

Curriculum Vitae

Ian M. Zeller Ph.D. ACTAR

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BACKGROUND

Dr. Zeller is an accomplished engineer with more than 10 years of experience in biomechanics and computational dynamics fields. He has investigated hundreds of cases ranging from motor vehicle accidents, recreational incidents, medical device designs, as well as injuries from product liability all across the United States. Dr. Zeller has graduate level experience in computational dynamics and orthopedic biomechanics with a specific emphasis in dynamics, vibrations, joint contact mechanics, and muscle control during static and dynamic loading applications. Dr. Zeller's past research includes clinical and computational analysis of the human body with respect to the design and implantation of orthopedic devices for the knee, hip, and spine. He has published in peer-reviewed journals and presented research at both technical and surgical conferences in North America, Europe, and Asia.

Dr. Zeller has an extensive background in biomechanics including the development, validation, and application of mechanical models of the human body using statistical modeling and prediction techniques coupled with motions captured from live human subjects. These models are parameterized for anatomy and physiology and are capable of simulating and predicting joint mechanics for healthy, diseased, and surgically-repaired knees in living subjects of varying demographic groups, facilitating improved targeting of interventional strategies and techniques. Dr. Zeller also worked with surgeons across the United States in the design and assessment of knee replacement devices, including personalized and prototype devices to optimize for efficacy and safety.

Dr. Zeller Additionally is accredited as a traffic accident reconstructionist and continues to conduct research as well as maintain a current knowledge of developing trends and best practices in the biomechanics and engineering fields. Dr. Zeller has published to various organizations on topics ranging from knee replacement design, forward solution modeling, joint mechanics, personalized joint replacements, material structures and properties as well as biological modeling of disease distributions. He also has an extensive testifying history including depositions, trials, and arbitrations.

AREAS OF EXPERTISE

- Biomechanical Analysis
- Accident Reconstruction
- Injury Consistency
- Mechanism of Injury Analysis
- Vehicle Occupant Kinematics
- Falling Object Mechanics and Analysis
- Bicycle Accidents
- Pedestrian Accidents
- Amusement Park and Playground Accidents
- Crash Data Retrieval and Analysis
- Product Failure Analysis

- Seat Belt Analysis
- Restraint System
- Occupant Position Determination
- Sequential Events Analysis
- Speed Analysis
- Vehicle Damage Consistency
- Collision Avoidance
- Material Fracture Analysis

PROFESSIONAL LICENSES & CERTIFICATIONS

- Accreditation Commission for Traffic Accident Reconstruction (ACTAR) Number 3713
- Certified Playground Safety Inspector (CPSI #47727-1222)

EDUCATION

- Ph.D., Biomedical Engineering (Biomechanics) University of Tennessee, Knoxville, TN, 2018
- M.S., Biomedical Engineering, University of Tennessee, Knoxville, TN, 2014
- B.S., Materials Science and Engineering Clemson University, Clemson SC, 2012

PROFESSIONAL ASSOCIATIONS

- National Safety Council (NSC)

PROFESSIONAL EXPERIENCE

2023 – Present | Quality Forensic Engineering, LLC | Biomechanical Engineer, Tallahassee, FL
2018-2023 | Rimkus Consulting Group | Senior Consultant, 2018-2023, Orlando, Florida
| Principal Consultant, 2023, Orlando, Florida
2012-2018 | University of Tennessee | Graduate Research Assistant – 2012 to 2018, Knoxville, TN
| Graduate Teaching Assistant 2015 to 2018, Knoxville, TN
| Senior Design Project Consultant 2017-2018, Knoxville, TN
2010-2011 | Tetramer Technologies, LLC | Research Scientist (Cooperative Education) | Pendleton, SC
2010-2011 | Kohler Company | Ceramic Engineer (Cooperative Education) | Spartanburg, SC
2009-2012 | Clemson University | Researcher (Mathematics and Materials Science) | Clemson, SC

NOTABLE PROJECTS

Mathematical Modeling Knee

Dr. Zeller developed and enhanced a 36 degree of freedom multibody forward solution model of the human lower limb in order to assess prospective surgical techniques and device designs with the goal of reproducing the functionality of these same components and techniques in the real world. This model used 3Dimensional representations of bone structures, ligament, and tendon placement insertions with optimized mechanical controllers applied to the controlling muscles during multiple flexion-based activities. This model was subsequently used to evaluate the motions of the knee under pathological conditions and for different demographics with this model ultimately being used to evaluate multiple

orthopedic devices currently on the market. This model additionally sees continued use in future device designs.

Personalized Geometry Knee Replacements

Dr. Zeller was one of the first researchers to complete live patient studies evaluating the motions and contact forces of knee replacements under fluoroscopic evaluation. This included human subject testing, interfacing with external sensors and radiology coordination through a multigenerational device comparison with the aim of validating novel design features while understanding the relationship between geometry in function for knee arthroplasty devices. Through this research Dr. Zeller showed functional advantages to asymmetric and personalized geometric designs pertaining to knee function during daily activities.

Ceramic Composition and Processing

Dr. Zeller designed and conducted long-term cost control and quality control studies to evaluate material properties for both raw and processed ceramic material under varying compositions and processing techniques to better optimize manufacturing processes while preserving the mechanical properties of the resulting products. These studies additionally evaluated the ceramic firing process for the purposes of establishing statistical criteria and establishing consistency during the ceramic firing process to preserve consistent material properties in the finished products. The material formulas developed were subsequently used in ceramic whitewares throughout the Southeast United States.

HONORS AND AWARDS

- American Ceramic Society National Speaking Competition Finalist (2011)
- Kohler Company College Scholarship (2011)
- Clemson University Cliff C. Fain Student Achievement Award (2012)
- International Congress for Joint Reconstruction Pan Pacific Basic Science Research Award (2014)

COURSEWORK/CONTINUING EDUCATION

Advanced Coursework: Musculoskeletal Biomechanics, Mechanobiology, Statics and Dynamics, Mechanical Vibrations, Mechanics of Materials, Dynamic Control and Simulation, Solid State Mechanics, Smart Materials and Applications, Computational Biology, Non-Crystalline Materials, Metallic Manufacturing, Data Mining and Pattern Recognition, Material Structures and Properties, Robotic Modeling and Control.

Continuing Education

December 2019 | Certified Playground Safety Inspector Course, Altamonte Springs Florida

September 2019 | Simcenter Madymo Introduction (V7.7), Livonia Michigan

October 2018 | Northwestern University: Crash Investigation 2, Online

September 2018 | Bosch CDR Tool Technician Training, Online

August 2018 | Institute of Police Technology and Management: Energy Methods and Damage Analysis in Traffic Crash Reconstruction, Jacksonville Florida

June 2018 | Northwestern University: Crash Investigation 1, Online

PUBLICATIONS AND PRESENTATIONS

- Zeller, Ian Michael**, The Role of Biomechanics in the Evaluation of Injury Claims, *Insurance Business Magazine* April 2020
- Zeller, Ian Michael**, "Parameterization of a Next Generation In-Vivo Forward Solution Physiological Model of the Human Lower Limb to Simulate and Predict Demographic and Pathology Specific Knee Mechanics" PhD diss., University of Tennessee, 2018.
- Ian Zeller**; Trevor Grieco; Bradley Meccia; Adrija Sharma; Douglas Dennis; Richard Komistek; "Mathematical Modeling of the Knee: Kinematic Analysis of Implant Design, Surgical Technique and Abnormal Pathology" (Scientific Exhibit) American Academy of Orthopedic Surgeons Annual Meeting 2018 New Orleans, LA
- IM Zeller**, A Sharma, WB Kurtz, MR Anderle, RD Komistek. "Customized Versus Patient Matched Cruciate Retaining Total Knee Arthroplasty: An In Vivo Kinematics Study Using Mobile Fluoroscopy" *Journal of Arthroplasty*, Volume 32, Issue 4, Pages 1344–1350.
- I Zeller**, G Dessinger, A Sharma, TK Fehring, R Komistek: "In Vivo Kinematics for Subjects Having a Posterior Stabilized Total Knee Arthroplasty with Gradually Reducing Curved Condylar Geometry" *Journal of Bone and Joint Surgery Orthopaedic Proceedings*, Volume 100 Supplemental Issue 5 Page 23, 2018.
- I Zeller**, T Grieco, B Meccia, A Sharma, R Komistek: "Development of a Mathematical Model to Successfully Predict Normal Knee Kinematics" *Orthopaedic Proceedings*, Volume 100 Supplemental Issue 5, Page 24, 2018.
- Grieco, T., LaCour, M., **Zeller, I.**, Sharma, A., Cates, H., Hamel, W., & Komistek, R "Kinematic Comparison of a First and Second Generation BCS TKA during a Deep knee Bend" *Orthopaedic Proceedings*. Vol. 99. No. SUPP_4. Bone & Joint, 2017.
- IM Zeller**, WB Kurtz, MD Ta, GM Dessinger, A Sharma, RD Komistek: "In-Vivo Kinematics for Patients Implanted with a Customized, Patient Specific Posterior Stabilized Total Knee Arthroplasty Vs a Traditional Patient Sized Off the Shelf TKA During Activities of Daily Living." *The Knee* Volume 24 Issue 6, Page VIII, 2017.
- Ian Zeller**; Trevor Grieco; Bradley Meccia; Adrija Sharma; Richard Komistek; "Development and Implementation of a Mathematical Model to Successfully Predict Normal Knee Kinematics" *International Society for Technology in Arthroplasty Annual Meeting 2017, Seoul South Korea*
- Ian Zeller** "In Vivo Mechanics and Vibration of the Knee Joint." *Insall & Scott Surgery of the Knee*, 6th Ed, Edited by W. Norman Scott, Textbook Chapter, 2016.
- Grieco, T; Komistek, R; Sharma, A; Hamel, W; **Zeller, I**; "In Vivo Mobile Fluoroscopic Analysis: Traditional and More Challenging Activities for subjects having a TKA", *Orthopaedic Proceedings* 98 SUPP_8 118-118 2016 Bone & Joint
- Reza Abiri; **Ian Michael Zeller**; Xiopeng Zhao "Parametric Analysis of Cancer Dynamics: An Evaluation of Environmental Contributing Factors" *Biomedical Engineering Society Annual Meeting 2015, Tampa, Florida*
- R Komistek, W Hamel, M Young, **I Zeller**, T Grieco, A Sharma: "In Vivo Kinematics of the Knee Using Both Stationary and Mobile Fluoroscopy" *Journal of Bone and Joint Surgery*, Volume 95 Supplemental Issue 34, pages 211-211, 2013.
- Viktorova, M. Scruggs, **I. Zeller** and K. Fairchild, "An Analysis of Heat Explosion for Thermally Insulated and Conducting Systems." *Applied Mathematics*, Vol. 3 No. 6, 2012, pp. 535-540.
- Zeller, IM**; Seeber, MJ; Luzinov I "Modification of PVDF Fibers Containing PNIPAM Containing Nanogels" *Material Science and Technology Annual Meeting 2011 Columbus, OH*