WADE LANNING, Ph.D.
PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Wade Lanning is a forensic investigator who uses his expertise in materials science and engineering to determine how and why a failure or accident occurred. Dr. Lanning is also a safety engineer and analyzes how product design, manufacturing, instructions and warnings, and consumer behavior relate to an accident. Dr. Lanning investigates incidents of any scope, from minor property damage to major accidents involving loss of life. He also works as a consultant in material processing, failure analysis, and risk management, and conducts research in forensic investigation and accident prevention.

Dr. Lanning holds a Ph.D. in Materials Science and Engineering (MSE) from the Georgia Institute of Technology, a Master of Science degree in MSE from Penn State University, and a Bachelor of Science degree in MSE from Boise State University. His research and teaching background include the mechanical properties of materials, material strengthening mechanisms, electromechanical failure modes of capacitors, and fracture mechanics. As a former laboratory manager, Dr. Lanning has experience designing equipment, the workplace, and policies to protect people from hazardous machines, electricity, chemicals, and radiation.

As a forensic investigator, Dr. Lanning applies materials science and engineering knowledge to understand the history of an artifact. Whether the part is made from metal, ceramic, polymer, or a composite, the material an object is made from dictates how the object interacts with its environment, so the condition of the object contains evidence of its past use. Dr. Lanning's past forensic investigations include failures of heavy construction and mining equipment, automobile suspensions, architectural glazing, plumbing materials, wood structures and furniture, food packaging, kitchen appliances, mechanics' tools, metalworking tools, welds, fasteners, and industrial and residential fires.

As a safety engineer, Dr. Lanning analyzes how engineering design, technology, standards, instructions, and warnings were used, or should have been used, to manage a hazard. He also designs, builds, and tests existing products and new prototypes to demonstrate different safety devices. Dr. Lanning's safety engineering analysis experience includes bulldozers, load haul dump (LHD) loaders, steel mill equipment, meat processing equipment, packaging machinery, elevated work platforms, hand and power tools, and consumer products.

AREAS OF SPECIALTY

- Forensic Analysis
  - Fracture Surface Analysis
  - Metal Corrosion
  - Polymer Oxidation and Degradation
  - Weld and Fastener Failures
  - Plumbing Failures
  - Equipment Involved in Fires
- Manufacturing and Material Processing
  - Tracing defects and damage to conditions in production, distribution, or service life
  - Shipping damage, corrosion, coating defects, surface scratches, surface contamination, foreign objects in food/beverage containers, and other material failures
- Material Identification and Characterization
- Safety Engineering, Machine Design, Safeguarding, Instructions, and Warnings
- Safety Device Design and Testing
- Consumer Product Failure Analysis
  - Distinguishing flaws and defects from wear, tear, and operator error or abuse
  - Blenders, pressure cookers, coffee makers, cookware, vape pens, eyeglasses, bicycles, power tools, safety equipment, and other devices involved in a failure or injury
- Construction Accident Investigation
- Industrial Safety Standards and Regulations
- Traffic Accident Reconstruction
  - Crash Data Retrieval
  - Vehicle Inspection and Damage Analysis

EDUCATION

Ph.D. in Materials Science and Engineering, Georgia Institute of Technology, May 2018
- Corcia Fellow, Lab Safety Officer, Lab Manager

Master of Science degree in Materials Science and Engineering, Penn State University, May 2012
- 3M Fellow, University Graduate Fellow, Ann C. Wilson Graduate Student Research Award

Bachelor of Science degree in Materials Science and Engineering, Boise State University, May 2009
- Summa Cum Laude; Top Ten Scholar; Treasurer, Tau Beta Pi Engineering Honors Society; Langroise, Bookstore, and MSE Scholarships

CERTIFICATIONS AND TRAINING

- OSHA 510 Occupational Safety and Health Standards for the Construction Industry, Pacific Northwest OSHA Education Center
- DOL-OSHA 30-hour Card: Construction Industry Outreach Training, UL
- Bosch© Crash Data Retrieval Tool Technician Training, University of North Florida Institute of Police Technology and Management
- Event Data Recorder Use in Traffic Crash Reconstruction for Engineers, Ruth Consulting
- Accident Reconstruction Course Certificate, Engineering Dynamics Company, LLC

PROFESSIONAL AFFILIATIONS

- American Society of Safety Professionals (ASSP) member # 010181849
- American Society for Nondestructive Testing (ASNT) member # 309322
- Society of Automotive Engineers (SAE) International member # 6153507205
- ASM International member # 309322
- Failure Analysis Society (FAS) member
- American Society of Mechanical Engineers (ASME) member # 103733840

PROFESSIONAL EXPERIENCE

January 2020 – Present | ARCCA, Incorporated | Senior Engineer

- Conducts forensic analysis of the fracture, fatigue, and degradation of materials
- Inspects accident scenes and failed components, including collection material samples for analysis, photographing the scene, and reviewing case documents
- Performs laboratory material identification and characterization experiments using techniques such as FTIR, EDS, XRF, XRD, etc.
- Assesses the safety design, guarding, instructions, and warnings of devices and procedures used in the workplace and consumer products
- Plans and executes experiments on exemplars to measure failure forces and mechanisms to aid in the reconstruction of device failures
- Designs and constructs custom test equipment, data acquisition systems, and analysis software
- Conducts research to improve tools and analyses used for automobile accident reconstruction

July 2018—January 2020 | Varsity Tutors, Upwork, AJE, & Catalant | Independent Contractor

- **Consulting:** product development, material processing and testing, and data science
- **Writing**: Content creator for Matmatch.com; manuscript editor for American Journal Experts
- **Teaching:** chemistry, physics, geometry, algebra, calculus, business calculus, computer science, history, English composition, and material processing

September 2018—March 2019 | Lab/Cor Materials, LLC | Materials Scientist & Lab Manager

- **Lab Management:** quality management (ISO 9001), safety compliance, inventory tracking, instrument maintenance, process development, and training/qualification of lab staff
- **Project Management:** onboarding new clients, project planning, budgeting, preparing reports, and invoicing
- **Services Offered**: mechanical testing, failure analysis, material identification, consumer product testing, new product development consulting, reverse engineering, GC-FID, FTIR, XRF, wet chemistry, fuel analysis, and microscopy
- **Industries Served:** clothing, cookware, hygiene, petroleum/energy, sports/entertainment, food processing, biomedical, defense, packaging, aerospace, and architecture

August 2012—May 2018 | Georgia Institute of Technology | Graduate Research & Teaching Assistant

- **Research**: developed new fracture mechanics and stress analyses for ductile thin sheets
- **Lab Management:** research team leader, training, inventory, and collaborative research coordinator
- **Data Science:** data acquisition, robotics, statistics, computer vision, and research team data management
- **Safety**: equipment maintenance, chemical inventory, hazardous waste management, chemical safety officer, laser/radiation safety officer, and EHS liaison
- **Teaching**: 10 semesters lecturing, grading, planning projects, and holding office hours for MSE 2001 and MSE 3005

August 2009—December 2011 | Pennsylvania State University | Graduate Research Assistant

- **Research:** novel residual stress strengthening mechanisms in multilayer ceramic capacitors
- **Roles:** research project lead, safety officer, written reports and oral presentations to the Center for Dielectric Studies

ADDITIONAL SKILLS

- **Material Characterization**: Optical Microscopy; SEM; TEM; EDS; XRF; XRD; FTIR; GC-FID; Raman; Mechanical Testing; Metallography
- **Materials Science**: Mechanical Properties of Materials; Fracture Mechanics; Fatigue; Failure Analysis; Crystallography; Thin Film Processing; Additive Manufacturing; Thermal Processing; Laser Machining; Electrolytic Processing; Mechanical Forming; Machining
- **Data Science**: photogrammetry and quantitative video analysis; Python; Mathematica; MATLAB; Computer Vision; Digital Image Correlation; Arduino; SolidWorks ANSYS; Elmer; Microsoft Office; LaTeX; Illustrator; Inkscape; Photoshop; GIMP

PUBLICATIONS

Peer-Reviewed Journal Publications

1. **Lanning, W. R.** and Muhlstein, C. L. (*In preparation*). The energetic interpretation of strain fields around a propagating crack in ductile thin sheets
2. Collins, J. G., **Lanning, W. R.**, and Muhlstein, C. L. (*In preparation*). A Monte-Carlo strain field mining methodology to identify and minimize image boundary-induced errors in interpolated fields
3. **Lanning, W. R.**, Johnson, C. E., Javaid, S. S., & Muhlstein, C. L. (2019). *Mode I steady-state crack propagation through a fully-yielded ligament in thin ductile metal foils*. Theoretical and Applied Fracture Mechanics, 101, 141-151.
4. Javaid, S. S., **Lanning, W. R.**, & Muhlstein, C. L. (2019). *The development of zones of active plasticity during mode I steady-state crack growth in thin aluminum sheets*. Engineering Fracture Mechanics, 218, 106540.
5. **Lanning, W. R.**, Javaid, S. S., & Muhlstein, C. L. (2017). *Reconciling fracture toughness parameter contradictions in thin ductile metal sheets*. Fatigue & Fracture of Engineering Materials & Structures, 40(11), 1809-1824.
6. Collins, J. G., Dillon, G. P., Strauch, E. C., **Lanning, W. R.**, & Muhlstein, C. L. (2016). *Correlating bonded joint deformation with failure using a free surface strain field mining methodology*. Fatigue & Fracture of Engineering Materials & Structures, 39(9), 1124-1137.
7. **Lanning, W. R.**, & Muhlstein, C. L. (2014). *Strengthening Mechanisms in MLCCs: Residual Stress Versus Crack Tip Shielding*. Journal of the American Ceramic Society, 97(1), 283-289.

Invited Lectures and Presentations

1. Wade Lanning, PhD and James Mason, PhD, *Failure Analysis- Investigating Losses*, ARCCA webinar, August 2021
2. Wade Lanning, PhD, *Heavy Construction Equipment Defects*, Asheville, NC, July 2021
3. Wade Lanning, PhD, *Stored Energy, Material Failures, and Workplace Safety*, American Society of Safety Professionals Puget Sound Chapter Professional Development Conference, February 2021
4. Wade Lanning, PhD, *Materials Science for Investigating Liability Claims*, ARCCA Online Lunch and Learn, February 2021
5. James Mason, PhD, and Wade Lanning, PhD, *Mechanical Failure Analysis and Materials Science*, ARCCA Webinar, October 2020.
6. Wade Lanning, PhD, *Image Correlation Strategies for Deformation Rate and Work Density Measurements in Thin Sheets*, invited talk, ASM International Puget Sound Chapter Meeting October 2018
7. Wade Lanning, PhD, *Fatigue Crack Growth and Fracture of Flexible Metallic Sheets*, invited talk, TMS 2017
8. Wade Lanning, PhD, *Ductile Crack Growth in Face-Centered Cubic Metal Nanosheets*, TMS 2016
9. Wade Lanning, PhD, *Length Scale Effects on the Toughening of Barium Titanate-Ni Laminate Composites*, TMS 2015
10. Wade Lanning, PhD, *Strengthening Mechanisms in Multilayer Ceramic Capacitors*, Quarterly progress reports and presentations to the Center for Dielectric Studies at PSU, 2009-2011