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Curriculum Vitae

Jeffrey A. Suway, P.E.

Accident Reconstruction and Human Factors Expert

OVERVIEW

Mr. Suway is a licensed Professional Mechanical Engineer, an ACTAR accredited accident reconstructionist and human factors expert and has been working in these fields since 2008. Mr. Suway holds a Master of Science degree in Civil Engineering with a specialty in Transportation Safety from the George Washington University through the National Crash Analysis Center (NCAC), and he holds a Bachelor of Science in Mechanical Engineering from Bucknell University. He has testified as an expert in Accident Reconstruction and Human Factors, including complex visibility and conspicuity analyses.

He has extensive experience conducting complex 3-dimensional accident reconstructions and simulations. He performs mechanical inspections for component failure and driveability issues in light-duty passenger vehicles, heavy trucks, buses, and other equipment. Mr. Suway is qualified to download and analyze all types of Event Data Recorders and is certified in the download and analysis of Bosch Crash Data Retrieval (CDR) data.

Mr. Suway conducts and analyzes complex visibility and conspicuity issues and recreations. These recreations allow for analysis of when or if pedestrians, vehicles, or other objects are visible. Additionally, Mr. Suway creates forensically accurate photographs and videos for demonstrative evidence.

Mr. Suway researches and analyzes human factors issues, such as perception-response times, typical human behavior, object detection, human perception, and product warnings and signage.

He has extensive involvement in research and has numerous peer reviewed publications and presentations through the Society of Automotive Engineers (SAE), Transportation Research Board (TRB), Human Factors and Ergonomics Society (HFES), and Enhanced Safety of Vehicles (ESV). Mr. Suway has published peer-reviewed papers on crush stiffness coefficients of heavy commercial vehicles, tractor-trailer tire blowouts, brake characteristics of tractors, small overlap impact configurations, and 3-dimensional simulations. He has also conducted research and published on topics relating to visibility, calibration of night-time photographs and video, retroreflective DOT-C2 tape, driver detection distances, driver eye glances, responses to slow or stopped lead vehicles, and the visibility of stairs in low-light conditions.

Mr. Suway is a voting member of several SAE and American Society for Testing and Materials (ASTM) committees dealing with data collection and analysis and retroreflective sheeting and materials.

AREAS OF EXPERTISE

- Night visibility and conspicuity
- Lighting issues
- Human Factors
- Perception-response issues
- Accident Reconstruction
- Vehicle equipment, mechanical component and engine failure
- EDR & HVEDR data imaging and analysis
- Computer reconstruction and simulations
- Computer Aided Design and photogrammetry analysis

EDUCATION

Dec. 2013 **The George Washington University** – Washington, D.C.
Masters of Science, Civil Engineering (MSCE)
Transportation Safety Engineering, National Crash Analysis Center

Classes focused on vehicle safety including investigation and analysis of vehicle accidents, federal safety standards, vehicle dynamics, traffic engineering and highway safety.

May 2008 **Bucknell University** – Lewisburg, PA
Bachelors of Science, Mechanical Engineering (BSME)

ACCREDITATIONS AND CERTIFICATIONS

2014 **Professional Engineer (P.E.)** - State of California
Mechanical – License #37373

2013 **Accreditation Commission for Traffic Accident Reconstruction (ACTAR)**
Traffic Accident Reconstructionist – ACTAR #2761

2013 **Collision Safety Institute, Inc. – Long Beach, CA**
Crash Data Retrieval (CDR) Technician Levels 1 and 2
Recertified June, 2014 and March 2016

2011 **Collision Safety Institute, Inc. – Chantilly, VA**
Crash Data Retrieval (CDR) Data Analyst Course

EMPLOYMENT HISTORY

Dec. 2018 - Present **JS Forensic Consulting, LLC** – Carlsbad, CA
Accident Reconstructionist and Human Factors Expert – Founder

Accident Reconstruction and Human Factors Expert specializing in reconstructions and analysis of low- and high-speed accidents involving automobiles, tractor-trailers, trucks, motorcoaches, motorcycles, heavy equipment, pedestrians, and other equipment and vehicles in all modes of collision, including small overlap impacts, rollovers and underrides/overrides. Perform reconstructions, recreations, analysis, and research focused on visibility, conspicuity, and perception-response issues including pedestrian, vehicle, and tractor-trailer accidents. Analyze human factors issues related to drivers, pedestrians, warnings, object detection including premises liability issues. Analyze failure modes of automotive mechanical components and mechanical systems, including brake, suspension, powertrain, bearings, engine and drivetrain. Analyze vehicle dynamics and performance, vehicle kinematics, occupant kinematics, advanced vehicle technologies, and vehicle systems.

Currently serves on the ASTM E12, Color and Appearance Committee, which promulgates standard test methods for measuring the performance of retroreflective materials. Also serves on the ASTM D04, Road and Paving Materials Committee which promulgates standard specifications for roadway materials, including retroreflective sheeting for traffic control.

Dec. 2017 - Nov. 2018 **Mecanica Scientific Services Corporation** – Carlsbad, CA
Accident Reconstructionist and Human Factors Expert – Director of Engineering

Accident Reconstruction and Human Factors Expert specializing in reconstructions and analysis of low- and high-speed accidents involving automobiles, tractor-trailers, trucks, motorcoaches, motorcycles, heavy equipment, pedestrians, and other equipment and vehicles in all modes of collision, including small overlap impacts, rollovers and underrides/overrides. Perform reconstructions, recreations, analysis, and research focused on visibility, conspicuity, and perception-response issues including pedestrian, vehicle, and tractor-trailer accidents. Analyze human factors issues related to drivers, pedestrians, warnings, object detection including premises liability issues. Analyze failure modes of automotive mechanical components and mechanical systems, including brake, suspension, powertrain, bearings, engine and drivetrain. Analyze vehicle dynamics and performance, vehicle kinematics, occupant kinematics, advanced vehicle technologies, and vehicle systems.

Aug. 2013 - Dec. 2017 **Biomechanical Research & Testing, LLC** – Long Beach, CA
Mechanical Engineer / Accident Reconstructionist

Responsible for investigation, analysis and reconstruction of accidents involving vehicles, pedestrians, industrial equipment, mechanical systems and equipment failures. Perform reconstructions, recreations, analysis, and research focused on visibility, conspicuity, and perception-response issues including pedestrian, vehicle, and tractor-trailer accidents. Analyze failure modes of automotive mechanical components and mechanical systems, including brake, suspension, power train, bearings, engine and drive train. Analyze vehicle dynamics and performance, vehicle kinematics, occupant kinematics, advanced vehicle technologies, and vehicle systems. Experienced in HVE, PC-crash, CarSIM and MADYMO engineering simulation; 2D and 3D Computer Aided Design (CAD); as well as photogrammetry and image analysis. Experienced in Crash Data Retrieval (CDR) equipment operation, CDR/Event Data Records (EDR) data analysis, and operation and analysis of 3-D laser scanner.

Currently serves on the ASTM E12, Color and Appearance Committee, which promulgates standard test methods for measuring the performance of retroreflective materials. Also serves on the ASTM D04, Road and Paving Materials Committee which promulgates standard specifications for roadway materials, including retroreflective sheeting for traffic control.

Conduct research on the biomechanics, human response, and injury potential of vehicular accidents and other activities. Perform fully instrumented tests utilizing human subjects and/or human surrogates. Data collected and analyzed include accelerations, velocities, displacements, forces, and vehicle crush and dynamics.

Nov. 2010 - Aug. 2013 **S-E-A Limited** – Millersville, MD
Technical Consultant

Perform reconstructions and analysis of low-speed and high-speed accidents involving automobiles, tractor-trailers, trucks, motorcoaches, motorcycles, heavy equipment, pedestrians, and other equipment and vehicles in all modes of collision, including small overlap impacts, rollovers and underrides/overrides. Perform reconstructions, recreations and analysis focused on night time visibility and conspicuity issues. Analyze failure modes of automotive mechanical components and mechanical systems, including brake, suspension, power train, bearings, engine and drive train. Analyze vehicle dynamics and performance, vehicle kinematics, occupant kinematics, advanced vehicle technologies, and vehicle systems. Experienced in HVE, PC-crash, CarSIM and MADYMO engineering simulation; 2D and 3D Computer Aided Design (CAD); as well as photogrammetry and

image analysis. Experienced in Crash Data Retrieval (CDR) equipment operation, Event Data Recorder (EDR) equipment operation, CDR/EDR data analysis, and operation and analysis of 3-D laser scanner.

Aug. 2008 - Nov. 2010 **National Highway Traffic Safety Administration (NHTSA) – Contract Engineer** – Alexandria, VA
Vehicle Crashworthiness Rulemaking
Contracted through Alpha Technology Associate

Rulemaking engineer in the Light Duty Vehicle Crashworthiness division. Rulemaking support activities included analysis of vehicle crash modes and occupant injury to support Federal Motor Vehicle Safety Standards (FMVSS). Analyzed occupant kinematics, injury potential, airbag, seatbelt, and seating systems. Research topics included small overlap impacts, rollovers, seatbelt and airbag systems, motorcoach, bus and truck crashworthiness, as well as tire and engine fires. Work also involved the analysis of NASS-CDS, NASS-GES, FARS, and CIREN data sets.

PROFESSIONAL MEMBERSHIPS

- Society of Automotive Engineers (SAE) – Reviewer
  - Data Analysis Standards Committee (SAE)
  - Data Collection and Archiving Standards Committee (SAE)
- ASTM International
  - ASTM D04 on Road and Paving Materials Committee – Voting Member
  - ASTM E12 Color and Appearance – Voting Member
- Human Factors and Ergonomics Society (HFES) – Reviewer
- Illuminating Engineering Society (IES)
- Southwestern Associate of Technical Accident Investigators, Inc. (SATAI)

PUBLICATIONS AND PRESENTATIONS

- Suway, J., Cornetto, A., *"Quantifying Retroreflective Materials using Digital Imagery"* SAE Technical Paper 2020-01-0570, 2020, doi:10.4271/2020-01-0570
- Cornetto, A., Suway, J., *"Simulation of Retro-reflective Materials in a Physically Based Rendering (PBR) Engine"* SAE Technical Paper 2020-01-0567, 2020, doi:10.4271/2020-01-0567
- Cornetto, A. and Suway, J., "*A Method for Mapping a Light Source Utilizing HDR Imagery*," SAE Technical Paper 2020-01-0566, 2020, doi:10.4271/2020-01-0566.
- *Night Time Accidents – Applied Human Factors Concepts for Accident Reconstruction*; Conference speaker at Southwestern Association of Technical Accident Investigators, Inc. (SATAI) 2019 Summer Conference. This presentation discussed vision, visibility, conspicuity, autonomous vehicles, machine vision, federal and state regulations and current standard practices and test methods. Specifically, I discussed light and color, contrast and pattern, retroreflective sign sheeting, retroreflective lane markings, retroreflective materials for vehicles, light simulations, headlight mapping, windshield transmittance, autonomous vehicles and machine vision, and glare. July 27, 2019 in Glendale Arizona.
- Cornetto, A.D. and Suway, J., *"Validation of the Cycles Engine for Creation of Physically Correct Lighting Models"* SAE Technical Paper 2019-01-1004, 2019, doi:10.4271/2019-01-1004.
- Grimes, C., Roescher, T., Suway, J.A., and Welcher, J., *"Comparing the Accuracy of Image Based Scanning Techniques to Laser Scanners,"* SAE Technical Paper 2018-01-0525, 2018, doi:10.4271/2018-01-0525.
- Young, J., Muttart, J., Suway, J., *"Nighttime Photography and Video: Techniques & Tips"* Proceedings of the Human Factors and Ergonomics Society 2017 Annual Meeting. Panel moderated by Cohen, J.

- Muttart, J., Dinakar, S., Suway, J., Kuzel, M., Gernhard, S., Rackers, M., Schafer, T., Vadnais ,T., Fischer, J., *"Influence of Taillight Width on the Ability to Recognize Closing Speed, Closing Distance and Closing versus Separating"* Proceedings of the Human Factors and Ergonomics Society 2017 Annual Meeting.
- Suway, J., Suway, S., *"A Method for digital Video Camera Calibration for Luminance Estimation"* Society of Automotive Engineers (SAE) World Congress and Exhibition, 2017, SAE Paper No. 2017-01-1368
- Muttart, J., Dinakar,, S., Suway, J., Kuzel, M., Maloney, T., Biever, W., Terpstra, R., Voitel, T., Cavanaaugh, D., Harms, T.J., *"Comparing a Times Exposure Methodology to the Nighttime Recognition Responses from SHRP-2 Naturalistic Drivers"* Society of Automotive Engineers (SAE) World Congress and Exhibition, 2017, SAE Paper No. 2017-0-1366
- Muttart, J., Dinakar, S., Suway, J., Kuzel, M., Lohf, D., Maloney, T., Whear, A., *"Is a Protocol for Measuring Aged Retroreflective Sheeting Warranted? Retroreflective Measurements from 191 Trailers from 36 States."* Transportation Research Board Paper 17-06767
- *Documentation and Reconstruction of Night Time Accidents;* Conference speaker at Southwestern Association of Technical Accident Investigators, Inc. (SATAI) 2016 Fall Conference. This presentation included an explanation of the types of data and measurements needed and a discussion of how a reconstructionist can use this measured data to accurately recreate a night time scene for accident investigation and analysis. Photographic and video techniques were discussed. Headlight bulb analysis and general human factors principles were discussed. Contrast, pattern, and the human ability to "see" an object was also discussed. October 8, 2016 in Glendale, Arizona.
- *Documentation and Reconstruction of Night Time Accidents;* Taught class on pertinent issues involved in evaluating a night time accident. An explanation of the types of data and measurements needed and a discussion of how a reconstructionist can use this measured data to accurately recreate a night time scene for accident investigation and analysis. Contrast and the human ability to "see" an object was also discussed. This class was approved for 1 CLE through the Nevada Board of Continuing Legal Education and the State Bar of California. February 24, 2016 in Las Vegas, Nevada. August 26, 2016 in Glendale, California. February 13, 2018 in Glendale California.
- Suway, J., Welcher, J., "*A Quantitative Method for Accurately Depicting still photographs or video of a night-time scene Utilizing Equivalent Contrast"* Society of Automotive Engineers (SAE) World Congress and Exhibition, 2016, SAE Paper No. 2016-01-1463.
- Suway, J., Welcher, J., "*Retroreflective DOT-C2 Tape Performance in Relation to Observation and Entrance Angle – A Real World Study"* Society of Automotive Engineers (SAE) World Congress and Exhibition, 2015, SAE Paper No. 2015-01-1432.
- Suway, J., Welcher, J., "*Quantifying Retroreflective DOT-C2 Tape Performance using a Retroreflectometer"* Society of Automotive Engineers World Congress and Exhibition, 2015, SAE Paper No. 2015-01-1429.
- *Conspicuity and Visibility: Issues and Testing;* Presentation at the 2014 ARC-CSI Crash Conference, Las Vegas, NV. Trucks, trailers, buses, and emergency vehicles have "conspicuity tape" but the question is: what conditions might affect a driver's ability to see the tape - and the vehicle it's on - at night? Part of the preparatory activities for the 2014 ARC-CSI Conference, a series of tests conducted will serve as part of the basis for this truly unique presentation. It will include an overview of nighttime visibility issues related to conspicuity tape and accident reconstruction. The presentation will also show how a night visibility study or recreation is accomplished and discuss the issues associated with this testing in an objective manner. An overview of recent testing of conspicuity tape performance will also be discussed.
- Cornetto, A., Suway, J., Wahba, R., Bayan, F., "*Calculating Three Dimensional Stiffness Coefficients for Use in Three Dimensional Simulation Modeling for Accident Reconstruction"* Published in conjunction with the Society of Automotive Engineers World Congress and Exhibition, 2014, SAE Paper No. 2014-01- 0473.
- Suway, J., Cornetto, A., Wahba, R., Bayan, F., "*Comparison of HVE simulations to NHTSA full-frontal barrier testing: an analysis of 3D and 2D stiffness coefficients in SIMON and EDSMAC4"* Presented at the 2014 HVE Forum. Published as HVE White Paper HVE-WP-2014-2.

- Suway, J., Cornetto, A., Wahba, R., Swanson, J., Bayan, F., "*Three Dimensional Simulation of a Crash Test Series in SIMON – Utilizing A, B, C, and D Stiffness Coefficients"* Collision Magazine, Volume 9, Issue 1, Spring 2014.
- Poirette, N., Bayan, F., Suway, J., Cornetto, A., Cipriani, A., and Wahba, R., "*Stiffness Coefficients of Heavy Commercial Vehicles"* Published in conjunction with the Society of Automotive Engineers World Congress and Exhibition, 2013, SAE Paper No. 2013-01-0796.
- Bayan, F., Cornetto, A., Dunn, A., Wahba, R., Suway, J., Prokrym, Y., and Price, A., "*Brake Characteristics for a Bobtail Vehicle"* Published in conjunction with the Society of Automotive Engineers World Congress and Exhibition, 2013, SAE Paper No. 2013-01-0792.
- Cornetto, A., Bayan, F., Dunn, A., Tanner, C., Wahba, R., Suway, J., Heydinger, G., Chakravarthy, K., and Guenther, D., "*Tractor-Semitrailer Stability Following a Steer Axle Tire Blowout at Speed and Comparison to Computer Simulation Models"* Published in conjunction with the Society of Automotive Engineers World Congress and Exhibition, 2013, SAE Paper No. 2013- 01-0795.
- Suway, J., Cornetto, A., Swanson, J., Bayan, F., Wahba, R., and Cipriani, A., "*A Comparison Between a Real World Crash Test, HVE Simulation and 3D Scanning"* Collision Magazine Volume 7, Issue 2, Fall 2012.
- Saunders, J., Craig, M., and Suway, J.A., "*NHTSA's Test Procedure Evaluations for Small Overlap/Oblique Crashes"* Presented at the 22nd International Technical Conference on the Enhanced Safety of Vehicles (ESV), 2011, ESV Paper Number: 11-0343.

CONTINUING EDUCATION

- Discomfort Glare in Outdoor Nighttime Environments: An Illuminating Engineering Society (IES) Webinar. This webinar covered the basics of glare, methods and research challenges when investigating glare and creating metrics, and the importance of research in this area. It will also cover work of the Discomfort Glare in Outdoor Nighttime Environments (DGONE) committee including the glare demonstration conducted during the 2019 IES Annual Conference. June 2020
- 3M Technology Talk: Improve Road Safety with Wet Reflective Pavement Markings webex. An informative session on the benefits of wet reflective road markings. 3M will cover the safety and science of how markings work in rainy conditions. Then hear from Texas A&M Transportation Institute on the findings from a recent study on wet retroreflectivity standards. Additional discussion was held on factors to consider when building a specification or standard for wet reflection. April 2020
- CCD or CMOS? How Imaging Sensor Properties Affect Pixel-Level Measurement of Displays. Radiant Vision Systems webex discussing the impact on sensor characteristics on the accuracy and repeatability of data captured by imaging systems for display metrology. This Webinar discussed sensor type, resolution, dynamic range, noise and other factors affecting the integrity of the data captured at each pixel. September 2019
- Quantifying Luminaire Performance – How luminaires are photometered and how that data is applied in lighting simulations: An Illuminating Engineering Society (IES) Webinar. Luminaire performance needs to be quantified so designers can make informed decisions when selecting products as well as evaluate how those products will contribute to the lighting requirements of their projects. Learning how luminaire photometry is done allows you to better understand their performance data and how it should be applied. Details such as the orientation of the intensity distribution, the location of the photometric center and the luminous shape can all have significant impacts on your lighting simulations. It is critical to know the limits of the data supplied by the manufacturer and what is contained in IES files so that you can obtain the most accurate lighting simulations possible and avoid reworking projects that don't perform as expected. This seminar covered the basics of how luminaires are photometered, how distributions and photometric centers are defined, near field/far field photometry, and the surprising importance of luminous geometry. August 2019

- SATAI 2019 Summer Conference, Glendale Arizona. Experts discussed Planar Collision Mechanics, Tesla EDR and determining speed from video, Heavy Vehicles, and Night Time Accidents.
- Metrics in Motion: Flicker & Glare: An Illuminating Engineering Society (IES) Webinar. Flicker and glare are visual phenomena that have several things in common: both can range from mildly annoying to seriously disabling, both can be made worse by poorly designed LED lighting and better by good LED lighting. This webinar provided an up-to-date evaluation of progress in addressing these critical lighting quality factors, their implications for energy-efficient LED lighting, and where additional research is needed. July 2019
- Metrics in Motion: Color Metrics: An Illuminating Engineering Society (IES) Webinar. After decades of debate and living with limitation, new color metrics for both color rendition and chromaticity have been standardized by the IES and/or CIE. This webinar will look at recent developments and how they might change lighting practice over the next 10 years. It will demonstrate how all constituents in the lighting community can benefit from using metrics that fit the capabilities of today's lighting technologies. June 2019.
- ASTM Committee Meeting, Denver, CO. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. Specifically, retroreflective materials, measurements methods, roadway materials, and raised retroreflective pavement markers were discussed. June 2019.
- Light and Color Measurements by Radiant Vision Systems. Radiant Vision Systems seminar discussing principles of light and color, imaging photometers and colorimeters, applications and imaging systems. April 2019.
- WCX19: SAE World Congress, Detroit, MI. Industry experts spoke on various topics related to human factors in driver vision and lighting, autonomous vehicles, retroreflective materials, accident reconstruction, automotive lighting, event data recorders, and occupant safety. April 2019
- Video Examinations for the Police Investigator. A 2-day class taught by Grant Fredricks of Forensic Video Solutions. This course exposes students to the latest techniques and methodologies used to accurately interrogate digital multimedia evidence for the purpose of furthering a criminal investigation. This dynamic hands-on course directs investigators through the processes of recovering valuable evidence from video images. This course focuses on specialized investigative techniques for the examination of video images to explore issues relating to Use of Force, Speed Estimation and Identification. Body Worn, In-Car Video, and security camera sources are examined in depth, testing image accuracy and exploring redaction processes. Investigators are exposed to automated methods and practices of producing interactive visual investigation reports for the accurate disclosure of a video driven investigation.
- Industrial Lighting Facilities, RP-7: An Illuminating Engineering Society (IES) Webinar. Providing a successful lighting design for a modern industrial facility is a complex task and in common with other lighting applications, the LED revolution is having a major impact. However, there is a lack of readily available advice for industrial facilities wishing to update their lighting technology to deal with the wide variety of applications found in an industrial environment. This session discussed some of the basic issues relevant to industrial lighting from the recently issued ANSI/IES RP-7-17 Recommended Practice for Lighting of Industrial Facilities, with emphasis on the efficient replacement of legacy lighting by the appropriate LED system. This includes the establishment of a suitable maintenance program to ensure that issues such as lumen degradation, particularly dirt depreciation, lifetime issues and lamp replacement scenarios are addressed in a timely manner. The session included a brief discussion of some aspects of lighting health and safety in an industrial environment.

- The Transportation Research Board (TRB) 98th Annual Meeting. The meeting program covered all transportation modes, with more than 5,000 presentations and nearly 800 sessions and workshops. Topics included human factors issues related to automated and autonomous vehicles, advanced driver assistance systems, vehicle-to-vehicle communications, vehicle-to-infrastructure communications, naturalistic driving data, retroreflective materials, raised retroreflective pavement markings, and pavement markings under wet and dry conditions. January 2019.
- Measure Across America: Stories Behind the Statistics. RoadVista and Performance Pavement Products presented statistics and stories from their comprehensive assessment of over 1150 centerline miles of pavement markings across 5 states. Statistics and analysis of the pavement markings' retroreflectivity, color, widths, road type and marking type was shared and explained. They also explored how their automated vehicle interpreted the markings with different reflectivity and contrast. January 2019.
- ASHRAE 90.1 Lighting Model: An Illuminating Engineering Society (IES) Webinar. The Illuminating Engineering Society is a co-sponsor of Standard 90.1 along with ASHRAE. ASHRAE published an addendum and responded to comments on the addendum related to Standard 90.1. The addendum will establish the lighting power density values for Standard 90.1-2019. The focus of the webinar will be how the lighting model works and the inputs and outputs of the model. December 2018.
- ASTM Committee Meeting, Washington, DC. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. December 2018.
- A New Measure of Color Discrimination: An Illuminating Engineering Society (IES) Webinar. Color rendition is commonly considered within three conceptual frameworks; color fidelity (the rendition of objects such that they appear as they would under a familiar reference illuminant), color preference (the rendition of objects such that they appear pleasant, vivid, or flattering), and color discrimination (the ability to distinguish colors of slightly different hue when viewed simultaneously). Color discrimination has been studied less frequently than color fidelity or color preference, though it is no less important. This presentation will summarize the previous literature on color discrimination and discuss recent work in this area. A recently published study by the current speaker will be discussed, which dispels the conventional wisdom that gamut area is a predictive color discrimination metric. This presentation will detail a new measure of color discrimination, which shows strong predictive ability of experimental results. November 2018.
- Maintenance in the LED Era: An Illuminating Engineering Society (IES) Webinar. Rather than being maintenance free, LED requires a change in maintenance practices more akin to stewardship than reactive replacement. Based on RP-36 and other information, this joint IES-NALMCO webinar will provide an overview of effective maintenance practices for indoor and outdoor LED lighting and control systems. August 2018.
- Lighting for Residential Environments (RP-11-17): An Illuminating Engineering Society (IES) Webinar. This new Recommended Practice provides design criteria for the many different types of interior and exterior spaces associated with residences and residential environments. This is the first version of RP-11 to be ANSI approved, as well as having collaboration with ALA. This document addresses the many and varied visual tasks during the course of the many activities and needs for all types of lifestyles and age groups. July 2018
- ASTM Committee Meeting, San Diego, CA. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. June 2018

- RP-28 Lighting and the Visual Environment for Seniors and the Low Vision Population: An Illuminating Engineering Society (IES) Webinar. RP-28-16 is intended to increase the designers' understanding of age-related vision loss and the importance of their design decisions that could impact the safety and independence of this growing sector of the population. This webinar provided a brief overview of some of the current research and design practices found in RP-28-16 that can help the aged and partially sighted maintain their quality of life. December 2017
- Measuring Light in the Field: An Illuminating Engineering Society (IES) Webinar. Recognized expert spoke about a few of the IES adopted methods for correctly measuring lighting in the field. November 2017
- Human Factors and Ergonomics Society (HFES) Annual Meeting, Austin, TX. Industry experts and researchers spoke on various topics related to human factors in driver vision, eye glance, perception, reaction, automotive lighting, and autonomous vehicles. October 2017
- WCX17: SAE World Congress, Detroit, MI. Industry experts spoke on various topics related to human factors in driver vision and lighting, accident reconstruction, automotive lighting, event data recorders, and occupant safety. April 2017
- I.DRR Users Forum, Nashville, TN. Industry experts spoke on various topics including driver distraction, naturalistic driving data, gap acceptance, and the latest changes and updates to the I.DRR software. February 2017
- Hands-on Heavy Duty Communications Protocols and Programming, Camarillo, CA. A three-day course taught by Jeremy S. Daily, Ph.D., P.E. dealing with vehicle communications protocols: CAN, J1939, J1708/J1587, and RP1210. The course focused on decoding and understanding the data transmitted over these communication protocols. December 2016
- SATAI 2016 Fall Conference, Glendale, AZ. Industry experts spoke about bicycle and motorcycle accident reconstruction and drug and alcohol toxicology. October 2016
- ASTM Committee Meeting, Participated via WebEx. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. June 2016
- Application of Human Factors Guideline for Road Systems, Transportation Research Board (TRB) Webinar. Industry experts spoke about research from National Cooperative Highway Research Program (NCHRP) Report 600. This research aims to provide insights to highway designers, highway planners, and traffic engineers on the extent to which road users' needs are influenced by the effects of age, visual demands, cognition, and expectancies. June 2016
- WREX 2016, Orlando, FL. Industry experts spoke on various topics including perception response times, human behavior, distracted driving, commercial vehicles, video analysis, vehicle performance, Event Data Recorders, pedestrian collisions, and motorcycle speed analysis. May 2016
- I.DRR Users Forum, San Diego, CA. Industry experts spoke on various topics including perception response times, naturalistic driving data, night recognition distances, motorcycle perception response times and the latest changes to the I.DRR software. February 2016
- Sign and Pavement Marking Retroreflectivity – Measurement Basics, Safety Benefits, Advancements: A state Department of Transportation (DOT) Perspective, Transportation Research Board webinar. Industry experts spoke during a TRB (Transportation Research Board) webinar on basic measurement of sign and pavement marking retroreflectivity and the differences of each measurement technique, sign sheeting assessment methods, and advancements in road markings to support autonomous vehicle technology. October 2015
- ARC-CSI Crash Conference, Las Vegas, NV. Industry experts spoke on various technical topics, including: accident reconstruction and biomechanics of low and high-speed collisions, tire mechanics and forensics, unmanned aircraft systems, and vehicle systems digital forensics. June 2015
- ASTM Committee Meeting, Anaheim, CA. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. June 2015

- Accessing and Interpreting Heavy Vehicle Event Data Recorders, Charlotte, NC. A four-day course covering various heavy vehicle systems and triggering events that may provide data useful in a collision investigation. The class covered available data and techniques for imaging the data in Detroit Diesel, Mercedes-Benz, Cummins, Caterpillar, Mack, Volvo, International, PACCAR, ABS and stability systems and advanced warning and collision mitigation systems. May 2015
- SAE World Congress, Detroit, MI. Industry experts spoke on various topics relating to vehicle and occupant safety and human factors issues. Topics included: driver distraction, cognitive demand, driver age, secondary tasks, vehicle collision warning and mitigation technologies and how driver's respond to these technologies, response time changes with driver fatigue, motorcycle dynamics, pedestrian accidents, rollover accidents, side impacts, medium-duty vehicle accidents, and accidents involving bollards. April 2015
- PhotoModeler Collision Reconstruction Course, Orlando, FL. A three-day course covering PhotoModeler features and techniques for use in a forensic setting. This course covered photography techniques, scene diagramming and mapping, scene and crush measurements, evaluating the accuracy and developing standard operating procedures for PhotoModeler projects, taking measurements from single photographs and from photographs taken with unknown cameras, night time photography, orthophoto and rectified photo generation as well as admission of photogrammetry and PhotoModeler into court. March 2015
- ASTM Committee Meeting, New Orleans, LA. ASTM Road and Paving Materials Committee and Color and Appearance Committee members met to discuss existing and proposed ASTM documents. Dec. 2014
- ARC-CSI Crash Conference, Las Vegas, NV. Industry experts spoke on various technical topics, including: accident reconstruction and biomechanics of low and high-speed collisions, fatigue and human factors, vehicle history data, conspicuity and visibility, vehicle, wheel and CDR reported speeds, and inadequate vehicle repairs and structural integrity. June 2014
- Advanced Crash Reconstruction Utilizing Human Factors, Evanston, IL. Dr. Jeffrey Muttart instructed a 40-hour class on topics including: history and foundation of reach time research, understanding driver response terms and definitions, common causes for response delays, whether weather influences driver response, evaluating a response during nighttime driving, nighttime response scenarios and documenting nighttime crashes, headlight beam analysis, evaluating path intrusion crashes, acceleration rate of drivers, gap acceptance, driver search patterns, driver response to lead vehicles, traffic signals and decision making, effects of fatigue and alcohol, tutorial on IDRR and V*Star software, and practical experience. May 2014
- SATAI Spring Conference, Laughlin, NV. Industry experts spoke on various nighttime visibility and conspicuity topics including reconstructing a nighttime car versus pedestrian crash, headlight performance in pedestrian strikes, and interviewing witnesses and drivers. March 2014
- HVE Forum, Saint Petersburg, FL. Completed 36 hours of workshops at the 2014 HVE Forum. Workshop topics include: Advanced HVE, 3D Vehicles – Part I: SIMON, DyMESH 3D Collision Model, Admissibility Workshop, Advanced 3D Environments, and 3D Vehicles – Part III: Blowouts & Rollovers. Feb. 2014
- FARO Laser Scanner, Long Beach, CA. Completed the training program to become a FARO Laser Scanner. Dec. 2013
- ARC-CSI Crash Conference, Las Vegas, NV. Industry experts spoke on various technical topics, including: Advancements in Photography, Brake Systems, Energy and FEM, Introduction to Energy, Motorcycle case study and New Tech, Single Degree of Freedom, Transit Bus Collision Investigation, and Vehicle orientation in rollovers. May 2013
- The George Washington University, Washington, D.C. Biomechanics I - Mechanical analysis of biological systems. Characterization of living tissue. Applications of statics, solid mechanics, kinematics, and elementary dynamics to the human musculoskeletal system. Fall 2012
- ARC-CSI Crash Conference, Las Vegas, NV. Industry experts spoke on various technical topics, including: Low Speed Collisions, Low Speed Biomechanics, Closing Velocity, Seat Belt Analysis, Yaw Marks, Fundamentals of Highway and Roadside Design for Accident Reconstruction, Establishing Safe and Realistic Speed Limits, Using ECM Diagnostic Data in Crash Reconstruction, Case Studies and Reconstruction Essentials for Tread Separation Accidents Involving Axle Tramp, Drug Recognition in crash investigation. June 2012

- The George Washington University, Washington, D.C. Advanced Demand Modeling – Addresses developments in the econometric and behavioral aspects of demand analysis and forecasting, supply-demand interaction in transport systems, and dynamic models. Applications include passenger travel, urban activity decisions, user responses to information, intelligent transportation systems, telecommunication use and interaction with travel choices, freight transportation as well as the demand for other types of infrastructure facilities and services. Fall 2012
- The George Washington University, Washington, D.C. Vehicle Dynamics - Engineering principles and analytical methods explaining the performance of an automotive vehicle. Basic mechanics governing vehicle dynamic performance in longitudinal, ride, and handling modes. Engineering analysis techniques applied to basic systems and subsystems to derive the governing equations. Spring 2012
- The George Washington University, Washington, D.C. Crash Investigation and Analysis - Crash reconstruction methods for systematic investigation of vehicle crashes. Analysis of vehicle safety systems and their effectiveness; computer simulation and analysis of crash data; sensitivity of analytical techniques; case investigations. Spring 2012
- MADYMO Introductory Training, Washington, D.C. Completed the 24-hour MADYMO Introductory Training class. Feb. 2012
- The George Washington University, Washington, D.C. Traffic Engineering and Highway Safety - Roadway traffic capacity and network performance measures; steady and unsteady traffic flow phenomena; traffic control signalization theory and practical implementation; monitoring techniques, instruments, and data processing for highway safety. Traffic related highway safety design concepts. Fall 2011
- The George Washington University, Washington, D.C. Continuum Mechanics - Introduction to the mechanics of continuous media. Tensor calculus; kinematics; stress and stress rate, conservation of mass, conservation of linear and angular momentum, energy balance, second law of thermodynamics; constitutive theory; linear and nonlinear elasticity, Newtonian fluids, micropolar elasticity. Fall 2011
- The George Washington University, Washington, D.C. Non-Linear FEM & Simulation - Rigid and flexible body methods for modeling crashes. Application of dynamic nonlinear finite element methods with contact algorithms for modeling crash phenomena. Modeling and simulation of vehicles, airbags, safety restraining systems, and highway barriers. Spring 2011
- SAE Government Industry Meeting, Washington, D.C. Government and industry experts spoke on various topics relating to new legislation, regulations, and research in the vehicle and occupant safety field. Topics included: Biomechanics, Child Safety, Crash Avoidance, and Crashworthiness. Jan. 2011
- The George Washington University, Washington, D.C. Introduction to Finite Element Analysis - Calculus of variations. Variational formulation of the finite element method. Weighted residual techniques. Computer implementation of the finite element method. Application to problems in heat transfer, stress analysis, fluid flow, and structural analysis. Prerequisite: proficiency in one computer language. Fall 2010
- The George Washington University, Washington, D.C. Vehicle Standards and Crash Test Analysis - Safety mandates and comparison of motor vehicles based on U.S. and European safety standards. Characteristics of dummies and mechanical devices specified for crash testing. U.S. national accident and injury data; calculation of benefits of safety measures. Fall 2010
- The George Washington University, Washington, D.C. Intelligent Transportation Systems - Commands, controls and communications in modern multimodal transportation; infrastructure/highway and vehicle automation, advanced traffic management, vehicle control and safety systems; information, data, and sensory requirements; practical applications and projects. Spring 2010
- SAE World Congress, Detroit, MI. Industry experts spoke on various topics relating to vehicle and occupant safety. Topics included: Active safety, Automotive lighting, Brake technology, Forensic photogrammetry, Human factors in driver vision and lighting, Human factors in driving and automotive telematics, Accident reconstruction, Biomechanics, Event Data Recorders, Occupant restraints, Pedestrian safety, Rear impact, Rollover, Safety test methodology, Side impact, and Structural crashworthiness and occupant safety. April 2010

- SAE Government Industry Meeting, Washington, D.C. Government and industry experts spoke on various topics relating to new legislation, regulations, and research in the vehicle and occupant safety field. Topics included: Crash avoidance technologies for heavy trucks, Advanced Safety Technology, Crash avoidance and crash causation, Pedestrian Safety, Child Safety, Distraction. Jan. 2010
- The George Washington University, Washington, D.C. Analytical Mechanics - Fundamental principles, particle and rigid-body dynamics, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Fall 2009
- SAE World Congress, Detroit, MI. Industry experts spoke on various topics relating to vehicle and occupant safety. Topics included: Active safety, Automotive lighting, Brake technology, Forensic photogrammetry, Human factors in driver vision and lighting, Human factors in driving and automotive telematics, Accident reconstruction, Biomechanics, Event Data Recorders, Occupant restraints, Pedestrian safety, Rear impact, Rollover, Safety test methodology, Side impact, and Structural crashworthiness and occupant safety. April 2009
- SAE Government Industry Meeting Government and industry experts spoke on various topics relating to new legislation, regulations, and research in the vehicle and occupant safety field. Topics included: Biomechanics, Crash Avoidance, Examining crash avoidance tech for heavy trucks, Priorities in motor vehicle safety, CIREN, Fuel Economy – Vehicle Safety, Inter vehicle communication for crash avoidance, Vehicle rollover and occupant containment, Child safety. Feb. 2009
- SAE Seminar: Injuries, Anatomy, Biomechanics and Federal Regulations. This seminar provides a comprehensive overview of these critical automotive safety considerations: injury and anatomy; human tolerance and biomechanics; occupant protection; testing; and federal legislation. The knowledge shared at this seminar will enable attendees to be more aware of safety considerations and to better understand and interact with safety experts. Nov. 2008
- Bucknell University, Lewisburg, PA. Biomechanics: Principles of mechanics applied to biological systems. Background in anatomy, physiology, and cell biology will be presented. Mechanical behavior of hard and soft biological materials. Topics in cellular, cardiovascular, musculoskeletal, implant, and sport/motion biomechanics. Spring 2008
- Bucknell University, Lewisburg, PA. Internal Combustion Engines: Description of internal combustion engines, methods of evaluating performance, the thermodynamics of combustion, engine testing, and design. Fall 2007
- SAE e-Seminar: A Familiarization of Drivetrain Components This e-seminar focuses on the terms, functions, nomenclature, operating characteristics and effect on vehicle performance for each of the drivetrain components. There is an introduction to the various components of the drivetrain, including the clutch or torque converter, manual or automatic transmission, driveshaft, axle, wheel ends, and brakes. The course presentation also provides insight into: the structure and function of each component; vehicle performance; and related noise, vibration and harshness issues. You will be equipped to evaluate the space requirements, mounting needs, clearances required, and effect on vehicle performance for each component. August 2007
- SAE e-Seminar: Fundamentals of Modern Vehicle Transmissions. This e-seminar details the transmission's primary functions - to provide drivability characteristics to the vehicle and adaptive connectivity between the engine and the remainder of the fixed function driveline. The discussion then focuses on the latest transmission systems designed to achieve the most efficient engine operation. Current designs, the components and subsystems used, their functional modes, how they operate, and the inter-relationships are examined. Automatic control, hydro-mechanic design theory and implementation, mechatronics, toroidal transmission functions, and the future of the automatic transmission are discussed. Continuously Variable Transmission (CVT) systems, which represent a fundamental shift in the way power is transmitted from the primary source to the remainder of the driveline, is covered in depth. Dec. 2006
- Certified Metal Inert Gas (MIG) welder. Summer 2004

RESEARCH RELATED ACTIVITIES

- Performed and participated in research related to human perception of different performance levels and observation angles of retroreflective materials. October 2019
- Research related to having retroreflective materials accurately respond to light within a physically based rendering engine with respect to illuminance, entrance angle, observation angle and luminance. May 2019
- Research related to mapping vehicle headlights for creation of an accurate light source in physically based rendering. May 2019
- Analysis of SHRP-2 naturalistic data for perception response times of real-world drivers to intruding vehicles. November 2018
- Performed and participated in research dealing with the creation of physically correct lighting models in a 3-dimenionsional computer environment. October 2018
- Performed and participated in research dealing with 3D laser scanning, 3D photogrammetry and creation of accurate 3D models. November 2017
- Performed and participated in research dealing with night time recognition distances, human ability to judge closing speed, and driver's eye glance behavior. The night time recognition distance research expanded on previous research conducted as well as Blackwell's method for determining contrast threshold. This research included an in-depth analysis of the Adrian Model for calculating Visibility Level (VL). May 2016
- Performed and participated in research which replicated and expanded on prior night recognition distance studies. This included replicating Blackwell's method, Blanco's method and Fambro's method. Additional work was done to compare Adrian's visibility model to the other methods. Research also included perception-response time for a driver using a hands-free cell phone. October 2015
- Tested performance of retroreflective conspicuity (DOT-C2) tape on real-world trailers manufactured between 1997 and 2015. The trailers included box trailers, multi-modal trailers, flatbed trailers, and tankers. July 2015
- Performed and participated in remote driven scooter to mini-van testing, motorcycle to Crown Victoria testing, and several other vehicle-to-vehicle crash tests. June 2015
- Performed and analyzed a testing series on calibrating nighttime video, photographs and prints to accurately depict nighttime visibility of different objects in and around the roadway. March 2015
- Performed and analyzed a testing series on visibility limit of stairs with different light levels. This testing was conducted with black, grey, and white stairs and with no nose treatment, a metal nose treatment, a black tread strip, and a yellow nose treatment. This research will be submitted for publication. March 2015
- Tested performance of retroreflective conspicuity (DOT-C2) tape from different manufactures at entrance angles from 0 to 45 degrees and observation angles from 0.2 to 2 degrees with a portable retroreflectometer. Aug. 2014
- Tested performance of retroreflective conspicuity (DOT-C2) tape from different manufacturers with different vehicles at different entrance and observation angles. Results presented at ARC-CSI conference, June 2-5, 2014, Las Vegas, Performed and participated in remote driven Explorer and Cobalt (with remote controlled ignition switch position) frontal barrier impacts, Contour to New Flyer city bus containing an instrumented anthropomorphic dummy driver and human passengers, and head-on collision between Crown Victorias, as well as human driven Prius and Cobalt to barrier impacts, rear-end and frontal impacts between a Prius and a Cobalt, multiple vehicle crash with Crown Victoria, Malibu and Saturn, broadside crashes between Crown Victorias and an Impreza and a Prius. NV. June 2014

- Performed and participated in remote-driven Saturn SL2, Chevrolet Cavalier, and Chevrolet Impala rear-ending and broadsiding a Neoplan city bus containing an instrumented driver, passengers, and a Hybrid III dummy; human driver and remote driven Toyota Yaris(s) in front-to-barrier impacts; angled head-on collisions between human-driven Ford Crown Victorias and Chevrolet Cavaliers; and a head-on collision between remote-driven Pontiac Grand Ams. All tests performed at the Las Vegas Motor Speedway, Nevada. May 2013
- Performed and participated in front and rear to barrier impacts using a Toyota Yaris with an instrumented human driver and a Hybrid III dummy passenger; as well as hard braking of a Neoplan city bus and an angled broadside to a Honda Civic with an instrumented human driver, passengers and a Hybrid III dummy at the Las Vegas Motor Speedway, Nevada. May 2013
- Performed and analyzed testing of retractor pretensioners. This testing included firing retractor pretensioners while in their unbuckled condition. The retractors were removed and analyzed. May 2013
- Performed and analyzed DOT-C2 retroreflective tape. The goal of this study was to quantify the performance characteristics of the retroreflective tape at different entrance angles. This study was performed in a laboratory setting. Spring 2013
- Performed and participated in a nighttime recreation involving a crossing tractor-trailer and a vehicle. Several studies were completed. These studies included the subject roadway, the roadway lighting conditions, exemplar vehicles, and an exemplar tractor trailer. Spring 2013
- Performed and analyzed a nighttime recreation involving a jackknifed tractor-trailer across a highway. Several studies were completed. These studies included the subject roadway, the roadway lighting conditions, exemplar vehicles, and an exemplar tractor trailer. Summer 2012
- Performed and participated in crash tests with instrumented human volunteers and anthropomorphic dummies, including a remote-drive Pontiac Grand Prix striking a Ford E350 Ambulance in an angled broadside, a Chrysler Town & Country with a remote tire deflation striking a Ford Aspire in an offset rear-end and then broadsiding a Toyota Corolla, a Ford Crown Victoria striking a Saturn SL2 in a high speed high angle broadside, a remote-driven Kia Rio striking a Toyota Yaris in an angled head-on, a remote-driven Jeep Grand Cherokee striking a Fiat Bertone in a high speed offset head on with override and a rollover, a Ford Crown Victoria sideswiping a Kia Sephia and then broadsiding a Ford Escort, and a remote-driven VW Jetta broadsiding a Chrysler Town & Country at the Las Vegas Motor Speedway, Nevada. June 2012
- Organized, setup and participated in a nighttime recreation involving an overturned trash truck. This testing was conducted on a closed drag strip. The subject roadway was recreated by adding temporary retroreflective lane markings, installing guardrail, and placing exemplar emergency vehicles at appropriate locations. Summer 2011
- Performed and participated in several nighttime recreations involving pedestrian versus vehicle collisions. These recreations were conducted on closed road ways, closed drag strips, or the subject roadway. Exemplar pedestrians were dressed in similar clothing to subject and exemplar vehicles were used. 2011 - 2013
- Performed, analyzed, and participated in testing of buckle pretensioners and airbag satellite sensors. This testing included the firing and disassembly of buckle pretensioners and the disassembly of airbag satellite sensors. Summer 2006