Dr. Jeremy Ronald Cummings

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CURRENT INTERESTS

Trauma biomechanics, accident reconstruction, human factors, injury mechanisms, human kinematics, vehicular accidents, materials science & failure analysis, vision/visibility, properties of biological tissues, video analysis, microscopy, and human-environment interaction.

EDUCATION

- **Ph.D. - University of North Carolina**, Chapel Hill, NC
  Biomedical Engineering. 2001.
- **B.S. - University of North Carolina**, Chapel Hill, NC
  Applied and Materials Science, minor in Chemistry. 1998.

EXPERIENCE

Principal Consulting Scientist and Biomedical Engineer – Cummings Scientific, LLC, Tallahassee, FL. Specializing in analysis of accidents involving the nature of human injury, injury causation, visibility analysis, and analysis of injury severity consistent with the physics of the accident situation. Qualified as an expert witness by both federal and state courts across the United States. Work Experience: ~50% plaintiff, ~50% defense cases.
Biomedical Engineer and Accident Reconstructionist – Quest Engineering and Failure Analysis, Inc. Scientific analysis of vehicular accidents; structural & material failures; forensic biomechanics.
Post Doctoral Fellow – National High Magnetic Field Lab, Tallahassee, FL. Near-field scanning optical microscopy. http://www.magnet.fsu.edu
Post Doctoral Fellow – Department of Physics UNC-Chapel Hill. Research and design on a three-dimensional force microscope with emphasis on understanding human tissues response to forces.
Research Assistant. Department of Physics UNC-CH. Designed and built several laser based computerized force microscopy instruments.
Research Assistant. Experimental Cardiology Group UNC-CH. Ischemia-induced ventricular fibrillation of porcine hearts, with 3-dimensional reconstruction of the heart.

SKILLS

- **Injury Causation** – medical records, experimental testing, computer modeling, and extensive knowledge of human injury tolerance allows for a correlation to be made between a claimed injury and the physics of a specific accident environment.
- **Biomechanics** – determination of the forces and movement of the human body (occupant kinematics and biokinetics) for frontal, side-impact, rear-impact, sideswipe, and rollover vehicular accidents, including helmet, seat-belt, and air bag analysis. Fall Analysis.
- **Accident Reconstruction** - Reconstruction of automobile, heavy truck, bus, heavy equipment, tractor trailers, trains, motorcycles, ATVs, bicycles, and pedestrian accidents. This includes the analysis of accident events and physical evidence to determine causation, critical accident events, sequence of events, compliance with procedures, and injury mechanisms. Typical projects include vehicular, construction, and slip/trip & fall accidents.
- **Seat Belt Analysis** – Materials analysis of physical evidence to determine if seat belts were operational, if occupants were wearing their seat belts, and if injuries may have been mitigated through the use of seat belts.

- **Product Failure Analysis** – analysis of specific projects with regard to materials failure, fatigue, corrosion, safety and design.
- **Computer based accident reconstruction and simulations –** using HVE, EDCrash, PC Crash, EDSMAC, MADYMO and other physics based simulation programs.
- **Crash testing** - data acquisition, crush analysis and reduction.
- **Investigative services** - Scene investigation, surveys, and drawings, skid analysis, photography, vehicle inspection, damage analysis, vehicle dynamics.
- **Photogrammetry** of digital and scanned photos using a variety of CAD programs and Photomodeler to analyze skid patterns, crush depths, and accident scenes.
- **Finite element analysis** – using state of the art mechanical modeling programs.
- **Human factor analysis** – human perception and reaction times, visibility analysis, warnings.

SIGNIFICANT COURSEWORK

Biomechanics	Physics: Electricity and Magnetism	Physics: relativity and quantum mechanics
Accident Reconstruction	Physics: Mechanics	Physics: Analog Electronics
Medical training, Anatomy, and Physiology	Injury Causation and Analysis	Finite Element Analysis
Math: Probability and Statistics	Math: Calculus I, II, III, Linear algebra and diff. equations.	Biomaterials, Molecular and Cellular Biology
Electronics (analog and digital)	Biochemistry	Thermodynamics
Biomedical Instrumentation	Tissue Engineering	Molecular Physiology

PROFESSIONAL AFFILIATIONS

Member: **BMES** – Biomedical Engineering Society.
ASB – American Society of Biomechanics.
ASTM – American Society for Testing and Materials
SAE – Society of Automotive Engineers.
AAAM – Association for the Advancement of Automotive Medicine

PUBLICATIONS, PRESENTATIONS, AND TALKS

1. Cummings, J., R. Superfine, and R.M. Taylor. *Development of a Near-Field Scanning Optical Microscope*. in *1999 Annual Research Review*. 1999. Talk at the University of North Carolina - Chapel Hill.
2. Cummings, J.R., et al. *Applications and Development of Near-Field Scanning Optical Microscopy*. in *2000 Annual Research Review*. 2000. Talk at the University of North Carolina - Chapel Hill.
3. Cummings, J. and Akmaloni, *Development of an Augmentative Portable Communication Device*, in *RESNA 2000*, J. Winters, Editor. 2000: Orlando, FL. p. 3.
4. Cummings, J., et al. *3-D Magnetic Particle Force Microscope for Manipulation In Cells*. in *2001 BME Annual Research Review*. 2001. Talk at the University of North Carolina - Chapel Hill.
5. Cummings, J., *Development and Applications of Magneto-Optical Scanning Probe Microscopy*, in *PhD dissertation, Biomedical Engineering*. 2001, University of North Carolina: Chapel Hill. p. 295.
6. Fisher, J.K., Cummings, J.R., et al., *Three-dimensional force microscope: A nanometric optical tracking and magnetic manipulation system for the biomedical sciences.* Review of Scientific Instruments, 2005.
7. Cummings, J.R., et al. *Development of a Three-Dimensional Force Microscope*. in *21st Southern Biomedical Engineering Conference*. 2002. Washington, DC, USA: Biomed Research Foundation.

8. Superfine, R., G. Bishop, J. Cummings, J. Fisher, K. Keller, G. Matthews, D. Sill, R. M. Taylor II, L. Vicci, C. Weigle, G. Welch and B. Wilde. *Touching In Biological Systems: A 3D Force Microscope*. in *Microscopy and Microanalysis*. 2002. Quebec City, Canada.
9. Cummings, J. R., Personal Injury (and Death) from Vehicle Collisions, a Biomechanical Analysis. Talk at the West Coast Claims Association. Jan. 2004, Tampa, FL.
10. Cummings, J. R., Continuing education course at the Tallahassee Claims Association: Biomedical Engineering and Biomechanics in Vehicle Collisions. CE credits given by the Florida Department of Financial Services. April 2004, Tallahassee, FL.
11. Cummings, J. R., Biomechanical Analysis. Continuing education course at Kubicki Draper's 2008 Annual Claims Conference. January 2008, Kissimmee, FL.
12. Cummings, J. R., Nationwide Insurance Company Claims Examiner Seminar. CE credits given by the Florida Department of Financial Services. February 6, 2008, Pensacola, FL.
13. Cummings, J. R., Auto-Owners Insurance Claims Examiner Seminar. CE credits given by the Florida Department of Financial Services. February 19, 2008, Tallahassee, FL.
14. Cummings, J.R., et al., Occupant Friction Coefficients on Various Combinations of Seat and Clothing. SAE, 2009. 2009-01-1672.
15. Cummings, J.R., Biller, B.A., Photogrammetry in Accident Reconstruction. Florida Engineering Society Journal, June 2010.
16. Osterholt, G.D., Cummings, J.R., et al.,Updating Generic Crush Stiffness Coefficients for Accident Reconstruction. SAE, 2010, 2010-01-1581.
17. Cummings, J.R., Forensic Biomechanics. Attorneys Information Exchange Group (AIEG) 2014 Fall Conference. San Antonio, Texas. October 22-24.
18. Friedman, K., J. Hutchinson, Mihora, D., Cummings, J., 2015, Finite-element Modeling of Restrained Occupant Partial Ejection under Rollover Conditions. International Journal of Crashworthiness, Vol. 20 Issue 3.
19. Cummings, J. R., Fletcher, H. J., Biller, B. A., Scanlan, S., Lamb, R., & Russo, M. D. (2016). Estimates of Motorcycle Speed Made By Eyewitnesses Under Ideal Experimental Conditions. *Accident Reconstruction Journal*, 12–17.

CONFERENCE AND COURSE ATTENDANCE

- National Biomedical Engineering Symposium. 1997 Seattle, WA.
- RESNA – Rehabilitation Engineering and Assistive Technology Society of North America Annual Meeting. 2000 Orlando, FL.
- The Biomechanics of Impact Course – Understanding the Limits of Human Tolerance, Sept 29, 2002
- 46th Association for the Advancement of Automotive Medicine Annual Conference, Tempe, AR. Sept 30 – Oct 2, 2002.
- Engineering Dynamics Corporation: Accident Reconstruction Course, Miami, FL. Nov 11 – Nov 15, 2002.
- Engineering Dynamics Corporation: Simulation Course, Northridge, CA. Jan 20–24, 2003.
- Spine Research Institute of San Diego: CRASH 2003, Aug 22 – Aug 24, 2003.
- Human Factors Course, IPTM, Jacksonville, FL. March 22 – March 26, 2004.
- Fall Protection Certification course, ASSE, Pensacola, FL. May 20, 2004.
- Northwestern University Traffic Institute, Traffic Accident Investigation Course. 2004.
- American College of Forensic Examiners International – Medical Investigator course. Atlanta, GA. July, 2004.
- 48th Association for the Advancement of Automotive Medicine Annual Conference, Key Biscayne, FL. Oct 24 – Oct 27, 2004.
- Photomodeler Collision Reconstruction Course, Raleigh, NC. March 7-9, 2005.
- 33rd International Workshop on Human Subjects for Biomechanical Research. Nov 8, 2005.
- 49th Stapp Car Crash Conference on biomechanics and human injury tolerance. Washington, D.C. Nov 9-11, 2005.
- Methodology and Techniques of Crash Data Retrieval, IPTM, Jacksonville, FL. Feb 27 – March 1, 2006.
- Adult, Infant and Child CPR Certification, American Red Cross, Tallahassee, FL. May 22-23, 2006.
- MSF Safe Rider Motorcycle Course. Florida SafeRider, Inc. FL. June 3-4, 2006.
- South East Biomechanics Conference, Duke University, Durham, NC. April 19-21, 2007

- Motorcycle Safety Foundation Experienced Rider Course. Monticello, FL August 16, 2008
- 52nd Stapp Car Crash Conference on biomechanics and human injury tolerance. San Antonio, TX. November 3-5, 2008
- Crash Data Retrieval System (CDR) Data Analyst Course. Ashburn, VA. January 6-9, 2009.
- 27th Annual Special Problems in Traffic Crash Reconstruction. Orlando, FL. April 20-24, 2009.
- Madymo Introductory Training Course. Livonia, MI. June 16-19, 2009
- 53rd Stapp Car Crash Conference on impact biomechanics, human injury tolerance, and crash injury protection. Savannah, GA. November 2-4, 2009.
- 28th Annual Special Problems in Traffic Crash Reconstruction. Orlando, FL. April 26-30, 2010.
- PC-Crash Physics simulation training, Orlando, FL. April 6-8, 2011
- CDR User's Summit – Training Conference for Crash Data Retrieval. Houston, TX. January 21-23, 2013
- Child Passenger Safety Certification Course. Jacksonville, Florida. April 9-11, 2013
- Kids in Motion Conference, Albuquerque, New Mexico August 27-29, 2013
- 59th Stapp Car Crash Conference. New Orleans, LA. November 9-11, 2015.
- 44th International Workshop on Human Subjects for Biomechanical Research. National Highway Traffic Safety Administration. Washington, DC. November 6, 2016.
- 60th Stapp Car Crash Conference, Washington D.C. November 7-9, 2016.
- Institute of Police Technology and Management Conference. Pedestrian and Bicycle Crash Investigation. Jacksonville, FL November 28-December 2, 2016.
- 2017 ARC-CSI Crash Conference. Las Vegas, NV. September 18-21, 2017.
- National Child Passenger Safety Training. Riverdale, GA. July 25, 2018.

HONORS AND ACHIEVEMENTS

- **Certified Accident Reconstructionist by the Accreditation Commission for Traffic Accident Reconstruction,** ACTAR #1465**.**
- **National Child Passenger Safety (CPS) board certification, NHTSA training,** CPS # 709797
- **2012 Tallahassee Volunteer of Year, Business/Government Agency Category,** 34th Anniversary Winner.
- **Low Speed Rear Impact Auto Crash Reconstruction certification.**
- **Outstanding Academic Performance** - Bayer Corporation Award.
- **Award Recipient** for the National Biomedical Engineering Symposium.
- **Eagle Scout** - Boy Scouts of America.