

**Kenneth M. Dupont, Ph.D.**  
**Associate**

**Professional Profile**

Dr. Kenneth Dupont is an Associate in Exponent's Biomechanics practice. Dr. Dupont specializes in issues involving the biomechanics of biological systems at a variety of size scales, such as whole-body kinematics and the performance and design of prosthetic devices at the macro scale, preclinical in vivo studies involving bioengineered tissue system mechanical testing at the intermediate scale, and finally micro scale design and biomechanical testing of cell-based systems. At Exponent, his work in biomechanics has focused on human kinematics and injury mechanisms in motor vehicle (e.g., high- and low-speed planar collisions), pedestrian, sporting, industrial, and fall accidents. Dr. Dupont also analyzes injury causation matters to assess whether the mechanisms of traumatic injury are present in an event and sufficient to be related to particular pathologies. His current research interests include occupant kinematics and injury potential in heavy-truck/passenger vehicle collisions. Dr. Dupont completed his bachelor's, master's, and doctorate degrees in mechanical engineering, and he is knowledgeable in the areas of statics and dynamics, strength of engineering and biological materials, human physiology, mathematical modeling of biological systems, and statistics.

Prior to joining Exponent, Dr. Dupont performed research at the Georgia Institute of Technology's Orthopaedic Bioengineering Laboratory and Vascular Cell Mechanics Laboratory. Dr. Dupont's research areas included design of biomechanical testing systems to create mechanical stimuli for use in the study of vascular cell biomechanics. He has additional research experience in tissue engineering and regenerative medicine, particularly stem cell and gene therapy based therapies for treating musculoskeletal pathologies, with a focus on large bone defects. He has experience with various imaging modalities including micro-CT as well as knowledge of numerous biological assays in both in vitro and in vivo systems.

**Academic Credentials and Professional Honors**

Ph.D., Mechanical Engineering, Georgia Institute of Technology, 2010  
M.S., Mechanical Engineering, Georgia Institute of Technology, 2008  
B.S., Mechanical Engineering, Georgia Institute of Technology (high honors), 2004

NSF Graduate Research Fellowship  
NIH Biotechnology Training Grant  
Georgia Tech President's Fellowship  
Medtronic Fellowship

Pi Tau Sigma Mechanical Engineering Honor Society  
Golden Key International Honour Society

## **Licenses and Certifications**

Licensed Engineer in Training, Pennsylvania, #ET013723

## **Languages**

Spanish – Conversational / Moderate

## **Publications**

Boerckel JD, Kolambkar YM, Stevens HY, Lin AS, Dupont KM, Guldborg RE. Effects of in vivo mechanical loading on large bone defect regeneration. *The Journal of Orthopaedic Research* 2011 Dec 14; Epub ahead of print.

Johnson MR, Boerckel JD, Dupont KM, Guldborg RE. Functional restoration of critically sized segmental defects with bone morphogenetic protein-2 and heparin treatment. *Clinical Orthopaedics and Related Research* 2011 Nov; 469(11):3111–3117. Epub 2011 Aug 24.

Dupont KM, Boerckel JD, Stevens HY, Diab T, Kolambkar YM, Takahata M, Schwarz EM, Guldborg RE. Synthetic scaffold coating with adeno-associated virus encoding BMP2 to promote endogenous bone repair. *Cell and Tissue Research* 2011 June; Epub ahead of print.

Kolambkar YM, Boerckel JD, Dupont KM, Bajin M, Huebsch N, Mooney DJ, Huttmacher DW, Guldborg RE. Spatiotemporal delivery of bone morphogenetic protein enhances functional repair of segmental bone defects. *Bone* 2011 Sep; 49(3):485–492. Epub 2011 May 18.

Boerckel JD, Kolambkar YM, Dupont KM, Uhrig BA, Phelps EA, Stevens HY, Garcia AJ, Guldborg RE. Effects of protein dose and delivery system on BMP-mediated bone regeneration. *Biomaterials* 2011 Aug; 32(22):5241–5251. Epub 2011 Apr 20.

Rodowicz KA, Dupont K, Smedley J, Raasch C, Mkandawire C, Fittanto D, Bare C, Smith J. Passenger vehicle occupant response to low-speed impacts with a tractor-semitrailer. *SAE Paper* 2011-01-112, Apr 12, 2011.

Kolambkar YM, Dupont KM, Boerckel JD, Huebsch N, Mooney DJ, Huttmacher DW, Guldborg RE. An alginate-based hybrid system for growth factor delivery in the functional repair of large bone defects. *Biomaterials* 2011 Jan; 32(1):65–74. Epub 2010 Sep 21.

Dupont KM, Sharma K, Stevens HY, Boerckel JD, García AJ, Guldborg RE. Human stem cell delivery for treatment of large segmental bone defects. *PNAS* 2010 Feb 23; 107(8):3305–3310. Epub 2010 Jan 19.

Dupont KM. Human stem cell delivery and programming for functional regeneration of large segmental bone defects. *Doctoral Dissertation, Georgia Institute of Technology, 2010.*

Wojtowicz AM, Shekaran A, Oest ME, Dupont KM, Templeman KL, Huttmacher DW, Guldborg RE, García AJ. Coating of biomaterial scaffolds with the collagen-mimetic peptide

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GFOGER for bone defect repair. *Biomaterials* 2010 Mar; 31(9):2574–2582. Epub 2009 Dec 26.

Boerckel JD, Dupont KM, Kolambkar YM, Lin ASP, Guldborg RE. In vivo model for evaluating the effects of mechanical stimulation on tissue-engineered bone repair. *Journal of Biomechanical Engineering* 2009 Aug; 131(8):084502.

Guldborg RE, Oest ME, Dupont K, Peister A, Deutsch E, Kolambkar Y, Mooney D. Biologic augmentation of polymer scaffolds for bone repair. *Journal of Musculoskeletal and Neuronal Interactions* 2007 Oct-Dec; 7(4):333–334.

Oest ME, Dupont KM, Kong HJ, Mooney DJ, Guldborg RE. Quantitative assessment of scaffold and growth factor-mediated repair of critically sized bone defects. *The Journal of Orthopaedic Research* 2007 Jul; 25(7):941–950.

Rai B, Oest ME, Dupont KM, Ho KH, Teoh SH, Guldborg RE. Combination of platelet-rich plasma with polycaprolactone-tricalcium phosphate scaffolds for segmental bone defect repair. *Journal of Biomedical Materials Research A* 2007 Jun 15; 81(4):888–899.

Guldborg RE, Oest ME, Lin ASP, Dupont KM, Peister A, Bellamkonda RV, Mooney DJ, Schwarz EM, Zhang X, O’Keefe RJ. Strategies for segmental bone repair. *European Cells and Materials* 2007; 13 (Supp 2):9.

### **Book Chapters**

Guldborg RE, Peister A, Boerckel JD, Dosier CR, Dupont KM, Johnson MR, Lin ASP, Oest ME, O’Keefe RJ. Chapter 7, pp. 125–144. *Translational Approaches for Engineering Bone Repair*. In: *Translational Approaches in Tissue Engineering and Regenerative Medicine*. Mao J, Vunjak-Novakovic G, Mikos A, Atala A (eds), Artech House, 2007.

### **Presentations / Abstract and Conference Proceedings**

Boerckel JD, Kolambkar YM, Dupont KM, Lin ASP, Guldborg RE. Load-bearing enhances segmental bone defect repair by altering bone formation and distribution. Poster presentation. Hilton Head Regenerative Medicine Workshop, Hilton Head, SC, March 2010.

Dupont KM, Stevens HY, Boerckel JD, Diab T, Takahata M, Schwarz EM, Guldborg RE. Synthetic scaffold functionalization by adeno-associated virus encoding BMP2 for orthotopic bone defect repair. Short talk. 56<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, March 2010.

Boerckel JD, Dupont KM, Kolambkar YM, Lin ASP, Guldborg RE. Load-bearing enhances segmental bone defect repair by altering bone distribution. Short talk. 56<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, March 2010.

Johnson MR, Boerckel JD, Dupont KM, Cool S, Guldberg RE. Integration of heparin in collagen delivery systems for BMP2-induced bone repair. Short talk. 56<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, March 2010.

Kolambkar YM, Boerckel JD, Dupont KM, Bajin M, Huebsch N, Mooney D, Hutmacher D, Guldberg RE. Spatiotemporal BMP delivery enhances functional repair of segmental bone defects. Short talk and poster presentation. 56<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, March 2010.

Boerckel JD, Dupont KM, Kolambkar YM, Lin ASP, Guldberg RE. In vivo model for assessing the role of load-bearing in tissue-engineered bone repair. Short talk and poster presentation. Hilton Head Regenerative Medicine Workshop, Hilton Head, SC, March 2009.

Dupont KM, Sharma K, Garcia AJ, Guldberg RE. Tracking human adult and fetal stem cells during segmental bone repair. Short talk and poster presentation, 55<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, Las Vegas, NV, February 2009.

Boerckel JD, Dupont KM, Kolambkar YM, Lin ASP, Guldberg RE. In vivo model for assessing the role of load-bearing on tissue-engineered bone repair. Poster presentation, 55<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, Las Vegas, NV, February 2009.

Kolambkar YM, Dupont KM, David Mooney, Dietmar Hutmacher, Guldberg RE. Effect of nanofiber mesh design on bmp-mediated segmental bone defect repair. Short talk and poster presentation, 55<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, Las Vegas, NV, February 2009.

Dupont KM, Sharma K, Garcia AJ, Guldberg RE. Tracking human adult and fetal stem cells during segmental bone repair. Short talk and poster presentation, Georgia Tech/Emory Center for the Engineering of Living Tissues Industrial Partners Symposium, Atlanta, GA, October 2008.

Wojtowicz AM, Oest ME, Dupont KM, Burns KL, Hutmacher DW, Guldberg RE, García AJ. Collagen-mimetic Scaffold Coating Enhances Healing of Critically-Sized Bone Defects. Short talk, Society for Biomaterials Annual Meeting, Atlanta, GA, September 2008.

Oest ME, Dupont KM, Kong HJ, Mooney DJ, Guldberg RE. Effects of co-delivering low-dose VEGF with osteogenic growth factors on bone formation and revascularization of critically-sized defects. Poster presentation, 54<sup>th</sup> Annual Meeting of the Orthopaedic Research Society, San Francisco, CA, March 2008.

Oest ME, Dupont KM, et al. Delivery of BMP-2 and TGF-Beta3 additively enhances functional repair of segmental bone defects. Poster presentation, Hilton Head Regenerative Medicine Workshop, Hilton Head, SC, March 2007.

## **Prior Experience**

Graduate Research Assistant, Orthopaedic Bioengineering Laboratory, Georgia Institute of Technology, 2004–2009

Undergraduate Research Assistant, Vascular Cell Mechanics Laboratory, Georgia Institute of Technology / Emory University, 2001

ProCare-Prosthetic Care, Inc., Internship focusing on fabrication of prosthetic and orthotic devices, 1999

## **Editorial Review Boards / Ad Hoc Reviewer**

Ad Hoc Reviewer – Acta Biomaterialia 2010, 2011

Ad Hoc Reviewer – Journal of Tissue Science and Engineering 2011

## **Professional Affiliations**

American Society of Mechanical Engineers—ASME

Biomedical Engineering Society—BMES