Bangalore University, India
1998 Graduate Fellowship, Engineering Foundation and the American Society for the Advancement of Science (AAAS), New York, NY
1999 Finalist, Phoenix Award for Research Excellence, Oklahoma State University, Stillwater, OK
1999 Graduate Student Presentation Award (2nd Place), 36th Rocky Mountain Bioengineering Symposium, Copper Mountain, CO
2000 - 2002 Postdoctoral Fellowship, American Heart Association (AHA)
2003 - 2007 Scientist Development Grant (Career Award), American Heart Association
2003 Member, American Heart Association Councils on Basic Cardiovascular Sciences (BCVS) and Atherosclerosis and Thrombosis (ATVB)
2017 Fellow, American Heart Association
2019 Nominee, Council of the Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM)

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

Member, American Institute of Chemical Engineers (AIChE, 1996); Tau Beta Pi (Engineering Honor Society, 1999); Biomedical Engineering Society (BMES, 2001); American Society for Matrix Biology (ASMB, 2001); Member, AHA Council on Arteriosclerosis, Thrombosis, and Vascular Biology (2003) and Basic Cardiovascular Sciences (2003); International Arteriosclerosis Society (2003); Tissue Engineering Society International (2004); International Society for Applied Cardiovascular Biology (ISACB) (2006), North American Vascular Biology Organization (NAVBO) (2016).

PROFESSIONAL SERVICES

Editorial Boards

2010 – Present	Executive Editor, Journal of Tissue Science and Engineering
2011 – Present	Member, Editorial Board, Journal of Regenerative Medicine and Tissue Engineering
2013 – Present	Member, Editorial Board, HOAJ Regenerative Medicine and Tissue Engineering
2012 – Present	Member, Editorial Board, Journal of Vascular Medicine and Surgery
2016 – Present	Member, Editorial Board, Current Biotechnology (Bentham Science)
2016 – Present	Editor, Scientific Pages of Regenerative Medicine
2017 – Present	Member, Editorial Advisory Board, Current Regenerative Medicine
2017 – Present	Member, Editorial Board, The Open Biomedical Engineering Journal (Bentham Science)

Journal Peer Review

Reviewer for 40+ Journals in Tissue engineering and regenerative medicine, biomaterials, and vascular bioengineering & disease including: J Vascular Surgery, J Biomechanics, J Heart Valve Disease, J. Biomaterial Science, Anatomical Record, Biomaterials, Tissue Engineering, Int., Journal of Pharmaceutics, Biochemie, J Biomedical Materials Research Biomacromolecules, FASEB, Carbohydrate Polymers, Journal of Biomaterials Science, Biotechnology Progress J, Tissue Science and Engineering, J Controlled Release, Histology and Histotechnology Progress , Carbohydrate Chemistry, J Vascular Disease, J Tissue Science and Engineering, J of Reg. Medicine and Tissue Engineering Drug Delivery & Translational Res., Annals of Biomedical Engineering, Biomed Research International, PLOS One Advanced Drug Delivery Reviews, Cell and Tissue Research , International J of Biol. I Macromolecules, J Vascular Medicine and Surgery, J Polymer Engineering, Nature Scientific Reports, Stem Cells Translational Medicine.

Grant Review

2004-2008	American Heart Association National Bioengineering and Biotechnology SS (Standing Member)
2007	Biomaterials and Biointerfaces Study Section (BMBI), National Institutes of Health (Ad-Hoc)
2008	Research Competitiveness Program, American Association for the Advancement of Science (AAAS) (Ad-Hoc)
2008	American Association for Advancement of Science (AAAS) Life Sciences Act (Ad-Hoc)
2008-2010	American Heart Association Region II Bioengineering and Biotechnology SS (Standing Member)
2009	Cell Biology Study Section (CB), National Institutes of Health (Ad-Hoc)
2009	Oakridge-Associated Universities (OAU)/ Pennsylvania Department of Health (PA DOH) Research Projects Assessment Program (Ad-Hoc)
2009-2010	Bioengineering Technology and Surgical Services study Section (BTSS), National Institutes of Health (Ad-Hoc)
2010-2011	CSR Special Emphasis Panel for Conference Grants (ZHL1 CSR S (F2)), National Institutes of Health (Ad-hoc)
2010-2014	American Heart Association Bioengineering-Clinical Technologies SS (Standing Member)
2010-2013	American Heart Association Bioengineering-Clinical Technologies SS (Standing Member)
2011	CSR Special Emphasis Panels for Tissue Regeneration (ZHL CSR-N (M1)), National Institutes of Health (Ad-Hoc)
2011-2012	American Heart Association Bioengineering-Biosciences 2 SS (Standing Member)
2012	American Heart Association Western Affiliate Innovation Award Peer Review SS
2012-2016	American Heart Association Bioengineering and Biosciences 3 Study Section (Standing Member)
2013	CSR Special Emphasis Panel for Bioengineering Sciences and Technology (ZRG1 BST B02), National Institutes of Health (Ad-Hoc)
2013	CSR Special Emphasis Panel on Animal Models in Stem Cell Therapies (ZOD1 CM-6 (01)), National Institutes of Health (Ad-Hoc)
2013	EPSCoR/IDeA GEAR: Collaborative Research Program (CRP), NSF (Ad-Hoc)
2013-2014	Cleveland Clinic, Division of Clinical Research, Research Program Committee (RPC) Funding
2013	Special Emphasis Panel on Stem Cell Models (ZOD1 CM-9 (01)), NIH (Ad-Hoc)
2014	National Fund for Scientific & Technological Development (FONDECYT), Chile
2014	Forschungskommission, Hienrich-Heins University School of Medicine, Dusseldorf, Germany
2014	CSR Special Emphasis Panel on Inflammation and Aging (ZRG1 CB-G (55)), NIH (Ad-Hoc)
2015	Agence Nationale de la Recherche, France
2015	Department of Veterans Affairs Office of Research and Development, Joint Biomedical Laboratory/Clinical Research and Development Scientific Merit Review Board (CNLB S15)
2016	American Heart Association National Center- Womens Health Strategically Focused Research Network (SFRN) Centers
2016	Wellcome Trust, UK. Translation Fund Award

2017	Science and Engineering Research program, Israeli Ministry of Science
2018	Special Emphasis Panel on Regenerative Medicine Innovation projects (RMlp), NIH
2018	American Heart Association Career Development Awards- Basic Sciences SS (Standing Member)
2019	Biomaterials and Biointerfaces Study Section (BMBI), National Institutes of Health
2018	Wellcome Trust, UK, Translational Fund Award
2018	National Cancer Institute, Special Emphasis Panel ZCA1 SRO-6 01 1, National Institutes of Health
2018-2019	American Heart Association 2018-2019 Career Development Award Basic Sciences Committee
2019	National Science Foundation CBET CAREER Awards Study Panel
2019, 2020	Chair, American Heart Association 2019 Innovative Project Award Cardiac Basic Sciences Committee
2020	Fellowships: Cell Biology, Developmental Biology, and Bioengineering (ZRG1 F05-D (21)), NIH

External Advisory Committees

2005 – 2008	Member, Advisory Board, CureSource, Inc., and D-Finitive, Inc., Charleston, SC
2011 – 2013	Member, External Advisory Committee, NIH COBRE Center for Biomaterials in Tissue Regeneration, Greenville, SC
2014 – Present	Chair, External Advisory Committee, NIH South Carolina Center for Bioengineering for Functional Restoration of Tissues (SC BioCRAFT; Phase II), Clemson, SC

COMMITTEE SERVICE

National/ International

2010 - Present	Member, Membership Steering Committee, North American Vascular Biology Organization
2010 - Present	Member, Communications and Technology Committee, North American Vascular Biology Organization
2012	Member, Organizing Committee, International Conference on Tissue Science and Engineering 2012, Chicago, IL
2013	Member, Organizing Committee, International Conference on Tissue Science: Transforming Repair into Regeneration 2013, Raleigh, NC
2013	Member, Organizing Committee, 3rd International Conference on Tissue Science & Regenerative Medicine, Valencia, Spain
2014	Chair, Symposium on Approaches to elastic matrix regeneration and repair in proteolytic disease at the Tissue Engineering and Regenerative Medicine International Society (TERMIS)-Europe Chapter 2014 Annual Meeting, Genova, Italy
2012, 2014	Nominee, Council of Officers, North American Vascular Biology Organization (NAVBO)
2014/2015	Member, Matrix Bioengineering Conference 2015 Organizing Committee, NAVBO
2014	Member, Organizing Committee, 4th International Conference on Tissue Science & Regenerative Medicine, 2015 Rome, Italy
2015	Chair, Session on Elastin Predictive Biology, Encoded Tissue Elasticity, and Regenerative Structural Repair, Tissue Engineering & Regenerative Medicine (TERMIS) World Congress 2015, Boston, MA
2016	Member, Organizing Committee, 2016 Annual Int. Conference on Biomaterials, London, UK
2016	Chair, Session on Biomaterials-Short Talks, Tissue Engineering and Regenerative Medicine Americas (TERMIS-AM) Meeting 2016, San Diego, CA
2016	Invited Delegate, American Heart Association Cardiovascular Research Leaders Academy 2016
2017	Chair, Session on Enabling In Situ Extracellular and Elastic Matrix Regenerative Repair (with co-Chairs, Katja Schake-Layland, Fraunhofer Institute/University of Tübingen, Germany and Michael Monaghan, Trinity College, Ireland) Tissue Engineering and Regenerative Medicine Europe (TERMIS-EU) Meeting 2017, Davos, Switzerland
2017	Chair, Session on Bioengineering approaches to imparting and restoring tissue elasticity (with Co-Chair Yadong Wang, University of Pittsburgh), Tissue Engineering and Regenerative Medicine Americas (TERMIS-AM) Meeting 2017, San Diego, CA
2017- Present	Member, American Heart Association National Research and Science Engagement Committee
2018	Co-Chair, Session on Local Drug, Protein, and Gene Delivery from Implant Surfaces and Coatings (with Co-Chair Gopinath Mani, Medtronic), Society for Biomaterials 2018 Meeting, Atlanta GA
2018	Chair, Session on Biomaterials and Regenerative Medicine, 10th European Conference in Elastin, Nijmegen, Netherlands
2019	Co-Chair, Session on Cardiovascular Biomaterials and Blood Compatibility (with Co-Chair Gopinath Mani, Medtronic), Society for Biomaterials 2019 Meeting, Seattle, WA

- 2019 Chair, Traversing biomaterial and cellular strategies to restore tissue stretch (with co-chair, Anthony Weiss, University of Sydney, Australia), Tissue Engineering and Regenerative Medicine Society World Congress, Orlando, FL
- 2020 Chair, Workshop on Bioengineering approaches for elastic tissue regeneration and restoration in diseased tissues, World Biomaterial Congress, Glasgow, Scotland (Dec 2020)
- 2020 Co-Chair, Symposium on Tissue Repair for Voiding Dysfunction and Pelvic Floor Disorders at the TERMIS-AM 2020 Conference, Toronto, Canada (Dec 2020)

Institutional Committees

- 2004 – 2005 Chair, Clemson-Medical University of South Carolina Joint Bioengineering Program Program Steering Committee
- 2005 Chair, Bioengineering Doctoral Qualifiers Committee, Clemson University
- 2005 - 2006 Chair, Bioengineering PhD Curriculum Task Force, Clemson University
- 2005 Chair, Bioengineering Student Evaluation Task Force, Clemson University
- 2005 – 2010 Chair, Bioengineering Bylaws Committee, Clemson University
- 2008 – 2010 Member, Bioengineering Graduate Curriculum Committee, Medical University of South Carolina
- 2008 Chair, Bioengineering Graduate Program Task Force, Clemson University
- 2010 – 2011 Member and CC Faculty Representative, Faculty Search Committee, Department of Chemical and Applied Biomedical Engineering, Cleveland State University
- 2011 – 2016 Member, Postdoctoral Fellows Oversight Committee, Cleveland Clinic, Lerner Research Institute
- 2012 - 2013 Member and CC Faculty Representative, Faculty Search Committee, Department of Chemical and Applied Biomedical Engineering, Cleveland State University
- 2012 – 2013 Preceptor, CCLCM Journal Club, Cleveland Clinic Lerner College of Medicine of CWRU
- 2012 – 2013 Thesis Advisor, Cleveland Clinic Lerner College of Medicine of CWRU (CCLCM)
- 2012 – Present Member, Admissions Committee, Cleveland Clinic Lerner College of Medicine of CWRU
- 2014 – Present Member, Admissions Committee, Molecular Medicine Doctoral Program, Cleveland Clinic Lerner College of Medicine of CWRU
- 2014 – Present Member, BME Graduate Program Curriculum Committee, Cleveland Clinic Biomedical Engineering-Universidad de Ingeniería y Tecnología del Perú (UTEC) Partnership
- 2014-Present Member, Technology Innovations Peer Review Committee, Cleveland Clinic Innovations/Global Cardiovascular Innovations Center (GCIC)
- 2016 – Present Graduate Program Director and Program Liaison - Cleveland Clinic, University of Akron Integrated Biosciences Program
- 2017 – 2018 Member, Steering Committee, Applied Biomedical Engineering Program, Cleveland State University
- 2017 – Present Member, Graduate Admissions Committee, Applied Biomedical Engineering Doctoral Program, Cleveland State University
- 2018 – Present Cleveland Clinic Research Program Committee (RPC) Council of Reviewers
- 2018 - 2019 Member, Graduate Admissions Committee, Cleveland Clinic- Case Western Reserve University BME Alliance
- 2018 - 2019 Member; BME Doctoral Student Recruitment Committee, Cleveland Clinic- Case Western Reserve University BME Alliance
- 2018 – Present Member, Cleveland Clinic BME Faculty Retreat Committee,
- 2019 – Present Member, CWRU School of Medicine Faculty Council
- 2019 –Present Member, Graduate Education Committee, Department of Biomedical Engineering, Case Western Reserve University
- 2019 -Present Member, Postdoctoral Program Project Strategy Team, Lerner Research Inst., Cleveland Clinic
- 2019- Present Director, BME Graduate Programs, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH
- 2019-Present Member, Doctoral Qualifiers Committee, Department of Biomedical Engineering, Case Western Reserve University
- 2019-Present Chair, Biomedical Engineering Faculty Retreat Committee
- 2019-Present Member, Elections and Nominations Committee of the Faculty Council, Case Western Reserve University School of Medicine

GRADUATE AND UNDERGRADUATE TRAINING

Primary Research Advisor/Mentor

Served as primary thesis advisor and mentor for 43 graduate students and 4 postdoctoral fellows including the following current trainees (*):

Amarnath, Leena P., MS Graduate, 2003-2005, **Current:** Engineer at Cognizant Device Solutions, Teaneck, NJ.

Srinivas, Arvind, MS Graduate, 2003-2005, **Current:** Vice President, S3V Vascular Technologies, Hyderabad, India

Joddar, Binata, PhD Graduate, 2003-2006, **Current:** Tenured Associate Professor of Mechanical and Biomedical Engineering, University of Texas, El Paso

Mashack, Mark F., MS Graduate, 2004-2006, **Current:** International Patent Lawyer and Associate, Baker Hostetler, Washington DC

Hasselbring, Cari A., MS Graduate, 2004-2006, **Current:** Physician, Chicago, IL.

Ibrahim, Samir, PhD Graduate, 2004-2008, **Current:** Manager, Regulatory Affairs, Medtronic, Denver, CO.

Wilson, Parker, 2005-2006, MD-PhD Student, Medical University of South Carolina (Rotation), Current: Clinical Fellow, Department of Medical Renal Pathology, Yale School of Medicine

Kothapalli, Chandrasekhar R., PhD Graduate, 2006-2008, **Current:** Tenured Associate Professor of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH.

Pardue, Erin, 2007-2009, MS Graduate, Current: Wearables Research Applications Manager, Profusa, San Francisco, CA

Gacchina, Carmen, PhD Graduate, 2007-2010, **Current:** Acting Chief, Vascular Surgery Devices Branch (CDRH/ODE/DCD/VSDB), U.S. Food and Drug Administration, Silver Springs, MD

Ongstad, Emily E, 2008-2010, MS Graduate, **Current:** Cardiovascular Research Scientist, Med Immune, Gaithersburg, MD

Venkataraman, Lavanya, 2008-2012, PhD Graduate, Department of Bioengineering, Clemson University, Based at the Cleveland Clinic, Cleveland, OH. Current: Sr. Development Scientist (Diagnost Beckman Coulter Corporation, Sacramento, CA

Sawicki, Suzanne, 2009-2010, PhD Student (Transferred interim due to my relocation), **Current:** PhD Candidate, Clemson-Medical U of South Carolina Bioengineering Program, Charleston, SC.

Bashur, Christopher A, 2009-2013, Research Associate, Department of Biomedical Engineering, The Cleveland Clinic, Cleveland, OH. **Current:** Associate Professor, Department of Mechanical and Biomedical Engineering, Florida Institute of Technology, Melbourne, FL

Wintrich, Sahithya P., 2010-2012, MS Graduate, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH. Current: Not known

Vaidya, Pratik, 2010-2012, MS Graduate, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH. Current: Sr. Engineer, Phillips Healthcare, Mentor, OH

Deb, Partha P., 2010-2013, MS Student, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH. Current: Systems Verification Engineering Lead, Phillips Healthcare, Mentor, OH

Sivaraman, Balakrishnan, 2010-Present, Research Associate Scientist, Department of Biomedical Engineering, The Cleveland Clinic, Cleveland, OH; Current: Staff R&D Engineer, Abbott Corp., Boston, MA

Manisastry, Shyam, 2010-2013, Senior Postdoctoral Fellow, Department of Biomedical Engineering, The Cleveland Clinic, Cleveland, OH. Current: Sr. R&D Scientist, Thermofisher Scientific.

Sylvester, Andrew, 2011-2014, BS Student, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH; Current: Business Process Analyst, Ateb Inc., Raleigh, NC

Mukhopadhyay, Durba, 2011-2012, Research Scholar, Department of Biomedical Engineering, The Cleveland Clinic, Cleveland, OH. **Current:** Lecturer, Department of Biology, Cuyahoga Community College, Cleveland, OH.

Ganesh Swaminathan, 2012-2016, PhD Graduate, Integrated Biosciences Program, Department of Molecular Medicine, University of Akron, Akron, OH. **Future:** Postdoctoral Fellow, Department of Bioengineering, Rice University, Houston, TX.

Linger, Jason, 2012-2012, Undergraduate Researcher, Department of Biomedical Engineering, Ohio State University, Columbus, OH; Current: JD Candidate, University of California, Los Angeles

Strong, Andrew, 2012-2013, MD Student, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH; **Current:** Clinical Fellow, Department of Surgery, Cleveland Clinic and Clinical Instructor in Surgery, Case Western Reserve University School of Medicine.

Jennewine, Brenton, 2012-2015; Undergraduate Researcher, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH. Current: Student, MD Program, University of Virginia School of Medicine, Charlottesville, VA

Toshiki Horie, 2013; Undergraduate Research Exchange Student, Mie University, Japan.

Howard, Gregory, 2013-2014; Undergraduate Researcher, Department of Biomedical Engineering, University of Akron, Akron, OH; **Current:** NIH Oxford Scholar Graduate Student, University of Oxford, UK

Ballash, Samantha, 2014; Undergraduate Coop Researcher, Department of Biomedical Engineering, University of Akron, Akron, OH; **Current:** Sr. Test Engineer, Altran NA, Cleveland, OH

Fox, Jonathan, 2015-2017; MS Student, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH; **Current:** R&D Engineer, Cook Medical, Bloomington, IN.

Camardo, Andrew, 2015-2017; MS Student, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH; **Current:** Sr. Research Engineer, Cleveland Clinic, Cleveland, OH

Shao, Andrew, 2015-2017; Undergraduate Researcher, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH

Dhruv Seshadri, 2016-2017; MS/PhD Student, Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH

Bopanna, Sriram, 2016; Undergraduate Researcher, Department of Biomedical Engineering, Purdue University, Lafayette, IN

Thomas, Jonah, 2016; MD Physician Scientist Program Sophomore, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH; **Current:** MD Student, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, OH.

Ortiz-Serrano, Daniel, 2016-2018 , MS Student, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH

Palomino, Luis. 2018. PhD exchange student, Department of Biomedical Engineering, Universidad de Ingeniería y Tecnología, Lima-Peru

Dejdar, Sepher, 2017-2018, PhD Student, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH

Pawar, Asawari, 2017-2018. PhD Student, Department of Chemical and Biomedical Engineering, Cleveland State University, Cleveland, OH

*Dahal, Shataakshi, 2015-Present; PhD Student, Appl. Biomedical Engineering, Cleveland State University, Cleveland, OH

*Sharma, Neha, 2017-Present, BS/MD Professional Program, Case Western Reserve University, Cleveland, OH

*Carney, Sarah, 2017-Present, PhD student, Biomedical Engineering, Case Western Reserve University, Cleveland, OH

*Palomino, 2018. PhD exchange student, Biomedical Engineering, Universidad de Ingeniería y Tecnología, Lima-Peru

*Barstola, Suraj, 2019, Doctoral student, Applied Biomedical Engineering, Cleveland State University, Cleveland OH

*Raghunathan, Shruti, 2018, PhD Student, Biomedical Engineering, Case Western Reserve University, Cleveland, OH

*Thampi, Sajeesh S. 2018-Present; Postdoctoral Fellow, Department of Biomedical Engineering, Cleveland Clinic

*Andrew Camardo, 2016- Present, Sr. Engineer, Department of Biomedical Engineering, Cleveland Clinic

*Dayal, Simran, 2019 -, PhD Student, Biomedical Engineering, Case Western Reserve University.

*Patwa, Simran, 2019-, Undergraduate, Biomedical Engineering, Case Western Reserve University.

Secondary Advisor/Dissertation Committee Member

Lu, Shan, 2011-Present, PhD student, Molecular Medicine Program, University of Akron, Akron, OH;

Shah, Mickey, 2014-Present, PhD student, Biomedical Engineering and Integrated Biological Sciences Graduate Program, University of Akron, Akron, OH

Rhett, Joshua Matthew, 2004-2010, Ph.D Graduate, Cell Biology and Regenerative Medicine, MUSC, Charleston, SC

Marigliano, J. 2001-2005; PhD graduate; Bioengineering, Clemson University, Clemson, SC.

Lovekamp, Joshua, 2001-2005, PhD Graduate, Bioengineering, Clemson University, Clemson, SC.

Chelvaraju, Chaitra, 2004-2010, PhD Graduate, Bioengineering, Clemson University.

Sivaraman, Balakrishnan, PhD Graduate, 2005-2010, Bioengineering, Clemson University,

Kutty, Jaishankar, 2005-2009, PhD Graduate, Department of Bioengineering, Clemson University.

Kurane, Aditee, 2005-2009, PhD Graduate, Department of Bioengineering, Clemson University.

Acampora, Bethany, PhD Graduate, Department of Bioengineering, Clemson University.

Raghavan, Devanathan, 2005-2009, PhD Graduate, Department of Bioengineering, Clemson University.

Brown, Lauren, 2006-2008, MS Graduate, Department of Bioengineering, Clemson University.

Drumm, Rebecca, 2007-2009, MS Graduate, Department of Bioengineering, Clemson University.

Chuang, Tom, 2007-2011, PhD Graduate, Department of Bioengineering, Clemson University.

Linsey III, John, 2007-2011; PhD Graduate, Department of Bioengineering, Clemson University.

Mohan, Grisma, 2008-2010, MS Graduate, Department of Bioengineering, Clemson University.

Mercury, Jeremy, 2008-2011, PhD Graduate, Department of Bioengineering, Clemson University.

Sinha, Aditi, 2008-2012, PhD Graduate, Department of Bioengineering, Clemson University.
Swaminathan, Nithya, 2009-2011, MS Graduate, Department of Bioengineering, Clemson University.
Deitch, Sandra, 2009-2010, PhD Graduate, Department of Bioengineering, Clemson University.
Friebe, Vincent, 2009-2012, PhD Graduate, Department of Bioengineering, Clemson University.
Munelly, Amy, 2009-2010, MS Graduate, Department of Bioengineering, Clemson University.
Rollakanti, Kishore, 2011-Present, PhD Student, Applied Biomedical Engineering Program, Cleveland State University (CSU), Cleveland, OH.
Borazjani, Ali, 2011-Present, PhD graduate, Applied Biomedical Engineering Program, CSU
Farrell, Kurt, 2011-2016, PhD graduate, Biomedical Engineering Program, CSU
Joshi, Jyotna, 2014-2018, PhD graduate, Biomedical Engineering Program, CSU
Valinteshly, Pierre, 2019-Present, PhD Student, Department of Biomedical Engineering, Case Western Reserve University

Other Undergraduate and High School Research Training (<6 months)

Machusik, Katrina, AHA Undergrad Fellow, John Carroll University, Cleveland, OH (2000, 2001)
Hsu, Howard, AHA Undergrad Fellow, Case Western Reserve University, Cleveland, OH (2002, 2003)
Curry, Leonard, Howard Hughes Research Program, John Hay High School, Cleveland, OH (2000-2003)
Ruth, Chermaine, NIH Dental Medicine Research Internship for Undergraduates, Med. U. of South Carolina (2004)
Hasselbring, Cari, Undergraduate Bioengineering Internship Program, Clemson University (2004)
Thomas, Bryan, Summer Health Professional Program (SHP) in Clinical Research Medical University of South Carolina
Cutshall, Christopher Cutshall, Medical University of South Carolina, Charleston, SC (2005)
Becker, Shawn, Clemson University, Clemson, SC (2005)
LaDana, Christina, T32 Cardiovascular Training for Minority Undergrads (SURP), U Maryland, College Park, MD (2007)
Dike, Nwamake, T32 Cardiovascular Training for Minority Undergraduates (SURP), U Maryland, Baltimore, MD (2008)
Mazgaj, Robert, T32 Cardiovascular Training for Minority Undergraduates (SURP), Furman U, Greenville, SC (2009)
Graham, Elizabeth, Bioengineering Undergraduate Sophomore, Clemson University (2007)
Balachander, Supriya, Duke University, Raleigh, NC (2008)
Kousik Shreyas, Academic Magnet High School, Charleston, SC (2008)
Wessels, Kevin, Charleston School of the Arts, Charleston, SC (2009)
Sylvester, Andrew, Case Western Reserve University Biomedical Engineering (2011-2014)
Niraj, Anshika, Beachwood High School, Beachwood, OH (2012)
Linger, Jason, Ohio State University, Columbus, OH. Biomedical Engineering (2012)
Cornwell, MacIntosh, Johns Hopkins University, Baltimore, MD (2012)
Suresh, Anupama, Ohio State University, Columbus, OH. Biomedical Engineering (2013)
Howard, Gregory, U of Akron Biomedical Engineering (2013)
Ballash, Samantha, U of Akron, Biomedical Engineering Senior Coop (2014-2015)
Shao, Andrew, Case Western Reserve University, Biomedical Engineering (2015-2016)
Auborg, Matthew, Beachwood High School, Beachwood, OH (2015-2016)
Zhou, Stephanie, Hathaway Brown School, Science Research and Engineering Program (2016-2017)
Hamilton, Claudia Hawken School Science Research program (2017)
Kasibhatla, Nithya, Twinsburg High School (2017)
Jennewine, Brenton, NSF Undergraduate Fellow, Biomedical Engineering, Case Western Reserve U (2014)
Boppana, Sriram, NSF Undergraduate Fellow, Biomedical Engineering, Purdue U (2015)
Shao, Andrew, NSF Undergraduate Fellow, Biomedical Engineering, Case Western Reserve U (2016)
Carney, Sarah, NSF Undergraduate Fellow, Material Science and Engineering, Ohio State University (2016)

EDUCATION/ TEACHING

Teaching Activities

Biomaterials (CHE 694/794-51, Cleveland State University and SUNY Buffalo, 3 Credit Hours), Spring 2002- 2003
Tissue Engineering (BioE 694/794, Clemson University, 3 Credit Hours), Spring 2003, 2004
Bioengineering Clinical Internship (BioE 890, Clemson University, 2 Credit Hours) Spring 2004, 2005, 2006
Cell-Biomaterial Interactions (BioE 848-400, 848-400 Lab, Clemson University ; 4 Credit Hours), Fall 2004-2007, 2009
Compatibility of Biomaterials (BioE 802-400, 802-400 Lab, Clemson University, 4 Credit Hours), Fall 2004-2006, 2008
Bioengineering Seminar (BioE 800-400, Clemson University, 1 Credit Hour), Fall 2004, Spring 2005, Spring 2006, Fall 2007, Spring 2009
Vascular Engineering (BioE 623/823, Clemson University, 3 Credit Hours), Spring 2006, 2007, 2008, 2009, 2010
Biopolymers (BioE 803-001, Clemson University, 3 credit hours), Spring 2010
Tissue Engineering (BME 694/794, Cleveland State University, 3 Credit Hours), Spring 2011.
Biomedical Sciences Research Topics (Cleveland Clinic Lerner College of Medicine), Fall 2012, 2013

Histocompatibility of Biomaterials (Cleveland State University, 3 Credit Hours), Spring 2012
Tissue Engineering (EBME 325), Case Western Reserve University, Spring 2017, 2018
Polymer Nanotherapeutics. Universidad de Ingeniería y Tecnología, Lima Peru (2018)
Nanomedicine, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (2019)

INSTITUTIONAL/CENTER PLANNING INITIATIVES

Center of Research Excellence in Functional Translational Genomics. Lerner Research Institute and Heart and Vascular Institute and Case Western Reserve University (BME). PI: Mina Chung, MD; Role: Co-Investigator, Program 3: Aortic, Valvular, and Vascular Diseases (Funded)

Center of Excellence in Regenerative Therapies for Prevention and Treatment of Female Pelvic Floor Disorders. Role: co-PI (with PIs: Margot Damaser, PhD, and Matthew Barber, MD).

RESEARCH FUNDING

Current

- National Institutes of Health (NHLBI) R01 Grant. Matrix Regenerative Nanotherapeutics for Small Abdominal Aortic Aneurysm Repair. \$1,981,300 (01/2018-12/2021); Role: Principal Investigator
- National Institutes of Health (NICHD) R21 Grant. Multimodal regenerative nanotherapy to improve surgical mesh outcomes in prolapse. \$435,780 (2019-2021); Role: Contact Principal Investigator (with M-PI, Margot Damaser)
- American Heart Association Predoctoral Fellowship Award. Stem Cell Derivatives for Regenerative Repair of Small AAAs. \$53,588 (2019-2021). Role: Sponsor (PI: S. Dahal)
- National Science Foundation CBET Grant. Collaborative Research: Multifunctional Nanotherapeutic Platform for Elastic Matrix Regeneration in Proteolytic Disorders. \$600,000; Role: M-Principal Investigator (contact M-PI: C. Kothapalli, CSU; \$300K Ramamurthi budget)
- American Heart Association Innovative Project Award. Gene silencing matrix regenerative nanoparticles for small AAA repair. \$300,000 (2019-2022); Role: Principal Investigator
- American Heart Association Predoctoral Fellowship Award. \$62,032 (2020-2022); Role: Sponsor (PI: Carney S)
- National Institutes of Health, (NICHD) R21 grant. Regenerative nanotherapeutics for tissue repair in proteolytic disorders. \$435,000 (08/2017-08/2019; NCE). Role: Contact Principal Investigator (with M-PI, Margot Damaser)
- National Institutes of Health (NICHD) R21 Administrative Research Supplement for investigation of sex and gender influences. \$104,000 (06/2018-08/2019; NCE). Role: Contact Principal Investigator (with M-PI, Margot Damaser)
- National Science Foundation CBET Grant. Division of Biomedical Engineering. Stem Cell Inspired Nanotherapeutics for Regenerative Repair of Elastic Matrix. \$300,000 (7/2015-7/2019; NCE); Role: Principal Investigator

Pending/In Review

- National Institutes of Health (NICHD) R01 Grant. Non-invasive regenerative nanotherapy for pelvic organ prolapse. \$3,892,000 (2020-2025); Role: Contact M-Principal Investigator (with M-PI, Margot Damaser) (Scored; Resubmission in preparation for July 2020)
- National Institutes of Health (NHLBI). R01 Grant. Multifunctional angiogenic factor AGGF1 nanotherapeutics for aortic aneurysms. \$3,928,630; Role: M-Principal Investigator (with Contact M-PI: Qing Wang, Cleveland Clinic) (Scored; Resubmission in preparation for July 2020)
- National Institutes of Health (NICHD). Mechanism of stem cell secretions for matrix repair in pelvic organ prolapse. \$439,998 (2020-2022). Role: Contact M-Principal Investigator (with M-PI, M. Damaser)
- National Science Foundation. Extracellular nanovesicles as a tool to augment in vivo elastic tissue repair. \$300,000 (2021-2024). Role: Principal Investigator (Submission in April 2020)
- American Heart Association Career Development Award. Stem Cell Derived Extracellular Vesicles for Regenerative Repair of Small Abdominal Aortic Aneurysms (Role: Sponsor for postdoctoral fellow, Sajeesh Thampi (PI)).

Completed

- American Heart Association (National) Innovative Research Grant. Minimally Invasive Regenerative Therapy for Small Abdominal Aortic Aneurysms. \$154,000 (1/2016-1/2019; NCE). Role: Principal Investigator
- National Institutes of Health (NHLBI), R56 Grant. Regenerative nanopharmacotherapy for small abdominal aortic aneurysms. \$396,250 (9/2016- 9/2018). Role: Principal Investigator

- National Institutes of Health (NICHD), R21 Grant. Regenerative Therapy for Pelvic Organ Prolapse. \$444,344 (9/2014-9/2018; NCE); Role: co-Principal Investigator (with contact PI, Margot Damaser, PhD, Cleveland Clinic)
- National Science Foundation (BME), I-Corps Program. RAPID: Exploring commercialization opportunities for a tissue reparative CVD technology. \$50,000 (07/2017-12/2018). Role: Principal Investigator
- National Institutes of Health National Center for Accelerated Innovations. Technology Development Program. Developing Antibody-targeted nanoparticle-drug conjugates as a non-surgical treatment for AAAs. \$150,000 (08/2017-07/2018). Role: Principal Investigator
- American Heart Association Grant in Aid, Great Rivers Affiliate. Cell therapy for Regenerative Matrix Repair in Abdominal Aortic Aneurysms. \$158,000 (2013-2015). Role: Principal Investigator
- University of Akron Coop Grant, Source specific differences in proelastogenic effects of human MSCs. \$16,146 (02/2014-09/2014). Role: Principal Investigator
- National Institutes of Health (NHLBI), RO1 grant program. Cues for cell-mediated assembly of vascular elastin networks. \$1,599,608 (02/2009-03/2014). Role: Principal Investigator
- National Institutes of Health (NHLBI), F32 NRSA Individual Postdoctoral Fellowship. Elastogenic Factor Functionalized Electrospun Scaffolds for in vivo Generation of Conduits for Small-Diameter Vascular Grafts. \$108,430. (01/2012-01/2014) Role: Sponsor and Research Mentor for Chris Bashur, PhD (PI)
- National Institutes of Health (NHLBI), RO1 Competitive Supplement. Evaluation of elastogenic induction site-specific aneurysmal smooth muscle cell populations in 3D matrix microenvironments. \$137,000 (08/2009-07/2011). Role: Principal Investigator
- Cleveland Clinic Research Fund, ~\$202,000 (02/2013-07/2014). Role: Principal Investigator
- Cleveland Clinic Research Research Seed Fund. 650,000 (07/2010-7/2013). Role: Principal Investigator
- National Institutes of Health (NCR). Endothelial-cell-response-guided design of hyaluronan-based vascular grafts." In South Carolina Center of Biomaterials for Tissue Regeneration (CBTR). \$451,000 (Total subproject costs; 09/2008-8/2012); Role: Co-investigator and PI on sub-project. (Note: Grant relinquished due to out of state relocation to the CCF in 2010)
- National Institutes of Health (NHLBI). T32 Pre-doctoral Grant Award. Cues for Elastin Matrix Repair and Regeneration in Aortic Aneurysms. \$44,000 (7/2008-07/2010); Role: Sponsor and Research Mentor for Carmen Gacchina, PhD Candidate (PI).
- National Institutes of Health (NIBIB), R21 Exploratory/ Developmental Grant Program. Hyaluronan scaffolds for regeneration of elastic matrices. \$300,101 (1/2007-12/2009). Role: Principal Investigator
- National Institutes of Health (NCR). INBRE Grant. In: Cardiovascular Biomaterial Design and Characterization. Subproject: Endothelial-cell-response-guided design of hyaluronan-based vascular grafts. \$220,500 (Sub-project costs; 07/2005-06/2010); Role: Co-Investigator and PI on Sub-Project (14% effort). PI: L. Dooley, PhD
- National Institutes of Health (NCR), General Clinical Research Center Sub-Grant at Medical University of South Carolina (RR01070). Hylan Gel Barriers for Preventing Restenosis in Damaged Arteries. \$9502 per year (09/2004-08/2005); Role: Project Principal Investigator (PI: Gerald Reeves, MD)
- American Heart Association (Ohio Valley Affiliate). Beginning Investigator Grant. Evaluation of hylan gels as endovascular stent sheaths to prevent re-occlusion of small diameter vessels. \$88,000 (2003-2005). Role: Principal Investigator (Declined due to conflict with parallel funding of AHA SDG).
- University Research Committee. Medical University of South Carolina. Testing inflammatory potential of hyaluronan-derived vascular implants. \$25,000 (8/2004-7/2005); Role: Principal Investigator.
- Cure Source, Inc. Isolation and purification of CD133+ progenitors from umbilical cord blood. \$51,008 (04/2005-03/2007); Role: Principal Investigator.
- American Heart Association (National Center). Scientist Development Grant (SDG). Hylan Gel Barriers for Preventing Restenosis in Damaged Arteries. \$260,000 (07/2003-06/2008); Role: Principal Investigator.
- American Heart Association (Ohio Valley Affiliate). Postdoctoral Fellowship Award. Evaluation of Hylan Gels as Cellular Scaffolds for Development of Tissue-Engineered Heart Valves. \$58,000 (07/2000-06/2002); Role: Principal Investigator.

PATENTS

- Ramamurthi A, Joddar B, and Kothapalli C. US Patent publication # US 8529951 B1. Elastogenic Cues and Methods for Using the Same. Patent dated September 10, 2013.
- Ramamurthi A, Sylvester A, and Sivaraman B. US Patent publication # US9675560 B2. Nanoparticles for controlled lysis of blood clots. Patent dated June 13, 2017.
- Ramamurthi A, Sivaraman B. Nanoparticles for stimulating elastogenesis. US patent application 14/471,508 (In final adjudication).
- Ramamurthi A, Sivaraman B. Nanoparticles for POP. US patent application. (Filed 2019)

PEER REVIEWED PUBLICATIONS

Primary or senior author on 62 peer reviewed publications in the biomaterials, tissue engineering, cardiovascular disease/bioengineering, nanomedicine fields. A complete bibliography of publications can be found at <https://www.ncbi.nlm.nih.gov/pubmed/?term=ramamurthi+A> . Select recent publications are listed:

- Kothapalli, C.R. and Ramamurthi, A. Copper nanoparticle cues for biomimetic cellular assembly of crosslinked elastin fibers. *Acta Biomater.* 2009; 5(2): 541-53.
- Kothapalli, C.R. and Ramamurthi, A. Biomimetic regeneration of elastin matrices using hyaluronan and copper ion cues. *Tissue Eng Part A.* 2009; 15(1): 103-13.
- Kothapalli CR, Gacchina CE, Ramamurthi A. Utility of hyaluronan oligomers and transforming growth factor-beta1 factors for elastic matrix regeneration by aneurysmal rat aortic smooth muscle cells. *Tissue Eng Part A.* 2009; 15(11): 3247-60.
- Kothapalli, C.R. and Ramamurthi A. Lysyl Oxidase Enhances Elastin Synthesis and Matrix Formation by Vascular Smooth Muscle Cells. *J Tissue Eng Reg Med.* 2009; 3(8):655-61.
- Kothapalli CR, Ramamurthi A. Induced elastin regeneration by chronically activated smooth muscle cells for targeted aneurysm repair. *Acta Biomater.* 2010; 6(1): 170-8.
- Ibrahim C, Kang Q, Ramamurthi A. Impact of bioactive oligomer content on physical, mechanical and biologic properties of divinyl sulfone crosslinked hyaluronan hydrogels. *J Biomed Mater Res A.* 2010; 94(2):355-70.
- Gacchina C., and Ramamurthi, A. Impact of pre-existing elastic matrix on TGF beta1 and HA oligomer-induced regenerative elastin repair by rat aortic smooth muscle cells. *J Tissue Eng Regen Med.* 2011; 5(2):85-96.
- Ibrahim C, Pardue EL, Kang, Q, Ramamurthi A. Characterization of glycidyl methacrylate - crosslinked hyaluronan hydrogel scaffolds incorporating elastogenic hyaluronan oligomers. *Acta Biomater.* 2011; 7(2):653-65.
- Gacchina C.E., Brothers, TE, and Ramamurthi A. Evaluating Smooth Muscle Cells from CaCl₂-Induced Rat Aortal Expansions as a Surrogate Culture Model for Study of Elastogenic Induction of Human Aneurysmal Cells. *Tissue Eng Part A.* 2011; 17(15-16):1945-58.
- Gacchina C.E., Deb P., and Ramamurthi A. Elastogenic Inductability of Smooth Muscle Cells from a Late-Stage Rat Model of Abdominal Aortic Aneurysms. *Tissue Eng Part A.* 2011; 17(13-14): 1699-711.
- Venkataraman, L., and Ramamurthi A. Induced Elastin regeneration within 3-Dimensional Collagen Scaffolds. *Tissue Eng Part A.* 2011; 17(21-22): 2879-89.
- Bashur, C., and Ramamurthi, A. Aligned Electrospun Scaffolds and Elastogenic Factors for Vascular Cell-mediated Elastic Matrix Assembly. *J Tissue Eng Regen Med.* 2011 Sep 23. doi: 10.1002/term.470. [Epub ahead of print]
- Bashur CA and Ramamurthi A. Perspectives on Strategies to Direct Elastic Matrix Assembly. *Journal of Tissue Science and Engineering.* 2011; 2: 106e-110e.
- Sivaraman B, Bashur CA, and Ramamurthi A. Advances in Biomimetic Regeneration of Elastic Matrix Structures. *Drug Delivery and Translational Research.* 2012; 2: 323-350.
- Bashur CA, Venkataraman, L, and Ramamurthi, A. Tissue Engineering and Regenerative Strategies to Replicate Biocomplexity of Vascular Elastic Matrix Assembly. *Tissue Eng Part B Rev.* 2012; 18(3):203-17
- Sivaraman B and Ramamurthi A. Multifunctional nanoparticles for doxycycline delivery towards localized elastic matrix stabilization and regenerative repair. *Acta Biomaterialia.* 2013; 9(5): 6511-25.
- Bashur CA, Eagleton M, and Ramamurthi A. Impact of Electrospun Conduit Fiber Diameter and Enclosing Pouch Pore Size on Vascular Constructs Grown within Rat Peritoneal Cavities. *Tissue Engineering Part A.* 2013; 19(7-8): 809-23.
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- Bashur CA, Rao RR, and Ramamurthi A. Perspectives on Stem Cell Therapy for Aortic Aneurysms. *Stem Cells Transl Med.* 2014; 2(6):401-8.
- Venkataraman L, Bashur CA, and Ramamurthi A. Impact of Cyclic Stretch on Induced Elastogenesis Within Collagenous Conduits. *Tissue Eng Part A.* 2014; 20(9-10):1403-15.

- Swaminathan G, Gadepalli V, Stoilov I, Mecham RP, Rao RR, and Ramamurthi A. Pro-elastogenic effects of bone marrow mesenchymal stem cell-derived smooth muscle cells on cultured aneurysmal smooth muscle cells. *J Tissue Eng Regen Med*. 2014 Nov 6. doi: 10.1002/term.1964. [Epub ahead of print]
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- Sivaraman B, Swaminathan G, Moore L, Fox J, Seshadri D, Dahal S, Stoilov I, Zborowski M, Mecham R, Ramamurthi A. Magnetically-responsive, multifunctional drug delivery nanoparticles for elastic matrix regenerative repair. *Acta Biomater*. 2016. pii: S1742-7061(16)30644-4.
- Venkataraman, L, Sivaraman, B, Vaidya, P, and Ramamurthi, A. Nanoparticulate Delivery of Agents for Induced Elastogenesis in 3-Dimensional Collagenous Matrices. *J Tissue Eng Regen Med*. 2016; 10(12):1041-1056.
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- Seshadri D and Ramamurthi A. Nanotherapeutics to Modulate the Compromised Micro-Environment for Lung Cancers and Chronic Obstructive Pulmonary Disease *Front Pharmacol*. 2018; 9:759.
- Camardo A, Carney S., Broekelmann T, Mecham RP, Ramamurthi A. JNK inhibition as a metric for quantitative and qualitative assessment of elastic matrix neoassembly. Accepted to *Tissue Engineering A*
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- Dahal S, Swaminathan G, Carney S, Broekelmann T, Mecham RP, and Ramamurthi A. Assessing elastogenicity of BM-MS-C-derived smooth muscle cells (SMCs) in a 3D collagenous milieu. In review with *Acta Biomaterialia*.
- Seshadri D and Ramamurthi A. Targeted Nanotherapeutics to Inhibit Macrophage Polarization in Non-Small Cell Lung Cancers. In review with *Nanomedicine*.
- Dahal S, Kuang M, Rietsch A, Butler S, Damaser M, and Ramamurthi A. Quantitative Morphometry Assessment of Elastic Fibers in Pelvic Organ Prolapse (POP). In review with *J Tissue Engineering*.
- Carney S, Broekelmann T, Mecham RP, Ramamurthi A. JNK Gene Silencing Augments Elastic Matrix Regenerative Repair by Aneurysmal Smooth Muscle Cells. Provisionally accepted to *Acta Biomaterialia*.

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- Sivaraman B and Ramamurthi A. Growth Factor Delivery Matrices for Vascular Regeneration. In Biomaterials for Cardiac Regeneration (Suuronen E and Ruel M Eds.), Springer International Publishing, Switzerland 2015; pp159-197.

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- **Ramamurthi A,** Lewis RS. "Nitric Oxide Inhibition of Platelet Adhesion to Biomaterials". Bioartificial Organs II Conference, Canmore, Alberta, Canada (1998).
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- Kothapalli, C.R., Smolenski, R.T., Taylor, P.A., Yacoub, M.H., and **Ramamurthi, A.** "TGF β and IGF-1 inducement of Elastin synthesis, and maturation by RASMCs is enhanced by hyaluronan fragments." Vascular Matrix Workshop 2007, Whistler, British Columbia (March 2007)
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- Swaminathan G, Brokelmann T, Mecham RP, **Ramamurthi A**. Phenotypically modulated BM-MSC-derived SMCs: Applications to in situ elastic matrix regenerative repair. Vascular Biology 2015; North American Vascular Biology Organization (NAVBO), Hyannis, MA (Poster; Oct 2015)
- Chen B, Wan Y, Wei Y, Wang Z, Green M, Wani P, Swaminathan G, **Ramamurthi A**, Reijo Pera R. In vivo integration and mechanism of action of smooth muscle precursor cells derived from human embryonic stem cells. Pelvic Floor Disorders (PFD) Week 2015, American Urogynecological Society (AUGS), Seattle, WA (Podium; Oct 2015)
- Li YH, Wen Y, Wang Z, Wei Y, Green M, Wani P, Swaminathan G, **Ramamurthi A**, Pera RR, Chen B. In vivo integration and mechanism of action of smooth muscle cell precursors derived from human pluripotent stem cells. Society for Female Urogynecology (Podium; Feb 2016)
- Dahal S, Swaminathan S and **Ramamurthi A**. Utility of Stem Cell-Derived Smooth Muscle Cells for Elastin Regenerative Repair in Aortic Aneurysms. 9th European Conference on Elastin. Stuttgart, Germany (Podium; June 2016)
- Fox J, Jennewine B, and **Ramamurthi A**. Cathepsin-K Targeting Nanoparticles for Regenerative Repair of Abdominal Aortic Aneurysms. 9th European Conference on Elastin. Stuttgart, Germany (Podium; June 2016)
- Camardo A, **Ramamurthi A**. JNK Inhibition as a metric for assessment of stimulated elastogenesis in vascular proteolytic disorders. International Society for Applied Cardiovascular Biology Biennial Meeting, Banff, Alberta, Canada (Poster; Sept 2016)
- Dahal S, Swaminathan G, Broekelmann T, Mecham RP, and **Ramamurthi A**. Pro-elastogenic Effects of Bone Marrow Stem Cell-Derived Smooth Muscle Cells for Regenerative Matrix Repair in Aortic Aneurysms. International Society for Applied Cardiovascular Biology, Banff Alberta, Canada (Poster; Sept 2016)
- Fox J, Carney, S, and **Ramamurthi A**. Elastic Matrix-Regenerative Nanoparticles for Targeted Abdominal Aortic

Aneurysm Wall Repair. Tissue Engineering and Regenerative Medicine International Society 2016 Meeting, San Diego, CA (Podium; Oct 2016)

- Camardo, C, and **Ramamurthi A.** Doxycycline Inhibition of C-Jun Kinase Contributes to Its Pro-Elastin Regenerative Effects at Low Doses. Tissue Engineering and Regenerative Medicine International Society 2016 Meeting, San Diego, CA (Poster; Oct 2016)
- Fox J and **Ramamurthi A.** Multifunctional Nanoparticles for Targeted Regenerative Repair of Extracellular Matrix in the Abdominal Aortic Aneurysms. 5th International Conference on Multifunctional, Hybrid and Nanomaterials. Lisbon, Portugal (March 2017; Podium; Invited)
- Seshadri, D, Shao A, and **Ramamurthi A.** Immuno-Nanotherapeutics to Improve the Tumor Microenvironment in Non-Small Cell Lung Cancers. Society for Biomaterials 2017 Meeting, Minneapolis, MN (April 2017; Poster)
- Fox J, Broekelmann T, Mecham RL, and **Ramamurthi A.** Antibody-Based Targeting of Elastic Matrix Regenerative Nanoparticles to Aortic Aneurysms. Society for Biomaterials 2017 Meeting, Minneapolis, MN (April 2017; Podium)
- Seshadri D, Shao A, and **Ramamurthi A.** Matrix regenerative polymer nanoparticles to improve the tumor microenvironment in non-small cell lung cancers. Materials Research Society (MRS) 2017 Meeting, Phoenix, AZ (April 2017; Poster)
- Seshadri D, Shao A, and **Ramamurthi A.** Matrix regenerative immuno-nanoparticles to improve the lung tumor microenvironment. Tissue Engineering and Regenerative Medicine International Society-EU Meeting 2017, Davos, Switzerland (June 2017; Poster)
- Camardo C and **Ramamurthi A.** Pro-elastic matrix regenerative effects of doxycycline-release nanoparticles targeting inhibition of c-Jun N-Terminal Kinase. Tissue Engineering and Regenerative Medicine International Society-EU Meeting 2017, Davos, Switzerland (June 2017; Podium)
- Fox J, Broekelmann T, Mecham RL, and **Ramamurthi A.** Antibody-Based Targeting of Matrix-Regenerative Nanoparticles for Abdominal Aortic Aneurysm Wall Repair in a Rat Model. Tissue Engineering and Regenerative Medicine International Society-EU Meeting 2017, Davos, Switzerland (June 2017; Poster)
- Dahal S and **Ramamurthi A.** Pro-elastogenic and anti-proteolytic properties of bone-marrow mesenchymal stem cell derived smooth muscle cells in 3D collagenous tissue microenvironments. Tissue Engineering and Regenerative Medicine International Society-EU Meeting 2017, Davos, Switzerland (June 2017, Poster)
- Jameson S, Dahal S, Kuang M, Rietsch A, **Ramamurthi A,** and Damaser MD. Extracellular matrix (ECM) homeostasis in cultures of non-epithelial vaginal cells (NEVCs) from mice with and without pelvic organ prolapse (POP). Tissue Engineering and Regenerative Medicine International Society –EU, Davos, Switzerland (June 2017; Poster).
- Dahal S, Broekelmann T, Meham RP, and **Ramamurthi A.** Demonstrating superior elastin regenerative properties of BM-MS-C-derived smooth muscle cells (SMCs) in a 3D collagenous milieu. Gordon Conference on Elastin, Elastic Fibers, and Microfibrils (July 2017; Podium and Poster).
- Camardo A, Sheshadri D, Broekelmann T, Mecham RP, and Ramamurthi A. JNK-inhibitory Nanotherapeutics to Augment Vascular Elastic Matrix Regenerative Repair. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM) 2017 Meeting, Charlotte, NC (Dec 2017)
- Seranno-Ortiz, D, Camardo C, and **Ramamurthi A.** C-Jun N-terminal Kinase Gene Silencing as an Effective Modality to Augment Elastic Matrix Regenerative Repair in a Proteolytic Milieu. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM) 2017 Meeting, Charlotte, NC (Dec 2017; Poster)
- Seshadri D and **Ramamurthi A.** Regenerative Nanotherapeutics to Modulate the Tumor Microenvironment in Non-Small-Cell Lung Cancers. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM) 2017 Meeting, Charlotte, NC (Dec 2017; Poster)
- Dahal S, Broekelmann T, Mecham RP, and **Ramamurthi A.** Superior elastogenicity and pro-elastogenic and anti-proteolytic effects of phenotype-selected, adult stem cell-derived smooth muscle cells in a 3-D collagenous milieu. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM) 2017 Meeting, Charlotte, NC (Dec 2017; Poster)
- Jameson SA, Swaminathan G, Dahal S, Couri B, Kuang M, Rietsch A, **Ramamurthi A,** Damaser MS. Altered Elastin Homeostasis with Pelvic Organ Prolapse in the Lysyl Oxidase-Like 1 Knockout Mouse Model. Society for Pelvic Research, Reno, NV, 2017 (Nov 2017; Poster)
- Carney S., Ortiz-Serrano D., Camardo A., and **Ramamurthi A.** C-Jun N-terminal Kinase Gene Silencing to Stimulate Elastic Matrix Regenerative Repair in a Proteolytic Disorders. Society for Biomaterials 2018 Meeting, Atlanta, GA (April 2018; Poster)

- Seshadri D, Camardo A, and **Ramamurthi A**. Matrix Regenerative Nanoparticles to Improve the Tumor Microenvironment in Non-Small-Cell Lung Cancers. Society for Biomaterials 2018 Meeting, Atlanta, GA (April 2018; Poster)
- Dahal S and **Ramamurthi A**. Evaluating elastic matrix regenerative potential of MSC-derived smooth muscle cells in a 3-D elastin-deficient tissue milieu. Society for Biomaterials 2018 Meeting, Atlanta, GA (April 2018; Poster)
- Carney S., Camardo A, and **Ramamurthi A**. JNK-2 Gene Silencing Multifunctional Nanoparticles for Augmented Vascular Elastic Matrix Regenerative Repair. 10th European Elastin Meeting, Nijmegen, Netherlands (Podium; June 2018)
- Jameson SA, Swaminathan G, Dahal S, Couri B, Kuang M, Rietsch A, Damaser MS, **Ramamurthi A**. Aberrations of Elastin Homeostasis Contribute to Pelvic Organ Prolapse in the Lysyl Oxidase-Like 1 Knockout Mouse Model. 10th European Elastin Meeting, Nijmegen, Netherlands (Poster; June 2018)
- Camardo A, Carney S, Sharma N, and **Ramamurthi A**. Targeting Nanotherapeutics for Matrix Regenerative and Repair in Proteolytic Vascular Disorders. Nanotech France 2018 International Nanotechnology Conference & Exhibition, Paris, France (Podium; June 2018)
- Palomino-Marcelo L, Carney S, Gakiyaa, M, **Ramamurthi A** and Rodríguez-Reyes, JCF. Interaction of silver nanoparticles with epidermal growth factor (EGF) in physiological media: Evaluation for their potential use in systems that improve the regeneration of epithelial tissues. American Chemical Society Fall 2018 Meeting: Nanomedicine, Nanotechnology and Beyond, Boston MA (Poster; Aug 2018)
- Dahal S, Broekelmann T, Meham RP, and **Ramamurthi A**. Elastogenicity of cBM-SMCs in a 3D collagenous milieu: Identifying a potential cell source for cell therapy in AAAs. Tissue Engineering and Regenerative Medicine International Society (TERMIS) World Congress 2018, Kyoto, Japan (Poster; Sept 2018)
- Carney S, Camardo C, Broekelmann T, Meham RP, and **Ramamurthi A**. Multifunctional, JNK-2 Gene Silencing Nanotherapeutics for Elastic Matrix Regenerative Repair in Abdominal Aortic Aneurysms. Tissue Engineering and Regenerative Medicine International Society (TERMIS) World Congress 2018, Kyoto, Japan (Podium; Sept 2018)
- Dahal S., Kuang M, Rietsch A, Butler S, Damaser M, **Ramamurthi A**. Quantitative morphometry assessment of elastic fibers in pelvic organ prolapse (POP). Meeting of the Society for Pelvic Research (2018), New Orleans, LA (Poster; Dec 2018)
- Thampi S, and **Ramamurthi A**. Stem Cells-Derived Nano-Vesicles for Augmented Regenerative Repair of Vascular Elastic Matrix. Society for Biomaterials Meeting 2019, Seattle, WA (Poster; April 2019)
- Carney S, Broekelmann T, Meham RP, **Ramamurthi A**. Gene Silencing Therapy for In Situ Elastic Matrix Regenerative Repair. Society for Biomaterials Meeting 2019, Seattle, WA (Poster; April 2019)
- Dahal S, and **Ramamurthi A**. Targeting adult stem cell-derived smooth muscle cells to the aortal wall for augmented ECM repair. Society for Biomaterials Meeting 2019, Seattle, WA (Poster; April 2019)
- Camardo A and **Ramamurthi A**. Antibody and Synthetic Peptide-Based Smart Targeting of Matrix Regenerative Nanoparticles for Aortal Wall Repair. Society for Biomaterials Meeting 2019, Seattle, WA (Poster; April 2019)
- Carney S, Camardo C, Broekelmann T, Meham RP, and **Ramamurthi A**. Gene silencing nanoparticle platform for in situ vascular matrix repair. Sixth International Conference on Multifunctional, Hybrid and nanomaterials, Sitges, Spain (Podium; March 2019)
- Thampi S and **Ramamurthi A**. MSC generated exosomes: Prospects for augmenting elastic matrix regenerative repair. ISACB+ ISVTE Meeting 2019, Zurich, Switzerland (Podium; June 2019)
- **Ramamurthi A**. Stem cell derived extracellular nanovesicles for augmented elastic matrix regenerative repair applications. Gordon Conference on Elastin, Elastic Fibers, and MicroFibrils, Manchester, New Hampshire (Podium; July 2019)
- Carney S, Sharma N, and **Ramamurthi A**. Multifunctional Gene Silencing Nanotherapeutics For Elastic Matrix Regenerative Repair. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM), Orlando, FL (Podium; Dec 2019)
- Dahal S and **Ramamurthi A**. Homing Of Adult Stem Cell Derived Smooth Muscle Cells To Aortic Aneurysms For Augmented ECM Repair. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM), Orlando, FL (Poster; Dec 2019)
- Thampi S and **Ramamurthi A**. Stem Cell-derived extracellular nanovesicles for vascular elastic matrix regenerative repair. Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM), Orlando, FL (Podium; Dec 2019)
- Camardo A, Chan KK, Sun XL, **Ramamurthi A**. Cathepsin K Binding Synthetic Peptides for Smart Targeting of Matrix Regenerative Nanoparticles for Aortal Wall Repair. World Biomaterial Congress, Glasgow, Scotland (Submitted)
- Carney S, Broekelman T, Meham RP, **Ramamurthi A**. Assessing siRNA-PEI Complexes for Gene-Silencing

Nanotherapy to Augment Regenerative Repair of Elastic Fibers. World Biomaterial Congress, Glasgow, Scotland (Invited Podium)

- Thampi S, Borekelman T, Mecham RP, **Ramamurthi A.** Stem Cells Derived Extracellular Nanovesicles for Regenerative Repair of Vascular Elastic Matrix. World Biomaterial Congress, Glasgow, Scotland (Submitted)

Invited Seminars

- **Ramamurthi, A.** Nitric oxide inhibition of platelet deposition on biomaterials. Department of Biomedical Engineering, Cleveland, OH, 1999.
- **Ramamurthi, A.** Nitric Oxide (NO) and Soluble Nucleoside Triphosphate Diphosphohydrolase (NTPDase) Delivery for Inhibition of Platelet Deposition *In Vitro*. Department of Bioengineering, Mississippi State University, Starkville, MS, 1999.
- **Ramamurthi, A.** Evaluation of Cross-linked Hyaluronans as Cellular Scaffold for Tissue Engineered Implants. Biomedical Seminar Series, Cleveland Clinic Foundation, 2001.
- **Ramamurthi, A.** Ultraviolet-irradiation techniques to modify crosslinked hyaluronan hydrogels for tissue culture. Department of Anesthesiology Research, Cleveland Clinic Foundation, 2003.
- **Ramamurthi, A.** Derivatized hyaluronan biomaterials as cell scaffolds for soft tissue regeneration or repair. Department of Cell Biology and Anatomy, The Medical University of South Carolina, Charleston, SC, 2004.
- **Ramamurthi, A.** Hylan gels preserve matrix synthesis potential of vascular smooth muscle cells. Department of Biomedical Sciences, The University of South Carolina, Charleston, SC (Aug 2004).
- **Ramamurthi, A.** Hyaluronan-induced regeneration of Internal Elastic Lamina to modulate vascular healing. Bioinformatics and Bioengineering Summer Institute (BBSI) Annual Symposium 2004, Clemson University, Clemson, SC (Aug 2004).
- **Ramamurthi, A.** Crosslinked hyaluronan gels for regeneration of elastic laminae to modulate vascular healing. Palmetto Bioscience Symposium, University of South Carolina, Columbia, SC (Nov 2004).
- **Ramamurthi, A.** Hyaluronan biomaterials for Cardiovascular tissue regeneration. Department of Chemical Engineering, Oklahoma State University, Stillwater, OK (Aug 2005).
- **Ramamurthi A.,** Cardiovascular Tissue Engineering: Designing Natural Biomaterials for Functional Vascular Regeneration. Children's Research Institute Inauguration Symposium (Feb 2005).
- **Ramamurthi, A.,** Comparative Assessment of Pathways for High Yield High Purity Derivation of Functional Endothelial Cells from CD133⁺34⁺ Cord Blood Progenitors. 2nd South Carolina Symposium on Bioengineering, Clemson, SC (June 2006)
- **Ramamurthi, A.,** Glycosaminoglycan-based scaffolds for regeneration of vascular and valvular elastin matrices. Heart Science Center, Imperial College of London, Middlesex, UK (July 2006).
- **Ramamurthi, A.,** Elastin: A biological rubber; In Introduction in cardiovascular development for biophysicists. Web-based lecture, Eds. Markwald RR, Mironov V. Medical University of South Carolina (Nov 2006).
- **Ramamurthi, A.** Designing natural biomaterials for tissue engineering vascular elastic networks. Department of Chemical Engineering, Brigham Young University, Provo, UT (Jan 2007).
- **Ramamurthi, A.** Elastogenic Cues Provided by TGF- β and HA Oligomers Significantly Enhance Vascular Elastin Matrix Synthesis. International Society for Hyaluronan Sciences 2007 Conference, Charleston, SC (March 2007)
- **Ramamurthi, A.** Matrix-derived cues for cellular assembly of vascular elastin networks. Departments of Biomedical Engineering and Material Science, State University of New York, Stony Brook, Stony Brook, NY (July 2007).
- **Ramamurthi, A.** Matrix engineering technologies for repair and regeneration of elastin matrix networks. Department of Mechanical Engineering and Biomedical Engineering Program, University of South Carolina, Columbia, SC (Aug 2008).
- **Ramamurthi, A.** Induction of Aneurysmal Cell-Mediated Matrix Elastin Regeneration for Stabilizing Aortic Aneurysms. Gordon Conference on Elastin and Elastic Fibers, Biddeford, ME (July 2009)
- **Ramamurthi, A.** Matrix Engineering Technologies for Regenerative Repair of Vascular Elastic Matrix Networks. Department of Biomedical Engineering, The Cleveland Clinic, Cleveland, OH (Sept 2009).
- **Ramamurthi, A.** Technologies for Biomimetic Assembly of Elastic Matrix Structures for In Vitro and In Vivo Vascular Tissue Regeneration. The Ohio State University, Department of Biomedical Engineering, Columbus, OH (Feb 2010).
- **Ramamurthi A.** Nonwoven Poly(ϵ -caprolactone) Electrospun Conduits for Guided Regeneration of Vascular Elastic Matrix. AAATC Advances in Multi-Functional Materials Symposium, Greenville, SC (Sept 2010)

- **Ramamurthi, A.** Technologies for elastic matrix regeneration and repair. Cleveland State University. Department of Chemical and Biomedical Engineering, Cleveland, OH (Oct 2010).
- **Ramamurthi, A.** Copper nanoparticles facilitate biomimetic assembly of elastin precursors into elastic fibers. 2010 Cleveland Nanomedicine Summit, Cleveland, OH (Oct 2010).
- **Ramamurthi, A.** Elastic Matrix Regeneration: Challenges and Progress. Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH (Nov 2010).
- **Ramamurthi A.** Matrix Engineering Technologies for Regenerative Repair of Vascular Elastic Matrix Networks. EMBRYO, Birla Institute of Technology, Pilani, India (April 2011)
- **Ramamurthi A.** Technologies for Regenerative Repair of Vascular Elastic Matrices. Cleveland Clinic Lerner Research Institute annual Retreat 2011, Geneva-on-the-lake, OH (Sept 2011).
- **Ramamurthi A.** Strategies to direct elastic matrix assembly for aneurysm repair. Cleveland State University. Department of Chemical and Biomedical Engineering, Cleveland, OH (Oct 2011).
- **Ramamurthi A.** Stretching paradigms to grow biologic rubber bands. Cleveland Clinic. Biomedical Engineering Spotlight Seminar Series, Cleveland, OH (Jan 2012).
- **Ramamurthi A.** Engineering Structures to Restore Tissue Stretch. Department of Chemical and Life Science Engineering, Virginia Commonwealth University, Richmond, VA (Feb 2012).
- **Ramamurthi A.** Stretching paradigms to grow biologic rubber bands. Molecular Medicine Program, University of Akron, Akron, OH (Feb 2012).
- **Ramamurthi A.** Nanomedicine Approaches to Localized Aneurysm Therapy. Society for Biomaterials; U of Kentucky Biomaterials Day, Lexington, KY (Sept 2012).
- **Ramamurthi A.** Matrix Regenerative Strategies for Abdominal Aortic Aneurysms. Aortic Conference, Cleveland Clinic, Cleveland, OH (March 2013).
- **Ramamurthi A.** Regenerative repair of elastic matrix in abdominal aortic aneurysms. Gordon Conference on Elastin, Elastic Fibers, and Microfibrils. Session on Biomedical Engineering and Stem Cells in Elastic Systems (July 2013).
- **Ramamurthi A.** Multifunctional Nanoparticles for Controlled Thrombolysis and Stimulated Elastogenesis in Abdominal Aortic Aneurysms (AAAs). 2nd International Conference on Tissue Science and Regenerative Medicine. Raleigh, NC (Aug 2013).
- **Ramamurthi A.** Stretching paradigms to regenerate biologic rubber bands. Department of Bioengineering, University of Illinois, Chicago, Chicago, IL (Sept 2013).
- **Ramamurthi A.** Multifunctional Nanoparticles for Controlled Thrombolysis and Stimulated Elastogenesis in Abdominal Aortic Aneurysms (AAAs). Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH (Sept 2013).
- **Ramamurthi A.** Localized Matrix Regenerative Strategies for Abdominal Aortic Aneurysms. North American Vascular Biology Organization (NAVBO) Vascular Matrix Biology and Bioengineering Workshop III, Hyannis, MA (Oct 2013).
- **Ramamurthi A.** Influence of rat bone marrow mesenchymal stem cell-derived smooth muscle like cells on elastogenesis by aneurysmal smooth muscle cells *in vitro*. 3rd World Congress on Cell Science & Stem Cell Research, Baltimore, MD (Nov 2013).
- **Ramamurthi A.** Stem Cell therapy for regenerative repair of abdominal aortic aneurysms. International Society for Applied Cardiovascular Biology Biennial Meeting 2014, Cleveland, OH (April 2014).
- **Ramamurthi A.** Stretching Paradigms for Biomimetic Regenerative Assembly of Biologic Rubber Bands. Department of Polymer Science/ Biomimicry Research and Innovation Center, University of Akron, Akron, OH (May 2014).
- **Ramamurthi A.** Regenerative approaches to reinstating tissue stretch properties. Frontier Lifeline Mediville and KM Cherian Heart Hospital, Chennai, India (Dec 2014)
- **Ramamurthi A.** Regenerative nanotherapies small AAA repair. Universidad de Ingeniería y Tecnología del Perú (UTE) (April 2015).
- **Ramamurthi A.** Phenotypic Coordinates as a Basis for Selection of Mesenchymal Stem-Cell (MSC)-Derived Smooth Muscle cells (SMCs) for Elastic Matrix Regenerative Cell Therapies. 4th International Conference on Tissue Engineering and Regenerative Medicine, Rome, Italy (July 2015).
- **Ramamurthi A.** Phenotypic Coordinates of Mesenchymal Stem Cell-derived Smooth Muscle Cells Determine their Potential for Elastic Matrix Regenerative Repair. Tissue Engineering and Regenerative Medicine International Society (TERMIS) World Congress 2015, Boston, MA (Sept 2015)

- **Ramamurthi A.** Regenerative approaches to growing elastic rubber bands. University of North Texas Health Sciences Center, Denton, TX (Feb 2016).
- **Ramamurthi A.** Biomimetic approaches to coaxing tissue stretch. Institute for Stem Cell and Regenerative Medicine (inStem), Bangalore, India (March 2016)
- **Ramamurthi A.** Cathepsin-K targeting nanotherapeutics for regenerative repair of small abdominal aortic aneurysms. Biomaterials 2016 Annual Conference and Expo, London, UK (March 2016)
- **Ramamurthi A.** Technologies for Stimulating Elastic Fiber Bioassembly. Institute of Bioengineering, Queen Mary University of London (QMUL), London, UK (March 2016)
- **Ramamurthi A.** Cathepsin-K Targeting Nanoparticles for Regenerative Repair of Abdominal Aortic Aneurysms. 9th European Conference on Elastin. Stuttgart, Germany (June 2016)
- **Ramamurthi A.** Multifunctional Nanoparticles for Targeted Regenerative Repair of Extracellular Matrix in the Abdominal Aortic Aneurysms. 5th International Conference on Hybrid, Multifunctional Nanomaterials, Lisbon, Portugal (March 2017)
- **Ramamurthi A.** Growing biological rubber bands: Regenerative Approaches and Challenges. Temple University Department of Biomedical Engineering, Philadelphia, PA (April 2017)
- **Ramamurthi A.** Pro-elastic matrix regenerative effects of doxycycline-release nanoparticles targeting inhibition of c-Jun N-Terminal Kinase. Tissue Engineering and Regenerative Medicine International Society-Europe, Davos, Switzerland (June 2017).
- **Ramamurthi A.** JNK-targeting nanotherapeutics for elastic matrix regenerative repair in abdominal aortic aneurysms. Gordon Conference on Elastin, Elastic Fibers, and Microfibrils, Biddeford, ME (July 2017)
- **Ramamurthi A.** JNK-silencing nanotherapeutics for elastic matrix regenerative repair in abdominal aortic aneurysms. Joint Meeting of the German and Swiss Societies for Matrix Biology, Stuttgart, Germany (March 2018)
- **Ramamurthi A.** Assessing pro-elastic and homing properties of BM-MSC-derived smooth muscle cells for AAA regenerative repair. 10th European Elastin Conference, Nijmegen, Netherlands (June 2018)
- **Ramamurthi A.** Gene silencing regenerative nanoparticles for augmented elastic tissue repair. Session on Elastin in regenerative medicine: biomaterials and biosynthesis. Tissue Engineering and Regenerative Medicine International Society (TERMIS) World Congress 2018, Kyoto, Japan (Sept 2018)
- **Ramamurthi A.** Nanomedicine platform for vascular repair. Cardiovascular Translational Research Center, School of Medicine, University of South Carolina, Columbia, SC (Sept 2018).
- **Ramamurthi A.** Regenerative platforms for restoring tissue stretch. Universidad de Ingeniería y Tecnología, Lima, Peru (Oct 2018)
- **Ramamurthi A.** Nanomedicine: Molecular machines for giant advances in tissue repair. Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (Oct 2018)
- **Ramamurthi A.** Matrix regenerative platforms for on-site tissue repair. Department of Biology, Cuyahoga Community College, Cleveland, OH (Oct 2018).
- **Ramamurthi A.** Stretching paradigms to grow biologic rubber bands. Department of Biomedical Engineering, University of Cincinnati (Feb 2019)
- **Ramamurthi A.** Multifunctional nanotherapeutics to reverse pathophysiology of proteolytic disorders. Departments of Pathology and Medicine, Case Western Reserve University School of Medicine (April 2019).
- **Ramamurthi A.** Stem cell derived extracellular nanovesicles for augmented elastic matrix regenerative repair applications. Gordon Conference on Elastin, Elastic Fibers, and MicroFibrils, Manchester, New Hampshire (July 2019)
- **Ramamurthi A.** Assessing siRNA-PEI Complexes for Gene-Silencing Nanotherapy to Augment Regenerative Repair of Elastic Fibers. World Biomaterial Congress, Glasgow, Scotland (May 2020)

PLENARY/ KEYNOTE/LEAD PRESENTATIONS

- **Ramamurthi, A.** Derivatized hyaluronan biomaterials for improved blood, Plenary Talk, Southeast Workshop on Tissue Engineering and Biomaterials, Clemson, SC (Jan 2004).
- **Ramamurthi A.** Cationic amphiphile-modified nano surfaces augment regenerative ECM repair by vascular smooth muscle cells. Symposium on Vascular and Blood Cell Interactions with Biomaterials. Society for Biomaterials 2015 Meeting, Charlotte, NC (April 2015).

- **Ramamurthi A.** Assessing pro-elastogenic and homing properties of BM-MSC-derived smooth muscle cells for AAA regenerative repair. 10th European Elastin Conference, Nijmegen, Netherlands (June 2018)

INTERNATIONAL COLLABORATIONS/ EDUCATIONAL INITIATIVES

- Biomedical Engineering Program, Universidad de Ingeniería y Tecnología, Lima-Peru (2015-Present)
- Hebrew University for Nanoscience and Nanotechnology/ Institute of Dug Research, Hebrew University of Jerusalem, Israel (2015-Present)
- Division of Technologies for Advancement of Science, National Center for Biological Sciences/Institute for Stem Cell and Regenerative Medicine (inStem), Bangalore, India (2015)

OTHER

- National Heart Lung and Blood Institute I-Corps Program on Cardiovascular Therapeutics, Cleveland Clinic Site, Cleveland, OH, 2016.
- National Science Foundation I-Corps Program, National Cluster, San Francisco, CA, 2017.
- Principal Investigator and Faculty Lead, NHLBI ICorps Program in Cardiovascular Therapeutics. National Center for Accelerated Innovations-Cleveland Clinic (2015).

The mission of my Matrix Engineering Laboratory at the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University is to 'to develop novel regenerative medicine/tissue engineering and nanomedicine-based solutions to a) biomimetically assemble and b) regenerate architecturally complex extracellular matrix structures to be able to grow elastic tissue replacements for human use or to effect in situ repair of vascular tissues that succumb to injury or disease'. While tissue-engineering technologies offer the promise of nearly limitless organs and tissues to treat a wide variety of injuries and diseases, there has been only limited progress towards regenerating complex matrix structures vital to maintaining homeostasis of tissues containing permanent cell types, such as cardiovascular (CV) tissues, since they have a capacity for self-repair that is far less effective than tissue-engineering principles demand. One critical and unsolved challenge is our inability to biomimetically-generate the structural matrix, especially the elastic matrix, on demand. Our core research focus and long-term goal is thus to develop matrix engineering technologies that could be applied to a) augment elastin synthesis, assembly, and maturation by *healthy* patient-derived cells within tissue-engineered constructs, and b) regress elastin compromised tissues to a healthy state by targeted therapeutic repair and in situ regeneration of both the elastic matrix and collagen fiber networks. Our research activities, which have been consistently funded by grants from the US National Institutes of Health (NIH), US National Science Foundation, (NSF), American Heart Association (AHA), industry, and state-wide consortiums, have been targeted at understanding the complex interplay between altered biomechanical signaling resulting from aberrations of ECM homeostasis and cell phenotype in proteolytic disorders. We expect that this will enable us to identify novel mechanistic targets for therapeutic reversal of ECM pathophysiology. Another dimension of our research lies in developing platform technologies to overcome key challenges to elastin matrix regeneration and repair including a) spatiotemporal complexity of elastogenesis and architectural complexity of elastic matrix structures, which are difficult to simulate, and b) poor tropoelastin mRNA expression by post-neonatal cells. We also seek to design and integrate innovative tools (e.g., biomaterial induced cell guidance, novel cell sources and cell-derived cues, and biochemical and mechanical conditioning regimens) to a) up-regulate tropoelastin synthesis, b) recruit and assemble these precursors into ultrastructural and functional mimics of native elastin, and c) stabilize the matrices against pathologic breakdown by robust crosslinking. Our research activities span five thrust areas (see **FIGURE 1**) as described below:

THRUST 1: Biomolecular Cues for Biomimetic Elastic Matrix Assembly

Since synthetic polymers poorly evoke cellular elastin matrix assembly, we focus on study of ECM-derived biomaterials to more faithfully evoke native integrin-ECM interactions and preserve the native cell phenotype; Our central research premises is that upregulated elastin synthesis and maturation is contingent on selecting elastogenic cues from a sub-set of ECM molecules that participate in elastin synthesis during neonatal development (e.g., glycosaminoglycans such as hyaluronan or HA and linked proteoglycans. In systematically investigating the size specific biologic effects of HA, we determined that tetrameric forms of HA, in specific, significantly upregulate elastin precursor *and* matrix synthesis by *healthy, adult* rat vascular smooth muscle cells (SMCs), and further enhance elastic matrix assembly, elastic fiber formation, maturation, and stability against enzymatic degradation. These effects were synergistically amplified when the tetramers were delivered together with growth factors such as transforming growth factor- β 1 (TGF- β 1) ('elastogenic cues'). We have further sought to identify and optimize 'elastin assembly and maturation cues' to improve tropoelastin recruitment and crosslinking is to enhance availability (endogenous or exogenous) and activity of lysyl oxidase (LOX), the primary elastin crosslinking enzyme. Our strategy for this involves controlled delivery of Cu^{2+} ions from copper nanoparticles (CuNP), which in turn critically enhances activity of LOX and cellular production of the enzyme itself, and alternately, exogenous delivery of LOX peptides. Having established proof of principle as to utility of CuNP and LOX peptides to enhance maturity of generated elastic matrix, we are now developing biofunctionalized scaffolds and microcarriers to enable their controlled delivery to cells. This is being investigated in two different small animal models of proteolytic disease: abdominal aortic aneurysms (AAAs) and more recently, pelvic organ prolapse (POP), and chronic obstructive pulmonary disease adjuvant to non-small cell lung cancers. In a separate body of work, in collaboration with the group of Dr. Anthony Weiss at the University of Sydney, we are investigating how recombinant tropoelastin proteins may be used a scaffold by elastogenically-deficient cell types to regenerate structurally and biologically functional elastic tissue structures.

THRUST 2: Cell sources for In vitro and In vivo Tissue Engineering

In situ elastic matrix repair by cells at sites of proteolytic disease: Towards enabling in situ regenerative elastic matrix repair, we are investigating basal and induced elastogenesis by diseased adult cells (e.g., SMCs from induced rat-, and

human abdominal aortic aneurysms, fibroblasts from tissues with chronic obstructive pulmonary disease). We have found such cells to be even more elastogenically deficient than healthy adult cell types but to responsive to our pro-elastogenic cocktails. In the context of poor or slow elastic matrix synthesis by diseased SMCs, despite stimulation, we are pursuing an innovative alternative strategy wherein exogenous tropoelastin precursors produced by elastogenically induced healthy cells are provided to the diseased cells, which will thus only need to assemble the precursors into matrix structures. This 'exogenous model of elastin assembly' is also an innovative strategy to hasten elastic matrix assembly by eliminating need to first synthesize tropoelastin, the most-time consuming step.

Stem cells for elastic matrix (re)generation & repair: Induced pluripotent stem cell (iPSC) techniques have emerged as innovative means of generating targeted and individualized cell lines by 'reprogramming' somatic cells from patient's own tissues. iPSCs (human, murine) have also been differentiated in vitro, into SMCs, outcomes which portend progress towards developing cell-based therapies to treat SMC-related diseases. With our collaborators, Drs. Robert Mecham at Washington University, and Raj Rao at the U of Arkansas, we have been investigating a new approach to enhance regenerative elastic matrix repair within abdominal aortic aneurysms (AAAs), based on cell therapy with autologous iPSC-differentiated SMCs (iPSC-SMCs). We are also exploring the use of iPSC-SMCs as a preferred, highly elastogenic cell source for vascular tissue engineering applications. A key aspect of this thrust also lies in investigating with iPSCs and bone marrow MSCs (rat, human), as to how SMC differentiation protocols and post-differentiation conditions of culture impact phenotype and elastogenic potential of the derived SMCs. Separately, we are exploring the matrix regenerative potential of progenitor cells recruited to intra-peritoneally implants and as to how their phenotypic profile & responses are influenced by scaffold composition, architecture & implantation time. This will be applied to growing in vivo, functional tissues for autologous use. More recently, we have initiated an investigation into active targeting of stem cell-derived exosomes as a stem cell inspired but cell free approach to matrix repair in proteolytic disorders.

THRUST 3: Biomaterial Scaffolds and Biomechanical Cues for Biomimetic ECM Assembly

Biomechanical transductive cues imposed by cellular substrates influence both cell phenotypes and their pattern of matrix deposition. Thus, to engineer ultrastructurally-faithful elastic matrix architectures specific to target CV tissues, we seek to develop electrospun nanofibrous cellular scaffolds using either or both natural and synthetic polymers, which incorporate ultrastructural facets of the vascular ECM, such as preferentially-aligned, nano-sized fibers, and micron-sized pores to replicate the attachment, migration, and orientation of cells within. Cyclic mechanical stretch simulating distension experienced by SMCs in intact vessels is also known to impact cell phenotype, alignment, matrix deposition, and growth factor release by both native and cultured SMC. Accordingly, working with the electrospun scaffolds further biofunctionalized with pro-elastogenic factors (e.g., HA oligomers), we are investigating as to how substrate choice and topography, cell source, cyclic distension, and biomolecular cues alone and together impact quantity and quality of elastogenesis in vitro and in vivo (peritoneal cavity) bioreactor microenvironments.

THRUST 4: Theranostic Nano-biomaterials for In Situ Regenerative Soft Tissue Repair

In small animal models of induced abdominal aortic aneurysms (AAAs), and separately in pelvic organ prolapse (POP), we are investigating (a) the route and mode of targeted delivery of elastogenic and elastin maturation/stabilizing cues to tissue sites of proteolytic injury, (b) the pharmacokinetics and fate of these cues post-delivery, and (c) their ability to effect local elastin matrix repair and reversal of ECM pathophysiology. These studies are also critical to determine if cells in the MMP-rich, dynamic 3-D matrix environment within the injured tissues respond to elastogenic stimulation as they appear to do in culture. Our studies also seek to ascertain if these delivered cues are retained at the tissue repair site, the duration and extent to which they effect elastin regeneration and/or matrix assembly and stabilization, and the stage in disease progression when they must be applied to elicit maximal benefit. Both these diseases exhibit highly heterogeneous matrix profiles that are influenced by their inducing cause, and disease stage. In the case of AAAs the matrix aberrations are also determined by the c) involvement of inflammatory cells and thrombus, d) location and size, and e) proximity of the AAAs to primary site of injury and tendency to rupture. These unique cellular microenvironments can in turn differentially alter cell phenotypes and the magnitude and quality of cell responses to provided elastogenic cues. Thus, our ongoing seek to assess the spatio-temporal changes to AAA wall and POP tissue matrix and their impact on innate and induced elastin regeneration/repair responses of resident cells so as to be able to customize the elastogenic cues based on characteristics of the tissues targeted for treatment.

Towards achieving localized, controlled, and sustained delivery of matrix regenerative factors and siRNAs to the AAA tissue site, we have been working on developing multifunctional nanoparticles that mimic nature-based templates. Via surface modification of these nanocarriers with novel cationic amphiphiles, we have been able to increase uptake into AAA tissues, enable targeted binding to elastic matrix, and enhance elastin crosslinking activity of the cell derived

enzyme lysyl oxidase and attenuate proteolytic matrix metalloproteases towards enhancing the elastin regenerative aspect and reducing matrix loss. We are also working a new generation of fibrinolytic nanoparticles that besides facilitating uptake of AAA therapeutics through an intraluminal thrombus into the aortic wall can be utilized for thrombolysis in other vascular diseases as well. In collaboration with Dr. Maciej Zborowski (BME), and expert in magnetophoresis, and vascular surgeons, Matthew Eagleton and Frederico Parodi, all at the Cleveland Clinic, we are developing magnetic guidance systems to enable highly efficient and targeted delivery of theranostic nanoparticles to tissues of interest. We have also been funded by the NIH Center for Accelerated Innovations (NCI)-Cleveland Clinic for fast-track development and preclinical testing of an antibody-mediated nanoparticle targeting modality. In collaboration with the group of Manasori Aikawa at Harvard University, we are developing a new class of regenerative nanoparticles based on new AAA therapeutic targets they have identified. We have also initiated a new collaboration with the group of Dr. Joy Roy in the Department of Vascular Surgery at the Karolinska Institute in Sweden, towards identifying new tissue markers of AAAs and intraluminal thrombi for active targeting of nanotherapeutics. This is based on proteolytic analysis of >200 biobanked clinical AAA specimens. We are also creating a biobank of human AAA tissues and cells and are focusing on studying the mechanisms of smooth muscle plasticity and signaling in normal vascular cells and in AAAs, cell-extracellular matrix (ECM) dynamics and ECM homeostatic changes driving aneurysm growth, and on investigating new nanotargeted therapies for biomimetic regenerative repair of the aneurysm wall ECM in human cell and ex vivo tissue culture models.

We have also been pursuing a new nanomedicine project in collaboration with Dr. Vamsi Velcheti, a thoracic oncologist at the Taussig Cancer Institute of the Cleveland Clinic. The goal is to develop nanotherapeutics capable of improving the tumor microenvironment (TME) in non-small cell lung cancers (NSCLCs) towards augmenting response to immune-checkpoint inhibitor treatments. Response to these promising new treatments is currently rather poor, likely due to a TME that favors immune evasion and pro-tumorigenic phenomena such as macrophage polarization from a pro-inflammatory (M1) type to an immunosuppressive and pro-tumorigenic (M2) phenotype. The TME is also compromised by chronic enzymatic breakdown of alveolar elastic matrix to generate elastin peptides that can promote M1 to M2 phenotypic switch, besides stimulating cytokine production, angiogenesis, and tumor growth. Preventing elastolysis and stimulating elastin regenerative repair can thus benefit immunotherapy outcomes. This is challenged by poor elastogenicity of adult cells. We seek to overcome these challenges via development of nanocarriers uniquely designed to provide multifunctional benefits including a) inhibiting proteolysis, b) stimulating elastogenesis, and c) attenuating macrophage polarization.

THRUST 5: Novel Molecular Targets for ECM Homeostasis-Restorative Therapies

Abdominal aortic aneurysms (AAAs) involve slow disruption of elastic matrix in the aortal wall, by inflammatory cell-generated matrix metalloproteases (MMPs) upon cytokine stimulation. We seek to identify upstream molecular events that lead to MMP overproduction and elastolysis on one hand and which regulate elastogenesis on the other. Recent studies have reported transforming growth factor-beta (TGF- β) over-expression and increased bioavailability within growing AAAs to stabilize the condition and impaired TGF- β signaling coupled with down-regulation of Notch signaling to coincide with progression of human AAAs. Taken together, these results suggest the centrality of TGF- β signaling to therapy targeted at stabilizing AAAs via induced elastic matrix regeneration. Wnts, a group of molecules that are involved in regulating developmental processes, have also been reported to regulate expression of c-Jun-N-Terminal Kinase (JNK), an upstream molecular regulator of both elastogenesis and elastolysis, and there is increasing evidence that they are vital mediators of inflammation and recovery from injury. On the basis of these effects, we are investigating how targeted inhibition of these upstream regulators using approaches that integrate stem cells/secretions, pro-regenerative and anti-proteolytic nanocarriers, and siRNA and peptide nucleic acid (PNA) based gene silencing approaches will impact elastic matrix regenerative repair in cell cultures and animal models of AAAs. This study is being pursued in collaboration with Dr. Eylon Yavin of the Center for Nanoscience and Nanotechnology at Hebrew University of Jerusalem, Israel, which is partnered with the Cleveland Clinic via the Global Center for Transformative Nanomedicine. Through this project, we expect to also elucidate, for the first time, the involvement of Wnts in AAA pathology; we will (a) assess if and how the two major inflammatory cytokines viz., IL-1 β and TNF- α impact on Wnt gene expression to activate healthy rat aortic SMCs, and (b) ascertain how the temporal changes in expression patterns of these Wnts influences the expression of MMPs, TIMPs and proteins relevant to elastic matrix assembly.

I am also a founder member of the newly established Center of Excellence in Cardiovascular Translational Functional Genomics at the Cleveland Clinic. My team focuses on investigating models for vascular connective tissue disorders. Leveraging ongoing prospective collections of aortic tissue biopsies, we aim to a) identify biologic factors associated with

aortic aneurysm, dissection, and atherosclerosis by performing paired -omics (e.g. RNASeq) on normal and abnormal aortic tissue, as well as blood, and b) derive vascular endothelial and smooth muscle cell models from patient-derived stem cells or fibroblasts for functional genomics studies to assess vascular cell phenotype, and c) correlate altered biomechanical signaling resulting from ECM homeostatic aberrations to the outcomes in (b) towards identifying novel mechanistic targets for treatment. I am currently working on putting together a collaborative multi-investigator program project grant that focuses on investigating fundamental mechanisms of matrix degeneration in aortic aneurysms and developing a multifunctional technology platform to reverse matrix pathophysiology.

FUTURE DIRECTIONS: In the last 17 years of my independent research career, I created a niche for myself as a researcher with expertise in technologies for in situ elastic tissue repair and in vitro tissue engineering. I have assembled a cohesive multidisciplinary team of outstanding national and international basic, translational and clinical researchers together with whom I have made much progress towards developing stem cell and nanomedicine approaches to enable functional elastic matrix engineering and regenerative ECM repair. As a faculty at the Lehigh University, I intend to continue to build up upon these earlier achievements to spearhead the establishment of a well-funded, focused and cutting-edge multi-investigator research program in stem cell and nanomedicine for ECM engineering and repair. Having built up my career performing research at academic institutions that are closely associated with centers of medical excellence, I am committed to propagating the translational aspect of biomedical research. I intend to continue to aggressively pursue research funding for my lab from national funding agencies, and lead an effort to seek funding for a collaborative multi-investigator grant focused on matrix regenerative therapies for proteolytic disorders. I intend to capitalize on cross-disciplinary collaborations with other investigators of engineering and the basic sciences at the university, including the new College of Health to foster a high quality research and training program for undergraduate and graduate bioengineering students and postdocs. Through these experiences, I hope to provide these individuals a rigorous training platform to impart the scientific and professional skills required to succeed in biomedical industry. In summary, my personal research philosophy mirrors your institute's aspirations in seeking to pursue the performance of innovative, cutting-edge research in translational matrix and mechanobiology research which would a) generate technologies with significant potential for clinical application, b) provide opportunities for commercialization and economic growth, and c) serve as breeding ground for well-trained, informed, and creative bioengineers. Based on my experience, I strongly believe that as a faculty at Lehigh University, I will be well positioned to achieve these objectives.

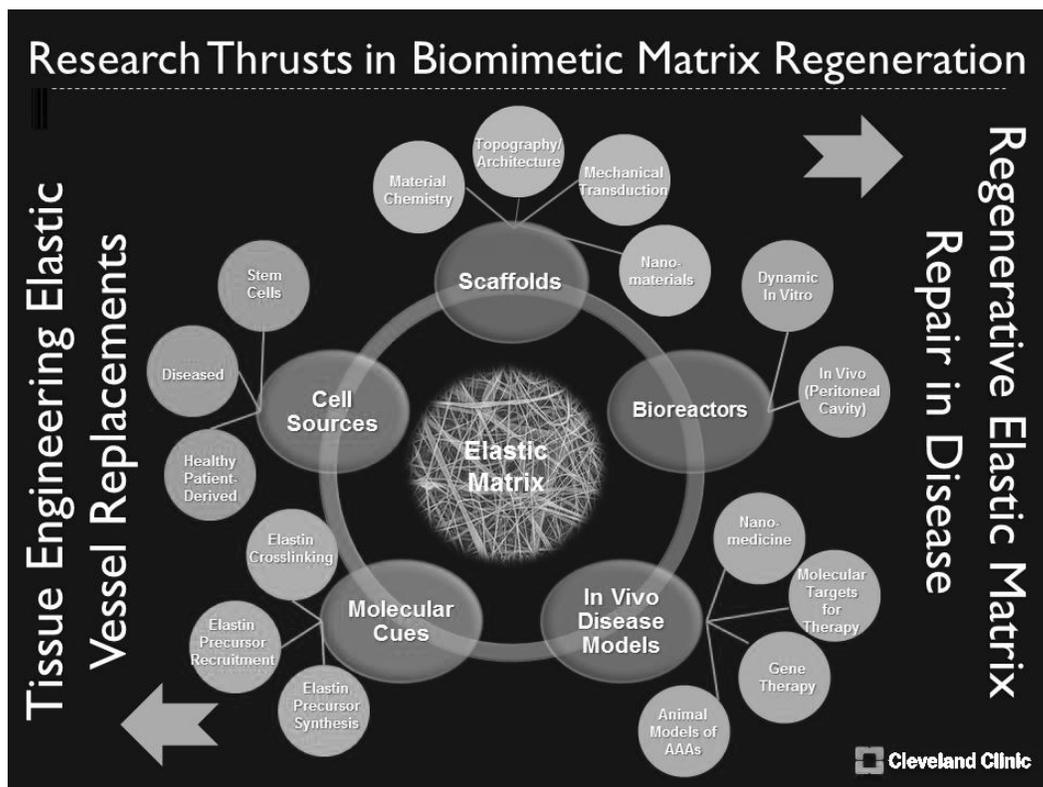


FIGURE I. Overview of research thrusts in the Ramamurthi lab.

My educational philosophy has been shaped by my experiences as a student, teaching assistant, lab instructor, undergraduate and graduate faculty, and as a researcher. My belief is that a communicative and interactive teacher is THE primary requirement for inciting interest, attention, and dynamism and their consequent graduation to become productive and professional individuals in their fields. Below I outline the educational philosophy that drives my teaching aspirations and interests and my possible contributions to BME education and training at Lehigh University.

Far from being separate entities, research and teaching are closely entwined. While working with peers helps to keep a researcher focused, interaction with students in a research setting can stimulate one to 'think outside the box'. On the other hand, as a graduate and undergraduate research advisor and teacher, I can attest to the fact that students relate to and assimilate theoretical classroom information better as a result of their 'hands-on' experience in the lab. My teaching philosophy therefore dictates that whenever possible, course material should mandatorily incorporate a practical component in addition to regular theory classes. When considered in reverse light, it may also be argued that a course curriculum that closely knits theory and hands-on experience helps to better provide a scientific context to research performed in the laboratory and thus progression of his/her research. My teaching activities over the years have emphasized my goal of developing curricula that a) encourage independent, analytical, and intuitive thought, b) foster practical experimental skills, c) inculcate effective oral and written communication skills, and d) raise awareness of the social responsibilities and expectations of a modern-day bioengineer. I am also very conversant with distance education methods having taught across campuses at Clemson U/Medical U of South Carolina, and thereafter at the Cleveland Clinic Lerner College of Medicine at CWRU and partner institutions. This experience has made me aware of the special needs of distance education, namely ready student access to the tutor, and importance of maximizing use of web-based course management tools (e.g., Blackboard) to a) enhance student-teacher interactions, and b) enable real-time exchange of feedback, to be able to replicate an in-classroom educational experience.

TEACHING METHODS

a) Interactive Teaching. As a teacher, my approach in the classroom is to foster a spirit of questioning. I strongly believe in interaction within the classroom which I feel leads to a better comprehension of the subject. Towards this end, I venture to include discussions as an implicit feature of my classes and ensure that adequate time is pre-dedicated for the purpose. In my personal experience, I have found that these discussions serve to fulfill four objectives, which are to a) motivate active student participation in class, which in turn contributes to greater inculcation of subject matter, b) encourage a spirit of scientific enquiry and logical deduction, c) hone analytical and communication skills, and d) challenge students to be up to date as to developments in the field. In teaching my courses, I use a question-answer type approach. I have found that constant quizzing of students, and inducing them to use their logic and memory to arrive at the correct answer helps them to be familiar with and readily recollect concepts and details, and to enable them to apply these to solving unfamiliar problems.

b) Independent Learning. A hallmark of my teaching style is my insistence that students review class material prior to being taught in class. I have consistently found that pre-familiarity with course material provokes a better understanding of it when explained class. Moreover, such a practice encourages self-tutoring, which is especially expected to benefit fresh incoming students who are exposed to the concept of independent research for the first time, and have difficulties educating themselves in pertinent research literature. To ensure that the students review their class material after the class, I administer surprise quizzes that contribute to nearly 10% of the final grade and thus provide some incentive for such preparation.

c) Creative Testing. As a graduate student, I recall performing best in courses that enabled me to demonstrate my creative and analytical skills in the subject in ways more than just through written examinations. Traditional testing methods, though inevitable for comparative evaluation of student performance, are not necessarily effective in assessing true understanding of the subject beyond the confines of textbook information. I believe that at the end of the course, students must be able to answer the following questions in the affirmative-

- Can I independently assimilate and understand more involved literature in this subject area?
- Will I be able to correlate the course information to other research scenarios, including my own research?
- Can I intelligently and convincingly communicate on this subject to both scientific astute and lay audiences?
- Will I be capable of logical problem solving in this subject area?

To reliably test the achievement of these goals, I believe in using testing methods other than just written exams. These methods include short oral presentations, written scientific reports or topical mini-reviews, and/or team projects.

I believe that incorporating one or more of these components into courses, will stimulate creativity, encourage team work, leadership and project planning skills, and give students the confidence to face the real world as bioengineers.

COURSE OFFERINGS

My goal as a joint faculty of the bioengineering department at Lehigh University would be to emphasize critical thinking and analysis, and to highlight recent cutting edge developments in the field and progress and challenges towards clinical translation and commercialization. Below I list courses that I have experience in teaching and could teach as undergraduate/ graduate courses at the Lehigh University, some possibly as new offerings.

- **Cell-Biomaterial Interactions:** This undergraduate/graduate course is an introduction to the tissue-level, cellular and sub-cellular processes that are involved and that determine the outcomes of cell interactions with biomaterials, a major determinant of the biological response to surgically implanted materials. At the conclusion of this course, the student would be able to a) design biomaterials that can mimic cell-substrate interactions in tissues, b) predict the attachment of cells onto the surface of any given material and their behavioral response to known substrate chemistry, surface topography, charge, and hydration, c) understand the cell attachment process from the standpoint of sub-cellular molecular assembly principles, d) design and carry out experimentation to examine cell attachment to an unknown material, e) design experiments to test for cytotoxicity and biocompatibility of a biomaterial, f) devise a strategy to characterize the properties of biomaterials surfaces and select materials accordingly for specific tissue culture applications, and g) analyze the state of the art in cell materials interactions. **Potential overlap/congruence: BIOE 257, BIOE321/421, BIOE 425**
- **Biomimetics in Tissue Engineering and Regenerative Medicine:** This course will review the fundamental principles needed for the biomimetic engineering of tissue, including overview of extracellular matrix structure, mechanical forces on cells, cell adhesion and migration, inflammatory and immune responses, and transport processes. Enabling technologies are presented, such as scaffold design and selection, stem cell approaches, model systems, cell encapsulation technologies, and in vivo and in vitro bioreactor design and how biomimicry can guide their development. Applications that will be discussed include the tissue-engineered pancreas, skin, bone, tendon, cartilage, kidney, and cardiovascular tissue. Considerations and steps in commercial tissue engineering product development including pre-clinical testing, safety and efficacy analysis, clinical evaluation, and scale up of tissue engineering processes, GMP guidelines for research in the tissue engineering industry and regulation of tissue engineered products will also be covered in this course. **Potential overlap/congruence: BIOE 324, BIOE 426**
- **Cardiovascular Engineering:** This new theory/lab course could be offered at the undergraduate levels with additional topics for graduate credit. This theory/ lab course provides an in depth understanding of the anatomy and physiology of the vascular system, the molecular and systemic basis for the initiation and progression of vascular disease, current and emerging techniques for diagnosis of vascular disease and the surgical management of vascular disease and pathology, reviews current and emerging trends in vascular device development with an emphasis on understanding the engineering and biologic parameters that influence the design and selection of endovascular prosthetics, and the engineering tools necessary to evaluate these parameters, and vascular mechanics and hemodynamics.
- **Compatibility of Biomaterials:** This theory lab/ lab course could be offered either at the undergraduate or graduate level. This course is an introduction to biocompatibility, i.e., the evaluation of the biological response to surgically implanted materials. The course will begin with the study of the histology of normal cells, tissues and organs. Following this, basic pathological principles will be used to study possible tissue responses to biomaterial implants, depending on tissue type and state, implant material composition and surface/bulk properties, mechanics, implant shape/design, and degradability. The course will train the student to systematically evaluate the biocompatibility of the materials based on observed tissue responses, and to also develop intelligent implant design based on knowledge of the tissue responses. The laboratory work will be geared to give the student experience in preparing histological slides and subsequently evaluating the slides qualitatively as well as quantitatively for various morphometric features and biocompatibility. **Potential overlap/congruence: BIOE 210, BIOE 257, MAT 033, BIOE 425**
- **Biopolymers and Drug Delivery:** This course may be offered at the undergraduate/ graduate level. The course provides an understanding of the use of biological and synthetic polymers in biomedical applications including those pertinent to development of biomedical devices, implants, drug delivery vehicles. The course will enable students to (a) predict biopolymer characteristics based on their macro and microlevel structure and chemical structure, (b) understand methods of polymer synthesis and post-formulation processing necessary to tailor surface and bulk properties, and (c) decide on appropriate choices of biomedical polymers based on application-device/implants or pharmaceuticals. **Potential overlap/congruence: BIOE 324**
- **Stem Cells in Regenerative Medicine:** This new elective course will first provide a fundamental understanding of stem cell biology including their development from the blastocyst to a somatic stage, types and classifications, identification and characterization of stem cell types, potential applications and merits and demerits, cloning technology, recent advancements in stem cell technology, and ethical considerations towards their use. The course will also discuss the phenomenon of hematopoiesis, molecular pathways involved in development of pluripotency and generation of tissue-specific stem cells, epigenetics and reprogramming of stem cells, in vitro and in vivo differentiation of stem cells along different lineages, host-graft interactions with focus on immune and infection issues, technologies for tracking implanted stem cells and their derivatives, use of stem cells for tissue regenerative applications and considerations thereof.
- **Nanomaterials in Tissue Engineering:** This new graduate/undergraduate level elective course will discuss cutting edge developments in nanomaterials technology and their application to enabling therapeutics or molecular targeting-mediated tissue regeneration and repair and diagnostic imaging of the outcomes. The course will cover topics such as multifunctional polymer nanostructures and core/shell nanoparticles for therapy and diagnosis, nanogels for imaging and drug delivery, magnetic nanoparticles for tissue regeneration and repair, nanofiber scaffolds for regenerating complex tissue architectures. **Potential overlap/congruence:**
- **Transport Phenomena in Tissue Engineering:** Tissue engineering processes involve integration of biomaterial scaffolds with cells and their further vascularization, integration with host tissue, and remodeling. The effectiveness of each of these steps that lead to

generation of a normally functioning tissue engineered construct are regulated and limited by several transport processes including nutrient and oxygen delivery, clearance of metabolic wastes, diffusion of paracrine factors/agents and inter- and intra-cell communication via biomolecules, besides migration and spatial organization of cells within biomaterial scaffolds. This course will discuss these phenomena from a computational and experimental standpoint towards being able to manipulate the processes to regulate tissue generation outcomes including tissue function. **Potential overlap/congruence: BIOE 247, BIOE 335**

- **Bioreactor Systems for Tissue Engineering:** This new course will focus on basic characteristics of mammalian cells related to cultivation systems and the consequences on the design, characterization, and operation of bioreactor systems for growing different kinds of tissues in vitro and novel in vivo bioreactor compartments. Mathematical models to predict tissue growth, scale up of tissue growth processes, mechanical conditioning of tissues to regulate tissue architecture and properties, and novel techniques for monitoring tissue growth are other topics that will be included in this course. **Potential overlap/congruence: BIOE 341-343**

Vision of Role as a Department Chair

As a department Chair, my goal is to provide participative and transformational leadership aimed at building upon strengths within the department, collaborative opportunities within and outside the institution, and leveraging the unique academic landscape and student and employer demographics in the region. The goal will be to foster the next phase of growth of a department that provides high quality, low cost education and research training in bioengineering. In this role, I see myself as representing a critical link between the administration and the department faculty, facilitating bidirectional communication, and being able to persuade my faculty colleagues on one hand, and the dean and administrators on the other, as to what might be best for both the department and the institution. I see a need early on to focus on learning the individual strengths of my faculty and staff colleagues in the department so that these may be leveraged and orchestrated to provide collective benefit to our constituents – our students, staff, faculty, and the administration. I believe that by maintaining open communication and honest and credible leadership, and a good reputation in our discipline, I can achieve a high level of credibility among these constituencies, to ask for and receive their cooperation to both gain resources for the department and align the department with institutional goals and policies. More specifically, my goals will be to a) build an educational and training program of excellence in translational biomedical research, b) provide a mentoring environment to assure professional growth and career success of junior faculty, c) promote individual and collaborative innovation in research and education, d) expand existing collaborations, and establish new ones to augment the impact and prestige of the department and provide greater training opportunities for students, e) develop a strong, extramurally funded translational and collaborative bioengineering research program, f) fulfill key interpersonal roles (counselor, coach, mediator, climate regulator) to develop cohesive interactions and productive relationships among and between departmental faculty, staff, and students, and g) serve as a key advocate to promote the interests of the department and institution.

Vision for the Department

My vision for the department is it to continue to evolve as an academic center of excellence and of national stature to provide cross-disciplinary bioengineering education and research aimed at advancing healthcare solutions. While a national/international perspective is vital to ensure brand value and scientific credibility as an academic program, the very fact that the BioE department at Lehigh U is one among several more established and recognized BioE programs even in the commonwealth of Pennsylvania, makes it imperative for us to carve itself a niche in the state academic ecosystem. As is likely already realized, careful planning is mandated to create a blueprint for resource investment and growth that assesses regional needs in terms of industry workforce and takes into account social and economic indicators of local student demographics. As a private school, I believe Lehigh U has the potential to selective as to its pattern of growth without the constraints and considerations encountered by public universities. The department is thus ideally perched to serve as a regional and even national platform to integrate the multidisciplinary expertise and skills of scientists and clinicians in the east coast towards advancing clinically translational bioengineering technologies. To continue to achieve this, the department will need to a) provide a platform for pursuing excellence in multi-disciplinary, translational research collaborations and for data sharing, b) develop scientific infrastructure, c) foster cross-disciplinary education and research training, & d) create productive partnerships with the bioengineering industry.

While it would be prudent to continue to build upon the strengths of the four core research areas currently represented by the department, namely Biomaterials (including nanomaterials), biocomputing, diagnostics and sensors, and therapeutics, organizing research into strategic research themes would be important to provide clear vision for future resource investment and growth patterns. I propose a stratified, pyramidal organizational structure. **Level I: Fundamental Innovations** will serve as a substratum of research activities that emphasize advancing fundamental and mechanistic studies and leading to development of fundamental tools and technology for tissue level applications. For example,

biomimetic approaches can be used to grow tissue engineered constructs, which can in turn be applied as model systems to assess exploratory, new therapeutic strategies in vitro and in vivo in level 2. **Level 2: Tissue Applications** represent select yet broad target disease applications E.g., cardiovascular, musculoskeletal, and cancer to which the developed fundamental research tools in level 1 will be applied. The selected application thrust areas will also leverage existing research strengths and expertise in the department and on the Lehigh campuses. **Level 3: Translation Enabling Technologies** would focus on developing technological tools specifically to facilitate bench to bedside translation of fundamental discoveries. Examples of pertinent research areas are animal models, nanotherapeutics and drug delivery, and cell therapy/delivery.

In order to extend educational and research funding deliverables of the department beyond what is directly commiserate with resource investment, outreach and engagement of faculty outside BioE, such as those with primary appointments in other engineering departments and faculty at the new College of Health must continue to be pursued. **Scientific Working Groups** can be created to consolidate research and clinical expertise pertinent to each of the identified 'tissue application' thrusts identified above. The working groups will be composed of both core BioE faculty and secondary/adjunct faculty. The working groups will bring shared interest and experience in cross disciplinary work together towards organizing (multiple) collaborative teams that will serve to fulfill the department's research mission with specificity in an accelerated and efficient manner. Since the working groups will be composed of members with expertise drawn from all three levels of research conducted within the program, it is expected that the groups will significantly improve the volume and quality of research conducted, and provide peer-review to enhance quality of grant proposals submitted for extramural funding, and also provide opportunities to support and co-mentor undergraduate and graduate student research.

Strategic planning for the department must involve periodic reassessment of growth and diversification metrics based on faculty profile, collective research funding and measures of research productivity, available infrastructure, student enrollment, quality of education, and career placement. My vision is that in 5 years, the department will in a good position to increase the number of primary faculty by at least 50%, increase undergraduate enrollment by 50% and double graduate enrollment. By aligning our new hires to our identified strategic growth areas, pursuing thematic cluster hires, encouraging cross-disciplinary faculty collaborations and data sharing, and providing stable research infrastructure within the department and outside, through inter-institutional agreements, I believe that research productivity and funding can be significantly enhanced. Establishing strengths in our identified key research areas and bringing together a critical mass of investigators, will also allow us to pursue longer-term, high impact research funding through program project grants and educational grants.

As an educator and researcher in an academic setting, I have been intensely aware of the challenges and economic, social, and professional barriers faced by minorities and women in finding opportunities in science and in progressing through their careers. Over the last 17 years or so of my independent research I have thus committed myself to encouraging diversity in the workplace, and to promoting the career development of these less represented groups. Early in my independent research career, I was involved as a mentor for the Howard Hughes Research Program for Inner city schools in Cleveland. My mentoring of my first student, an African American high school senior, Leonard Curry, brought me close to understanding the financial hardships and poor educational infrastructure that these minority students from poor economic backgrounds have to contend with. I am happy to report that Leonard successfully completed high school and went on to obtain a science degree from The University of Memphis. In the years since, as a tenure track/tenured faculty at Clemson University and the Medical University of South Carolina (2003-2010) and thereafter at the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (CCLCM-CWRU), I have actively participated in numerous summer research training programs for women and minorities. For example, at the Medical University of South Carolina, for several consecutive years, I served as research supervisor for undergraduates selected to an institutional NIH T32 Cardiovascular Training for Minority Undergraduates (SURP) program. I participated in my university's NSF IDeA program and hosted undergraduate researcher, roughly half of them women and a third, minorities in my lab for research internships. At the Cleveland Clinic, I mentor students from local high schools- the Hathaway Brown School, Science Research and Engineering Program (Stephanie Zhou) and Beachwood High School (Matthew Auborg), who are both minorities. I also volunteer as a mentor and supervisor for the Science Internship Program (SIP) organized by the Office of Civic Education Initiatives (OCEI) at the Cleveland Clinic. I am also active as an evaluator for research disseminatory outcomes of SIP program participants. The SIP, initiated in 2005, is designed to increase high school students' interest and literacy in science by expanding their learning experiences beyond the classroom, and inspiring them to not only embrace science and math as keys to success, but to also encourage them to continue scientific studies throughout their academic careers. While this 9 week, paid summer internship primarily targets high achieving high school juniors and seniors, successful past internees now enrolled in college are also highly encouraged to reapply. Applicants to the program, which claims 700 alumni of all ethnicities and social strata, are drawn from schools from 22 Ohio counties and in many other states. I have also been active as a mentor for undergraduate students selected to our NSF REU program – two of these students have been female and have progressed on to pursue graduate degrees in bioengineering. Similarly, approximately half of my graduate trainees to date have been female, and several have been from minority racial groups, including currently, Jonah Thomas, an African American student in our MD physician scientist program at the CCLCM-CWRU, who is pursuing research in my lab. In working with all these students, I have always sought to provide a welcoming and positive learning environment. I intimately understand the need to fit in, be accepted and to receive and be able to avail of fair opportunities to progress in our personal and career development goals, aspects that we all tend to take for granted though not so. I continually strive to put in the effort to provide these conditions for all my students, minorities and women in particular. As a researcher I collaborate closely with several female faculty and staff, and a couple of colleagues from the LGBT community. As a faculty at your institution, I intend to continue my positive engagement with students and colleagues through such educational programs as described above, and as listed in my curriculum vita, and via my daily interactions. The strength of institutions and our scientific fields, not to mention our country, lies in our diversity and our diverse experiences and strengths. My strong commitment to fostering such diversity will always continue.