

# Douglas Eugene Rodriguez

210 Rhines Hall  
University of Florida  
Gainesville, FL 32611

d.rodriquez@ufl.edu  
(352) 792-0900

## EDUCATION & TRAINING

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- July 2009 - **University of Florida** Gainesville, FL  
Present *Post-Doctoral Fellow, Materials Science & Engineering*  
Howard Hughes Medical Institute (HHMI) – Faculty Fellow
- Aug 2009 **Texas A&M University** College Station, TX  
*Ph.D., Mechanical Engineering*
- May 2002 **Texas A&M University** College Station, TX  
*M.S., Mechanical Engineering*
- Dec 2000 **Texas A&M University** College Station, TX  
*B.S., Mechanical Engineering*

## RESEARCH EXPERIENCE

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- July 2009 - Materials Science & Engineering, **University of Florida** Gainesville, FL  
Present **HHMI- Faculty Fellow**
- Investigated biomimetic mineralization of bone (and pathological mineralization of kidneys) using non-collagenous proteins and their mimics as *in vitro* process-directing agents
  - Characterized *in vitro* osteoclast cell response to remineralized bone substrates
  - Performed characterization studies of developed collagen/hydroxyapatite (HA) composites via SEM, TEM, TGA/DTA, XRD, Raman spectroscopy and compression testing
  - Helped in directing 4 graduate student research projects, directed 6 undergraduate research projects
  - Co-wrote 1 funded NSF proposal, assisted with 2 funded NIH proposals
- Feb 2011 - Dept of Biology, **Morehouse College** Atlanta, GA  
Aug 2011 **HHMI- Faculty Fellow**
- Designed, developed protocols, and performed human mesenchymal stem cell (hMSC) studies on HA/collagen constructs
  - Performed characterization of hMSC response via DNA assay, alkaline phosphatase assay, live/dead cell viability, and gene expression techniques
- June 2010 Dept of Biomaterials, **Max Planck Institute of Colloids & Interfaces** Potsdam, Germany  
**Visiting Researcher** (*host: Dr. Peter Fratzl*)
- Performed nanoindentation and micro-tensile experiments to characterize effects of remineralization of bovine bone
  - Conducted ESEM studies to elucidate water composition of collagen/HA scaffolds

- 2003-2009 Mechanical Engineering, **Texas A&M University** College Station, TX  
**Graduate Research Assistant**
- Developed technique to infiltrate open-cell carbon foam with poly(DL-lactide)-co-poly (glycolide) (PLGA) reinforced HA micro-particles
  - Designed and performed *in vitro* degradation studies to elucidate absorption and resorption characteristics of HA/PLGA and HA/PLGA/Carbon foam specimens
  - Assisted in rat calvarial osteoblast *in vitro* biocompatibility study
  - Developed an experimental based time-dependent constitutive relationship for bioresorbable polymers based on diffusion and resorption rates
  - Created finite element (FE) models of *in situ* orthopedic device incorporating time-dependent constitutive relations to determine response to physiological loading
- Summer 2004 Institute of Biomedical Engineering, **National Taiwan University** Taipei, Taiwan  
**Visiting Research Student** (host: Dr. Tai-Horng Young)
- Developed and performed experimental evaluation of degradation mechanisms of poly(L-lactide) (PLLA) membranes
- 2001-2002 Mechanical Engineering, **Texas A&M University** College Station, TX  
**Graduate Research Assistant**
- Developed and conducted four-point flexure tests to experimentally evaluate response of composite tubes subjected to applied loads
  - Created FE models utilizing ABAQUS, incorporating non-linear geometry effects, residual stresses and material subroutine to detect progressive damage

## AWARDS & HONORS

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- June 2011 **GEM<sup>4</sup> Summer School**, Tuition Fellowship  
Georgia Institute of Technology
- Sept 2010 **Rice University NSF Advance Workshop**, Negotiating the Ideal Faculty Position  
Participant, ~17% acceptance rate, Rice University
- Aug 2010 **Carl Storm Underrepresented Minority Fellowship**, Conference Travel Award  
Biom mineralization Gordon Research Conference
- 2009 **Howard Hughes Medical Institute (HHMI) - Faculty Fellow**, Postdoctoral Fellowship  
Science for Life Program, University of Florida
- 2003-2005 **NSF LSAMP Bridge to Doctorate Graduate Fellowship**  
Texas A&M University
- 2004 **NSF East Asia and Pacific Summer Institutes Program**  
National Taiwan University
- March 2002 **1<sup>st</sup> Place Oral Presentation, Student Research Week**  
Texas A&M University
- May 2001 **Caddess Award – Outstanding Senior in Material Science**  
Dept. of Mechanical Engineering, Texas A&M University
- 2000 **TEES Undergraduate Summer Research Program**  
Texas A&M University
- 1998-2000 **3M Engineering Scholars Program**

- 1998-Present **Pi Tau Sigma**  
Mechanical Engineering Honor Society, Texas A&M University
- 1996-2000 **President's Achievement Award**, Academic Scholarship  
Texas A&M University

## RELEVANT WORK EXPERIENCE

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- 2008-2009 **Louis Stokes Alliance for Minority Participation, Texas A&M University**  
Program Coordinator
- Organized developmental seminars for Bridge to the Doctorate graduate fellowship students
  - Assisted associate program director with undergraduate research student seminars
  - Developed and maintained database to track student fellowship expenses
  - Designed and created TAMUS informational page for NSF publication
- 2003-2006 **Office of Graduate Studies, Texas A&M University** College Station, TX  
Graduate Assistant
- Assisted with recruitment of graduate students at multiple on-campus and off-campus recruiting fairs
  - Created informational brochures and initial website for Texas A&M University System *Pathways to the Doctorate* program
  - Created and maintained Access database to track Graduate Council / Graduate Operations Committee items for approval
  - Helped organize and run multiple new graduate student orientations
  - Assisted Dean of Graduate Studies with evaluation of research seed proposals

## INVITED TALKS

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### *International Conferences*

**Rodriguez DE**, "Role of non-collagenous proteins in the biomimetic mineralization process", Invited Speaker, Materials Science & Technology 2013, Montreal, Canada. October 29, 2013.

**Rodriguez DE**, "Multifunctional role of NCPs and their mimics in HA/collagen nanocomposites", Invited Speaker, The 10<sup>th</sup> Pacific Rim Conference on Ceramic and Glass Technology, San Diego, CA. June 6, 2013.

### *Regional and Local Talks*

**Rodriguez DE**, "Biomimetic Bone: From Materials Science to Biomedical Engineering", Invited Speaker at UF Chapter of Society for Biomaterials meeting, Gainesville, FL. Oct 16, 2012.

**Rodriguez DE**, "Engineering HA/Collagen Scaffolds: From the Nanoscale to the Macroscale", Texas Bioscience Institute, Temple, TX. Sept 9, 2011.

**Rodriguez DE**, "Mimicking Bone: From Collagen Fibrils to Porous Scaffolds to Dense Scaffolds", Max Planck Institute of Colloids & Interfaces, Potsdam, Germany. June 18, 2010.

**Rodriguez DE**, "Beyond the Ph.D.: Preparing for the Next Step", Texas A&M University LSAMP 6<sup>th</sup> Annual Symposium, College Station, TX. Feb 26<sup>th</sup>, 2010.

## REFEREED PUBLICATIONS

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Rodriguez DE, deGlee B, Seto J, Harris K, Fratzl P, Gower L. Bone-like micro-mechanical properties of remineralized bone created with a novel biomimetic process. *In preparation*.

Chidambaram A, Rodriguez DE, Gower LB, Khan S. Biomimetic Randall's plaque to develop an in-vitro model system for studying the role of acidic proteins in renal stone formation. Invited article to special issue of Urolithiasis. *In preparation (to be submitted by Jan 31, 2014)*.

**Rodriguez DE**, Guiza-Arguello V, Ochoa OO, Gharat T, Sue H-J, Lafdi K, Hahn M. Development of a hydroxyapatite-poly(D,L-lactide-co-glycolide) infiltrated carbon foam for orthopedic applications. Carbon. *Submitted*

**Rodriguez DE**, Khan SR, Gower LB. Initial investigations in applying a PILP-mineralization system to calcium oxalate formation using vapor diffusion. In: McKittrick J, Narayan R, Lin H-T, editors. Advances in Bioceramics and Biotechnologies II - Ceramic Transactions, Volume 247. (Feb 2014).

**Rodriguez DE**, Thula-Mata T, Toro E, Yeh, YW, Holt C, Holliday LS, Gower LB. Multifunctional role of osteopontin in directing intrafibrillar mineralization of collagen and activation of osteoclasts. *Acta Biomaterialia*, 10(1) 494-507 (2014).

Khan SR, **Rodriguez DE**, Gower L, Monga M. Association of Randall plaque with collagen fibers and membrane vesicles. *Journal of Urology*. 187(3) 1094-1100 (2012).

Thula TT, **Rodriguez DE**, Lee MH, Pendi L, Podschun J, Gower LB. In vitro mineralization of dense collagen substrates: a biomimetic approach toward the development of bone-graft materials. *Acta Biomaterialia*. 7(8) 3158-3169 (2011).

Thula TT, Svedlund F, **Rodriguez DE**, Podschun J, Pendi L, Gower LB. Mimicking the nanostructure of bone: comparison of polymeric process-directing agents. *Polymers*. 3(1) 10-35 (2011); doi:10.3390/polym3010010.

**Rodriguez DE**, Ochoa OO. Flexural response of spoolable composite tubulars: an integrated experimental and computational assessment. *Composite Science and Technology*, 64, 2075-2088 (2004).

## NON-REFEREED PUBLICATIONS

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**Rodriguez DE**, Gower L. Influence of mineral content on mechanical properties of porous hydroxyapatite/collagen scaffolds created using a biomimetic mineralization process. In: Proceedings of the American Society for Composites. Montreal: Canada, September 26-29, 2011.

**Rodriguez D**, Ochoa O, Hahn M, Sue H-J. Processing, morphology, and biocompatibility of hydroxyapatite and carbon foam reinforced bioresorbable polymer. In: Proceedings of the American Society for Composites 22<sup>nd</sup> Annual Technical Conference. Washington: Seattle; 2007.

**Rodriguez D**, Ochoa O, Lafdi K, Fox W, Lee IC, Young TH. Bioresorbable polymers and infiltrated carbon foams for biomedical applications. In: Proceedings of the ASC 20<sup>th</sup> Annual Technical Conference. Pennsylvania: Philadelphia; 2005.

Ochoa O, Walsh T, **Rodriguez D**. Hybrid composite tubulars. In: Proceedings of the ASC 17<sup>th</sup> Annual Technical Conference. Indiana: West Lafayette; 2002.

Ochoa O, **Rodriguez D**. Flexure behavior of composite spoolable tubes. In: 21<sup>st</sup> International Conference on Offshore Mechanics and Arctic Engineering. Oslo: Norway; 2002.

**Rodriguez D**, Ochoa O. Influence of geometry, lay-up, and material on the radius of curvature of spoolable composite tubulars. In: Proceedings of the ASC 16<sup>th</sup> Annual Technical Conference. Virginia: Blacksburg; 2001.

## PODIUM PRESENTATIONS

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**Rodriguez DE**, Gower L. Influence of mineral content on mechanical properties of porous hydroxyapatite/collagen scaffolds created using a biomimetic mineralization process. American Society for Composites. Montreal: Canada, September 26-29, 2011.

**Rodriguez D**, Nassif N, Thula T, Wang Y, Babonneau F, Giraud-Guille MM, Gower L. Biomimetic bone: mineralization of dense collagen matrices. MRS Spring 2011 Meeting. California: San Francisco, April 25<sup>th</sup>-29<sup>th</sup>, 2011.

**Rodriguez D**, Catania C, Brown S, Gower L. Mechanical properties of biomimetically mineralized collagen fibrils using nanoindentation techniques. MRS Spring 2010 Meeting. California: San Francisco, April 5<sup>th</sup>-9<sup>th</sup>, 2010.

**Rodriguez D**, Ochoa O, Hahn M, Sue H-J. Processing, morphology, and biocompatibility of hydroxyapatite and carbon foam reinforced bioresorbable polymer. In: Proceedings of the American Society for Composites 22<sup>nd</sup> Annual Technical Conference. Washington: Seattle; 2007.

**Rodriguez D**, Hahn M, Sue H-J, Lafdi K, Ochoa O. Bioresorbable polymers and carbon foam: development and characterization of filled foams for orthopedic devices. In: Society of Engineering Science 44<sup>th</sup> Annual Technical Meeting. Texas: College Station; 2007.

**Rodriguez D**, Ochoa O, Lafdi K, Fox W, Lee IC, Young TH. Bioresorbable polymers and infiltrated carbon foams for biomedical applications. In: Proceedings of the ASC 20<sup>th</sup> Annual Technical Conference. Pennsylvania: Philadelphia; 2005.

**Rodriguez D**, Ochoa O. Influence of geometry, lay-up, and material on the radius of curvature of spoolable composite tubulars. In: Proceedings of the ASC 16<sup>th</sup> Annual Technical Conference. Virginia: Blacksburg; 2001.

## POSTER PRESENTATIONS

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- **Rodriguez D**, Peister A, Gower L. "Human MSC response to collagen substrates mineralized with HA using a biomimetic process - preliminary results." 2011 GEM<sup>4</sup> Summer School, Atlanta, GA. June 20-30, 2011.
- **Rodriguez D**, deGlee B, Allen J, Gower L. "Osteoblast response to biomimetically mineralized hydroxyapatite/collagen scaffolds." 15<sup>th</sup> Annual Hilton Head Workshop "Regenerative Medicine: Innovations for Clinical Applications". Hilton Head, SC, March 16-19, 2011.
- **Rodriguez D**, Brown S, Gower L. "AFM nanoindentation of mineralized collagen fibrils." Gordon Research Conference on Biomineralization, Colby-Sawyer College, August 15-20, 2010.
- **Rodriguez D**, Gower L. "Mimicking Bone: From Collagen Fibrils to Porous Scaffolds to Dense Scaffolds." Material Science & Engineering Annual Banquet, University of Florida, April 22, 2010.
- **Rodriguez D**, Sue H-J, Lafdi K, Hahn M, Ochoa O. "Development of reinforced biopolymers for orthopedics." Polymer Technology Industrial Consortium, Texas A&M University, Oct 2007.

## TEACHING EXPERIENCE

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- Co-Instructor, *Introduction to Material Science*, Morehouse College Pre-Freshman Bridge Summer Science Program, June - July 2011
- Guest lecturer for undergraduate biomaterials class (EMA 4061), UF Fall 2010, Fall 2011 (Developed and delivered 3 sets of lectures on *Bone Structure & Physiology*, *Hard Tissue Biomaterials*, and *Orthopedic/Dental Biomaterials*)
- Guest lecturer for undergraduate biomaterials class (EMA 4061), UF Fall 2009 (Developed and delivered 2 sets of lectures on *Composite Biomaterials*)
- Participant in the Center for the Integration of Research, Teaching, and Learning (CIRTL) Annual Forum, Madison, WI, November 2003

## RESEARCH MENTORING

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- UF University Scholar undergraduate Aline Yonezawa (BME), Aug 2013 – Present
- UF undergraduate Juan Gabriel Taquero (MSE), Aug 2013 – Present
- UF undergraduate Jessica Rex (MSE), Jan 2013 - May 2013
- UF undergraduate Ben deGlee (MSE), May 2010 - May 2012
- UF University Scholar undergraduate, Chelsea Catania (MSE), July 2009 - May 2011, (Recipient of 2011 NSF Graduate Student Research Fellowship)
- UF undergraduate David Hwang (MSE), Oct 2009 - May 2010
- TAMU undergraduate Vincent Barker (ME), September 2008 - May 2009
- TAMU undergraduate international exchange student (ME), Sylviane Gomez, Fall 2003

## UNIVERSITY SERVICE

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- Reviewer for South Carolina Space Grant Consortium – REAP Program, August 2013
- Poster Judge, UF Biomaterials Day, March 22, 2013
- Video Presentation Judge, Morehouse College Pre-Freshman Bridge Summer Science Program, July 12, 2011
- Poster Judge, 23<sup>rd</sup> Annual MAPP Student Scientific Research Symposium, Morehouse College, Feb 9, 2011
- Poster Judge, Summer REU Poster Presentation, SEAGEP, University of Florida, July 30, 2010
- New Graduate Student Orientation, Member of Discussion Panel, South East Alliance for Graduate Education and the Professoriate (SEAGEP) Program, UF, Sept. 26<sup>th</sup>, 2009
- TAMU University Disciplinary Appeals Panel, Graduate Student Representative, 2003-2008
- 1<sup>st</sup> Annual Lonestar Diversity Colloquium, Member of Organizing Committee, Spring 2006
- TAMU Association of Former Students Outstanding Graduate Student Awards Selection Committee, Spring 2006

## DEVELOPMENTAL WORKSHOPS

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- 2011 GEM<sup>4</sup> Summer School: Cellular and Molecular Machines with a focus on Biological Machines, Georgia Institute of Technology, June 20-30, 2011
- Negotiating the Ideal Faculty Position Workshop, Rice University NSF Advance Program, Sept 2010
- Career Development for New Engineering Faculty, College of Engineering, UF, Aug 2009
- NSF Joint Annual Meeting (Division of Human Resource Development), June 2009
- NSF Joint Annual Meeting (Division of Human Resource Development), June 2004

## PROFESSIONAL MEMBERSHIPS

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- The Minerals, Metal, and Materials Society (TMS)
- Materials Research Society
- American Society for Composites
- American Society of Mechanical Engineers