

Curriculum Vitae

Ian M. Zeller, Ph.D., P.E., ACTAR

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BACKGROUND

Dr. Zeller is an accomplished engineer with more than 15 years of experience in materials science, biomechanics, and computational dynamics fields. He has investigated more than a thousand cases ranging from motor vehicle accidents, recreational incidents, medical device designs, trip/slip and fall accidents, and product liability cases 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, textbooks, 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 specific 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 clinical assessment of knee replacement devices, including personalized and prototype devices to optimize for efficacy and safety. He also taught engineering principles to surgeons through local seminars and at the American Academy of Orthopedic Surgeons (AAOS) meetings.

Additionally, he is a licensed Professional Engineer in multiple states and is accredited as a traffic accident reconstructionist. He continues to conduct research and maintain a current knowledge of developing trends and best practices in the biomechanics and engineering fields. Dr. Zeller has published in various organizations on topics ranging from knee replacement design and forward solution modeling to joint mechanics, personalized joint replacements, material structures and properties, as well as biological modeling of disease distributions. He also has an extensive testifying history, having been under oath more than 210 times, including depositions, trials, and arbitrations on cases involving accident reconstruction, injury mechanisms, and workers' compensation.

AREAS OF EXPERTISE

- Biomechanical Analysis and Injury Consistency
- Accident Reconstruction
- Mechanism of Injury Analysis
- Vehicle Occupant Kinematics and Kinetics
- Occupant and Pedestrian Kinematics
- Falling Object Mechanics and Analysis

- Bicycle, Motorcycle, and Pedestrian Accidents
- Theme Park and Recreation Facility Safety
- Waterslide and Playground Accidents
- Black Box and ECM Downloads and Analysis
- Product and Machinery Failure Analysis
- Seat Belt and Restraint System Analysis
- Occupant Position Determination
- Sequential Events Analysis
- Vehicle Speed Analysis
- Vehicle Damage Consistency
- Collision Avoidance
- Material Fracture Analysis
- Commercial Vehicle Investigation
- Automobile and Tractor-Trailer Collisions
- Boat and Watercraft Accidents
- Digital Video Analysis
- Golf Cart, RV, and ATV Accidents
- Retail Facility Safety
- Slip, Trip and Fall Investigations
- Workplace Safety, OSHA, and ADA Regulations

PROFESSIONAL LICENSES & CERTIFICATIONS

- Licensed Professional Engineer, Florida, #100760
- Licensed Professional Engineer, Georgia, #PE053801
- Licensed Professional Engineer, Louisiana, #PE.0050130
- Licensed Professional Engineer, South Carolina, #43963
- 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)
- ASTM International (Forensic Engineering Committee)
- National Association of Professional Accident Reconstruction Specialists (NAPARS)

PROFESSIONAL EXPERIENCE

2023 – Present | Quality Forensic Engineering LLC | Senior Biomechanical Engineer, Tallahassee, FL

| Biomechanical Engineer 2023 to 2025, Tallahassee, FL

2018 – 2023 | Rimkus Consulting Group | Senior Consultant – 2018 to 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 to 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

Small Scale Forensic and Accident Reconstruction Projects

Dr. Zeller has worked as the project lead on more than 1500 small-scale forensic consultations averaging between 8 and 20 hours of work each. These were located nationwide and entailed the entire process from scope confirmation up through defending opinions in court. Dr. Zeller's specific role was to manage each project including the review of all statements, technical documentation, and medical records. This included tasks such as reviewing and completing calculations related to vehicle damage as well as dimensional data and math properties and using principles such as momentum, energy and impulse in order to establish both kinetics and kinematics on motor vehicles in crashes, based on the available physical evidence. Dr. Zeller was additionally involved mathematically determining the associated forces on occupants within these vehicle crashes within the context of tissue stresses and tolerances on the human body. This was done through the evaluation of the mechanical coupling between occupant and vehicle systems to establish case specific injury probability as well as provide feedback on the efficacy of modern safety features on vehicles for a number of modes and magnitudes of car crashes through the calculation of the forces and torques on the body. This process from start to finish involved hands-on work including the review and understanding of principles established in biomechanics, accident reconstruction, and biomechanics studies, as well as calculations pertaining to crash specific vehicle and occupant motions, material calculations of tissue loads and tolerances including bone, cartilage, and ligaments. Finally, Dr. Zeller had the additional role of testing these methods for validity within the scientific community and defending these methods and conclusions in court.

Slip and Fall Biomechanics

In order to complete several nationwide projects (Florida, Georgia, and Texas), Dr. Zeller led several research projects pertaining to the evaluation of slip and fall and trip and fall biomechanics. These included a review of pertinent facts including descriptions, scene measurements, and videos for the purposes of understanding both causes and mitigation strategies. His specific roles involved the calculation of surface friction, ground reaction forces, as well as the forces in torques on the body during the normal gait process and during slip and fall events. The initial conditions were used to determine underlying circumstances and the post moment forces were used to assess any associated injury mechanisms within the context of specific tissue tolerances. This specific set of projects included about 10-15 local documented slip and fall incidents up to and including a computational recreation of the incident conditions to evaluate and validate the calculated movement profiles using both forward and inverse kinematic models. The scope of this set of projects was to evaluate slip and fall conditions and evaluate optimal fall patterns to mitigate injuries.

Municipal Playground Safety

Dr. Zeller has led multiple small-scale projects involving the evaluation of specific injury related instances on playgrounds (mostly in the state of Florida). This included an analysis which were performed regarding calculations of the force's children experience falling off playground equipment, as well as fall orientations with respect to specific injury mechanisms. This additionally included the Playground Safety Inspector certification and review regarding ASTM F1487 with respect to general playground standards along with various others including specific instances such as water parks, and netted play structures. Dr. Zeller's role was to evaluate the applicability and effectiveness of the standards with respect to predominantly head and upper extremities on a case-by-case basis including an assessment of surfacing material, volume fill, and age appropriateness of play structures. This was done through the calculations of forces and accelerations experienced in real world environments and comparisons with both published tissue tolerances and published standards. Similar to the other projects my goal was to understand playground accidents and determine effectiveness of standards and regulations on a case-by-case basis.

Mathematical Modeling Knee and Surgical Simulator

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.

Human Body Forward and Inverse Solution Model

Dr. Zeller developed, tested, and coded various complex computational models of the human body for the purposes of understanding motions, forces, torques, contact constraints, material properties, and forcing functions of the knee, spine, ankle, and hip. These models included contact geometries, muscle control, and material properties for the purposes of understanding the relationships between forces and motions. This research additionally expanded to anthropomorphic robotic manipulators including, controls systems, as well as their applications to human muscle control optimization, anatomical motions, and singularity avoidance.

Cancer Dynamics Model

Dr. Zeller collaborated with a multidisciplinary team to develop a multidimensional single organ cancer model for the purposes of evaluating convergence conditions along with variation of parameters for cancer treatment models and the effects of the surrounding environment. This research was presented at the annual meeting of the Biomedical Engineering society.

Personalized Geometry Knee Replacements

Dr. Zeller was one of the first researchers to complete live patient studies evaluating the motions and contact forces of personalized 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.

Integral Transformations and Wavelet Decomposition

Dr. Zeller led an interdisciplinary team to research engineering applications of integral transformation functions. These included applications in signal processing, statistical analysis, and engineering. From derivation, testing, and coding, this process culminated in presentations at multiple conferences regarding wavelet signal decomposition for use as in signal de-noising applications and thermal failure.

Polymer Synthesis and Surface Modification

Dr. Zeller designed, setup, and performed polymer synthesis reactions of thermoactive materials in a cleanroom setting to be used in surface modification research. These materials were synthesized, purified, grafted, and tested in a research environment for possible future medical applications in drug delivery. Additional later projects included batch scaling for synthesis reactions and quality control.

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

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| • Musculoskeletal Biomechanics | • Smart Materials and Applications |
| • Mechanobiology | • Computational Biology |
| • Statics and Dynamics | • Non-Crystalline Materials (Glasses) |
| • Mechanical Vibrations | • Metallic Manufacturing |
| • Mechanics of Materials | • Data Mining and Pattern Recognition |
| • Dynamic Control and Simulation | • Material Structures and Properties |
| • Solid State Mechanics | • Robotic Modeling and Control |

Continuing Education

August 2024 | "Institute of Police Technology and Management: Commercial Vehicle Crash Investigation," Jacksonville, Florida

August 2024 | "Institute of Police Technology and Management: Pedestrian and Bicycle Crash Investigation," Online

June 2024 | "Tire Basics & Tire Failure Evaluation," by Brian A. Darr, P.E., Quality Forensic Engineering, LLC, New Orleans, LA

June 2024 | “Maintenance of Traffic and Work Zones”, by Tyler P. White, E.I. Quality Forensic Engineering, LLC, Tampa, FL

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

SELECTED PUBLICATIONS AND PRESENTATIONS

Zeller, Ian, “An Overview of Forensic Engineering: Accident Reconstruction and Biomechanics,” Georgia Institute of Technology BMED 2310, March 2026

Zeller, Ian, “That’s How We Roll: Testing Object Distances Thrown from Vehicles,” Quality Forensic Engineering Newsletter, January 2026

Zeller, Ian, “Slips and Falls: Walk This Way – CLE,” Florida Justice Association, Orlando, FL, September 2025

Zeller, Ian, “Motor Vehicle Accident Biomechanics and the Daubert Standard – CLE Zoom Presentation,” Palm Beach County Justice Association, October 2024

Zeller, Ian, “Reconstruction Math Seminar,” Quality Forensic Engineering, LLC, Tallahassee, FL, September 2024

Zeller, Ian, “Motor Vehicle Accident Biomechanics and the Daubert Standard,” Quality Forensic Engineering, LLC, May 2024

Zeller, Ian Michael, “The Role of Biomechanics in Personal Injury Litigation,” *Attorney at Law Magazine*, December 2023

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 November 22, 2010

March 13, 2026