



JAMES COLLINS, Ph.D.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Collins is a Materials Science and Engineering expert for ARCCA, LLC. Dr. Collins received a Ph.D. and M.S. degree in Materials Science and Engineering from the Pennsylvania State University. His research focus was fatigue and fracture of metallic films and damage evolution in composite laminates. Dr. Collins has extensive knowledge and experience with mechanics of materials, mechanical deformation, fatigue, and thermomechanical effects on mechanical properties from his background in mechanical testing and investigation.

As the Research Engineer for the Mechanical Properties Characterization Facility and Lab Manager of the Paper Physics Laboratory at Georgia Institute of Technology, Dr. Collins applied his expertise for fundamental and investigative research of materials as well as qualification material and design of experiments. He applied his knowledge to conduct research programs for companies and government agencies including Boeing, Siemens Energy, Pratt & Whitney, Department of Energy, Department of Defense, and National Science Foundation.

Dr. Collins operated and maintained all laboratory equipment including: twelve servohydraulic test frames, four electromechanical test frames, four creep frames, furnaces, induction heaters, auxiliary sensors and accessories. Accessories included mechanical and optical extensometers, signal amplifiers, induction coils, PLCs, and power supplies for electropotential drop measurements for crack growth investigation. Dr. Collins incorporated his expertise in digital image correlation to expand the scope of deformation investigation and analysis, particularly for additive manufactured materials from lattice structures to metallic alloys and textiles as well. Testing included using ASTM, TAPPI, and ISO standards and non-standard testing specific to the complex requirements and fixturing common for industry research.

Dr. Collins applies his knowledge of materials science and engineering to relate processing, properties, defects, and structure to the mechanical properties and performance of engineering materials. His materials science background covers metals, ceramics, polymers, and composites. The material that a part, component, or equipment is made from informs how it deforms, generates and propagates damage, and degrades. Investigation and evaluation of the material reveals its history and relationship with its environment and past use and service.

AREAS OF SPECIALTY

- Forensic Analysis
 - Fracture Surface Analysis
 - Laminated Composite Failure
 - Bonded Joint Failure
 - Metal Corrosion
 - Polymer Oxidation and Degradation
 - Paper, paperboard, and corrugated board degradation
- Relating process history, defects, and damage accumulation to performance and service life
- Material Identification and Characterization
- Mechanical Systems Failure
- Accident Investigations
- Safety Engineering
 - Safety Codes and Analysis
 - Root Cause Analysis
 - Failure Mode and Effects Analysis
- Thermomechanical Fracture and Fatigue
- Creep and Creep-Fatigue of Metals
- Fatigue and Fracture of Metals
- Static and Dynamic Testing
- Medical implant material performance
- Data Acquisition and Analysis

EDUCATION

- Ph.D. in Materials Science and Engineering, The Pennsylvania University, Dec 2011
- M.S. in Materials Science and Engineering, The Pennsylvania State University, May 2008
- B.S. in Materials Science and Engineering, Virginia Tech, May 2005

PROFESSIONAL AFFILIATIONS

- ASM International
- American Society of Safety Professionals (ASSP)

CERTIFICATIONS

- OSHA 30 – General Industry

PROFESSIONAL EXPERIENCE

November 2023 – Present | ARCCA, LLC | 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

January 2021— November 2023 | Georgia Institute of Technology | Laboratory Manager

- Operated and maintained all laboratory equipment for TAPPI, ISO, and ASTM paper, paperboard, and corrugated board testing for the Paper Physics Laboratory
- Conducted independent investigative and fundamental research and reporting for program sponsors and external industry partners
- Conducted qualifications testing and reporting for external industry clients

March 2017— November 2023 | Georgia Institute of Technology | Research Engineer II

- Operated and maintained all laboratory equipment including: twelve servohydraulic test frames, four electromechanical test frames, four creep frames, Charpy and drop impact testers, furnaces, induction heaters, auxiliary sensors and accessories for the Mechanical Properties Characterization Facility
- Purchased lab equipment to enhance and expand research capabilities to meet program demands and research interests of faculty, program sponsors, and external industry clients
- Supported and trained all laboratory users which included: undergraduate students, graduate students, faculty, and external industry partners
- Lead classroom support to train Teaching Assistants and improve curriculums for student learning and engagement
- Provided reports to external/industry clients
- Provided reports and presented findings verbally to internal/academic projects where I was the Principal or co-Principal Investigator

January 2012— March 2017 | Georgia Institute of Technology | Postdoctoral Researcher

- Installed, calibrated, and maintained new and existing lab equipment to establish a new research laboratory at Georgia Tech
- Assisted graduate students in my advisor's research group with experimental program setup
- Purchased lab equipment to enhance and expand research capabilities to meet program demands and research interests of faculty
- Maintained and stocked lab safety equipment and chemical supplies
- Conducted independent research and reporting for grants funded by National Science Foundation, Department of Energy, and Department of Defense

ACADEMIC EXPERIENCE

August 2005—December 2011 | Pennsylvania State University | Graduate Research Assistant

Ph.D. Dissertation Title: *Development and Distribution of Peel Strains in Composite Laminate Structures*

Advisor: Dr. Christopher Muhlstein

M.S. Thesis Title: *Elastic Behavior of Nickel Films During Monotonic and Cyclic Loading*

Advisor: Dr. Christopher Muhlstein

ADDITIONAL SKILLS

- **Material Characterization:** Optical Microscopy, SEM, TEM, EDS, XRF, XRD, FTIR, Mechanical Testing, Metallography, Fractography
- **Materials Science:** Mechanical Properties of Materials, Fracture Mechanics, Interfacial Mechanics, Fatigue, Failure Analysis, Crystallography, Thin Film Processing, Additive Manufacturing, Thermal Processing, Laser Machining, Electrolytic Processing, Mechanical Forming, Machining
- **Data Science:** Python, Mathematica, MATLAB, Arduino, LabView, Computer Vision, Photogrammetry, Digital Image Correlation, SolidWorks ANSYS, Microsoft Office, LaTeX, Illustrator, Photoshop

PUBLICATIONS

Peer-Reviewed Journal Publications

1. **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*
2. Neu, R.N., A.N. Caputo, S. Gorgannejad, A.E. Albela, M.N. Carpenter, C. Zhang, A.H. Tanna, B. Peloke, M. Defay, **J.G. Collins**, J.C. Sobotka, C.F. Popelar, J.H. Macha, and S.B. Coogan (2022), *Evaluation of HCF Strength of Alloy 625 with Non-Optimum Additive Manufacturing Process Parameters*, International Journal of Fatigue, 162
3. **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.
4. **Collins, J.G.**, W. Lanning, and C.L. Muhlstein (2016), *Using Noise to Minimize Edge Effects: A Strain Field Mining Approach for Digital Image Correlation*, Experimental Mechanics, 39(9), 1124-1137
5. **Collins, J.G.**, M.C. Wright, and C.L. Muhlstein (2011), *Cyclic Stabilization of Electrodeposited Nickel Structural Films*, Journal of Microelectromechanical Systems, 20(3), 753-763

6. Lei, F., C.L. Muhlstein, A.L. Romasco, **J.G. Collins**, and L.H. Friedman (2009), *Augmented Instrumental Indentation using Nonlinear Electrical Contact Current-Voltage Curves*, Journal of Materials Research, 24(5), 1820-1832
7. Lei, F., C.L. Muhlstein, **J.G. Collins**, A.L. Romasco, and L.H. Friedman (2008), *Continuous Electrical In Situ Contact Area Measurement During Instrumented Indentation*. Journal of Materials Research, 23(9), 2480-2485

Conference Presentations

1. W.R. Lanning, **Collins, J.G.** and C.L. Muhlstein, *Ductile Crack Growth in Face-Centered Cubic Metal Nanosheets*, The Minerals, Metals, and Materials Society, Orlando, FL, 2016
2. **Collins, J.G.** and C.L. Muhlstein, *Failure Prediction of Composite Bonded Joints by Analyzing Strain Map Homogeneity*, The Minerals, Metals, and Materials Society, Orlando, FL, 2015
3. Kirkpatrick, R., **Collins, J.G.**, and C.L. Muhlstein, *Flexure Strength and Failure Probability of Silicon Nanowires*, 39th International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, 2014
4. **Collins, J.G.**, V. Wu, V. Sarthak, and C.L. Muhlstein, *Fatigue Deformation and Failure of Carbon Nanotube-Loaded Polyacrylonitrile Fibers*, The Minerals, Metals, and Materials Society, Orlando, FL, 2014
5. **Collins, J.G.**, Y. Wang, Z.K. Lie, A.M. Minor, and C.L. Muhlstein, *Cyclic Stabilization of Micro- and Ultrafine-Grained Nickel Films*, 10th International Fatigue Conference, Prague, CZ, 2010
6. **Collins, J.G.**, G.P. Dillon, and C.L. Muhlstein, *Strain Distribution and Rearrangement in a Cracked and Uncracked Composite Laminate*, Society for the Advancement of Material and Process Engineering, Baltimore, MD, 2009
7. Dillon, G.P., J.F. Tarter, C. Byrne, C.L. Rachau, C.L. Muhlstein, and **J.G. Collins**, *Strain Mapping for Performance and Failure Prediction in Composites Using Digital Image Correlation*, Society for the Advancement of Material and Process Engineering, Baltimore, MD, 2008
8. **Collins, J.G.** and C.L. Muhlstein, *Cyclic Hardening and the Durability of Nanostructured Nickel Films*, Materials Science and Technology, Pittsburgh, PA, 2008