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Engineering & Scientific Consulting


# Brad James, Ph.D., P.E., FASM

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## Professional Profile

Dr. James applies the fundamental principles of metallurgy, materials science, engineering mechanics, electrochemistry, and quantitative risk analysis to the investigation and prevention of failures in engineering systems, devices, structures, and products. Dr. James' specific expertise includes metallurgical and materials engineering, fracture mechanics, fractographic examination, corrosion, material embrittlement and degradation, welding and joining, risk analysis, life prediction, material selection, and design.

In his more than 30 years' experience, Dr. James' broad understanding of materials, mechanics, electrochemistry, and risk concepts allows him to consult within several diverse industries. He has led multidisciplinary investigations in power generation and transmission, oil and gas, medical device, transportation, aviation, mining, fire protection, and consumer products industries.

Dr. James has served as an Adjunct Professor at Stanford and Santa Clara Universities, teaching several graduate-level courses that include metallurgical/materials failure analysis, fractography, fracture mechanics, mechanics of materials, and electrochemistry concepts. Dr. James has also taught dozens of day-long failure analysis, fracture, corrosion, and materials design courses to medical device engineers for ASM International. He is a Fellow of ASM International (the world's largest materials engineering technical society) and has served on the editorial review board of the Journal of Failure Analysis and Prevention.

Prior to joining Exponent, Dr. James was employed as a Research Engineer, Materials Performance Division, at the Babcock and Wilcox Research and Development Center in Alliance, OH. In this role he conducted fatigue, fracture, and corrosion testing and analyses of materials with power generation and aerospace applications.

## Academic Credentials & Professional Honors

Ph.D., Metallurgical and Materials Engineering, Colorado School of Mines, 1994

B.S., Metallurgical Engineering, University of Washington, 1988

ASM International Fellow, 2011

## Licenses and Certifications

Professional Engineer Metallurgical, California, #1867

Professional Engineer Metallurgical, Texas, #116334

## Professional Affiliations

ASM International (Fellow)

Failure Analysis Society (member)

International Organization on Shape Memory and Superelastic Technologies (member)

Independent Metallurgical Engineering Consultants of California (Past President)

## Publications

**Book Chapters**

Stewart JR, Ganot GS, Slone CE, James BA, Roepke CT. Fractography of Weldments. ASM Metals Handbook Volume 12. 2024; 441 – 449

Malito LG, Bowers ML, Briant P, Ganot GS, James B. Fractography of Nitinol. ASM Metals Handbook Volume 12. 2024; 430-440

Hudgins, C. Roepke, B. James, B. Kondori, B. Whitley, Failures of Pipelines, ASM Handbook, Volume 11A, ASM International 2021.

Bowers, M. Ganot, G. Malito, L. Kondori, B. Ezechukwu, E. Svedlund, F. James B., Failure Analysis of Medical Devices, ASM Handbook Volume 11A, ASM International 2021.

James B, Hudgins A. Failure Analysis of Oil and Gas Transmission Lines. Handbook of Materials Failure Analysis With Case Studies from the Oil and Gas Industry. Elsevier, 2015

James B. Medical Device Failure Analysis. ASM Handbook, Volume 23, Materials for Medical Devices, ASM International 2012

**Selected Presentations, Proceedings, and Publications**

Liu C, Hudgins A, James B. Failure Analysis of a Ruptured Pipeline. Journal of Failure Analysis and Prevention 2024.

Slone C, Mostaed E, Cline C, Kaplowitz D ,Ganot G, James B, Aguiar D. Copper Contamination Cracking in a Pipeline Repair Weld. Journal of Failure Analysis and Prevention, February 2024.

James, B, Failure analysis of a gold mill slide ring, IMECA Fall Meeting, Pacific Grove, CA, October 9, 2022.

James B, Stevenson K, Bowers M, The metallurgy of fire cause-and-origin analysis, Materials Science and Technology Conference, Columbus OH, October 18, 2018.

Nirankari V, James B, Van Der Schjiff, Grooving corrosion: differentiating weld defects from corrosion failure, Materials Science and Technology Conference, Columbus OH, October 17, 2018.

Bowers M, James B, Case studies on sterilization-induced failures in metallic medical devices, Materials Science and Technology Conference, Columbus OH, October 17, 2018.

James B, Fire-cracking of lead-free brasses for use in water, oil and gas applications, IMECA Spring Meeting, April 21, 2018.

Birringer R., Hudgins A, James B, Case Study of a Natural Pipeline Explosion Caused by a Combination

of Manufacturing Defects and Environmental Factors, Materials Science and Technology Conference, Salt Lake City, UT, October 24, 2016.

Birringer R, Ganot G, James B. Failure analysis of internal fixation medical devices: overview and case studies, Journal of Failure Analysis and Prevention, Vol. 16, Issue 5, Oct 2016, pp 849-857.

James B, Briant P, Fatigue Design and Validation for Medical Device: What We Learned from Portico. Invited Lecture, St. Jude Medical Materials Summit, September 29, 2015.

James B, Hudgins A, Fracture mechanics and crack management for natural gas operators, American Gas Association Fall Operators Meeting, Nashville TN, September 13, 2016.

Briant P, James B, Easley S, Kennett S, Schaffer J, Kay L, The effect of crimp strain on the fatigue performance of nitinol, Shape Memory and Superelastic Transformation (SMST) Conference. May 22, 2015.

Hudgins A, James B. Fatigue of threaded fasteners, Advanced Materials & Processes, ASM International 2014 Aug; 172(8):18-22.

Guyer E, James B. Surgical tool failure analyses. Journal of Failure analysis and Prevention 2013 Dec; 13(6). DOI 10.1007/s11668-013-9763-5.

James B. Pipeline rupture failure mechanisms and prevention. IMECA, Pacific Grove, CA, October 2012.

James B. Pipeline ruptures: Review of common metallurgical failure mechanisms. Materials Science and Technology Conference, Pittsburgh, PA, October 2012.

James B. Pipeline ruptures: Causes and prevention. Natural Gas Claims and Litigation Association, San Diego, CA, April 2012.

James B. Fracture, fatigue, corrosion and failure analysis of medical devices. Health Canada, Ottawa, Canada, March 2012.

James B. Medical device failure modes: Learning from unexpected outcomes. Plenary Speaker, Bay Area Biomedical Device Conference, San Jose State University, March 2012.

Briant P, Lieberman S, James B. Residual stress distribution in MP35N due to plastic deformation and comparison to finite element analysis. International Medical Device Conference and Expo, Chicago, IL, October 5-6, 2011.

Briant P, Siskey R, Rau C, Easley S, James B. Effect of strain rate on nitinol constitutive modeling in the clinically relevant strain range. Proceedings, ASM Materials and Processes for Medical Devices, Minneapolis, MN, August 8-10, 2011.

James, B, Lieberman S. Analysis of a brake cylinder failure. Journal of Failure Analysis and Prevention 2011; 11:193-196.

James B. Fracture surface interpretation. Invited lecture, St. Jude Medical Cardiac Rhythm Management Division, Sylmar, CA, September 2010.

James B. Medical device fatigue design. Invited lecture, Medtronic Cardiovascular Innovation Seminar (CVIS), Santa Rosa, CA, July 2010.

James B, McVeigh C, Rosenbloom S, Guyer E, Lieberman S. Ultrasonic cleaning-induced failures in medical devices. Journal of Failure Analysis and Prevention 2010; 10(3):223-227.

James B, Sire R. Fatigue-life assessment and validation techniques for metallic vascular implants. Biomaterials 2010; 31:181-186.

James B. Fatigue design and validation of implantable medical devices. Invited lecture, St. Jude Medical, Cardiovascular Division, Maple Grove, MN, January 2010.

Fasching A, Kuş E, James B, Bhargava Y, Eiselstein L. The effects of heat treatment, surface condition and strain on nickel-leaching rates and corrosion performance in nitinol wires. Materials and Processes for Medical Devices, ASM International, Minneapolis MN, August 2009.

James B, Sire R, Caligiuri R. Determination of the failure mode and the rupture pressure in a mechanically damaged pipeline. Journal of Failure Analysis and Prevention 2008; 8(3):223-230.

James B. Medical device failure analysis — Practice and pitfalls. Invited lecture, ASM International, Materials and Processes for Medical Devices Conference, Cleveland Clinic, August 2008.

James B. Nitinol fatigue and fracture — Beyond the fundamentals. Invited lecture, International conference on shape memory and superelastic technologies, Monterey, CA, May 7, 2006.

Eiselstein L, Sire R, James B. Review of fatigue and fracture behavior of nitinol. ASM Symposium on Materials and Processes for Medical Devices, ASM International, pp. 135-147, Boston, MA, November 14-16, 2005.

James B. Compressive damage-induced cracking in nitinol. International Conference on Shape Memory and Superelastic Technologies, ASM International, Baden Baden, Germany, October 2004.

James B. Failure analysis of NiTi wires used in medical applications. Materials and Processes for Medical Devices, ASM International, St. Paul, MN, August 2004.

James B, Eiselstein L, Foulds J. Failure analysis of NiTi wires used in medical applications. ASM International Journal of Failure Analysis and Prevention 2005; 5(5):82-87; Materials and Processes for Medical Devices, ASM International, pp. 44-49, St. Paul, MN, August 2004.

Eiselstein L, James B. Medical device failures — Can we learn from our mistakes? Proceedings, Materials & Processes for Medical Devices Conference, ASM International, pp. 3-11, August 2004.

James B, Wood L, Murray S, Eiselstein L, Foulds J. Compressive damage-induced cracking in nitinol. Proceedings, International Conference on Shape Memory and Superelastic Technologies, ASM International, pp. 117-124, Baden Baden, Germany, October 2004.

James B, Murray S, Saint S. Fracture characterization in nitinol. Proceedings, International Conference on Shape Memory and Superelastic Technologies, SMST Society, pp. 321-329, May 2003.

James B, Matlock D, Krauss G. Interactive effects of phosphorus and tin on carbide evolution and fatigue properties of 5160 Steel. 38th Mechanical Working and Steel Processing Conference, Vol. XXXIV, pp. 579-590, October 1996.

Jones D, Hoppe R, Hechmer J, James B. An experimental study on the effects of compressive stress on the fatigue crack growth of low-alloy steel. Journal of Pressure Vessel Technology 1994; 116:317-324.

James B. Interactive effects of phosphorus and tin on carbide evolution and fatigue and fracture properties in 5160 steel. Ph.D. Thesis, Colorado School of Mines, 1994.

Merlano N, James B, Matlock D, Krauss G. Effects of tempering and residual element content on mechanical properties of 5160H steel. Proceedings, Gilbert R. Speich Symposium, Iron and Steel Society, pp. 101-109, Montreal, Canada, October 1992.

James B. Low cycle fatigue crack initiation in SA-210 A1 carbon steel boiler tubing in contaminated boiler water. Pressure Vessels and Piping Conference, ASME, Nashville, TN, June 1990.

## Project Experience

**Utilities**

Dr. James has extensive experience conducting failure and risk analyses for both gas and electric utility clients. This work has included consulting on PG&E's San Bruno pipe failure investigation, helping implement pipeline records review processes, as well as helping implement novel methodologies and engineering models to help utilities quantify fire risk due to wind-induced equipment failures. Examples of Dr. James' utility work are as follows:

- PG&E San Bruno pipe rupture investigation. Dr. James' findings were consistent with those of the NTSB.
- Testing and quantification covered conductors and their reduced risk of fire ignition.
- Analysis of earthquake fault creep and the susceptibility increased stain on gas distribution line fracture susceptibility.
- Analysis of the effect of wear on C-hook strength.
- Analysis (and testimony) regarding inspection and cold-end hardware damage on the Caribou-Palermo and similar transmission lines.
- Dozens of hydrotest-induced natural gas pipe rupture failure investigations.
- Post-explosion failure analysis of home natural gas piping, meters, and appliances.
- Metallurgical analysis of electrical components to assess likelihood of arcing.

**Oil and Gas**

Dr. James has conducted dozens of failure analysis investigations of oil and gas facilities, pipelines, and components. Dr. James has also helped assess the fitness for service and flaw tolerance of pipelines and associated components. The following list a few examples of his oil and gas work.

- Separator failure: Dr. James led a failure analysis investigation into how and why a natural gas separator experienced a catastrophic breach.
- Sulfidation analyses: Examined sulfidation-induced breach in refinery steel piping.
- Hydrotest failure analyses: Dr. James has conducted failure analysis investigations to determine the cause of gas pipelines that ruptured during hydrotesting.
- Sierra-Nevada Pipeline Leak: Analyzed a pipeline leak in the Sierra-Nevada mountains that occurred due to damage from improper installation that occurred some 50-years prior to the leak. The local damage resulted in increased stresses that initiated slow-growing "near-neutral" stress-corrosion cracking.
- LEFM-fatigue analysis: Assessed the risk of fatigue-crack growth, leakage, and rupture in pipelines with seam-weld defects of varying depths and lengths using linear-elastic fracture mechanics. This work provided the basis for the client to establish a methodology for seam-weld defect assessment.
- Estuary pipeline rupture: Investigated the cause of a pipeline rupture that occurred within an estuary. Evaluated the cause and extent of corrosion that led to the rupture.
- High pH SCC rupture: Evaluated the cause of a gasoline pipeline rupture that occurred in a high-population area in Arizona. The cause of the rupture was high-pH stress-corrosion cracking

(SCC). Dr. James recommended hydrotesting of adjacent pipeline areas, which revealed other SCC locations that were close to rupture.

- Nevada 3rd party damage: Conducted a failure analysis investigation of a gasoline pipeline that leaked in the desert outside of Las Vegas. This pipeline had suffered a gouge from third-party digging. A fatigue crack initiated from the gouge and eventually grew through wall to cause a leak.
- Bellingham Washington pipeline: Helped investigate the cause of a ruptured gasoline pipeline rupture that tragically killed three youths. Dr. James participated in investigations at the NTSB and Exponent laboratories. The pipeline failed several years after it had been severely damaged by an excavator.
- Seam weld defect- Sacramento: Investigated the cause of a gasoline pipeline leak that occurred along an electric-resistance weld (ERW) seam near Sacramento, CA. The leak was caused by fatigue crack growth that initiated and grew from the seam weld defect.
- Seam weld defect - Texas: Investigated the cause of a gasoline pipeline rupture that occurred in Texas. Metallurgical examination indicated the rupture occurred at an improperly welded ERW seam. A fatigue crack initiated and grew in the weld seam until it reached sufficient length to cause the rupture.
- Australian Gas Pipeline SCC risk assessment: Participated in a study to assess the risk of rupture in an Australian natural gas pipeline that exhibited significant stress corrosion cracking (SCC). This analysis included using the results of in-line inspection coupled with fracture mechanics to help determine the risk of rupture.
- Tee failure: A tee at an oil refinery ruptured resulting in release of product and environmental damage. Metallurgical analysis indicated that the tee failed due to a creep-rupture mechanism, caused by excessive temperature.
- Ethanol storage tank weld: An ethanol storage tank fractured at a weld, resulting in significant loss of product and damages. Analysis indicated that the tank fractured from stress-corrosion cracking at the weld heat-affected zone.
- Gasoline storage tank failure analysis and integrity assessment: Analyzed the cause of a gasoline tank failure, and conducted a fracture mechanics-based fitness for service analysis for floor-to-shell repair welds.

**Medical Devices**

Dr. James has conducted medical device failure analysis investigations for over 25 years. He has also assisted dozens of device manufacturers test, assess, and validate fatigue and corrosion performance of their implants and surgical tools. Selected examples are as follows:

- Cardiovascular implants: Has conducted failure analysis investigations of dozens of stents, filters, and coronary/peripheral devices. Also has directed several fatigue, corrosion, and/or fretting studies of cardiovascular implants for various medical device manufacturers.
- Pacemakers / ICDs: Has conducted several pacemaker/ ICD failure analysis investigations. Dr. James has also helped pacemaker manufacturers with lead and can material selection, as well as fatigue and corrosion testing and validation.
- Orthopedic implants: Dr. James has conducted failure analysis investigations on dozens of orthopedic implants, including hip and knee prostheses, pedicle screws, bone plates, nails, and various other prostheses. He has also evaluated metallurgical, embrittlement, fatigue, coating, and corrosion issues to help manufacturers solve problems or validate device performance.
- Heart Valves: Has investigated several heart valve failures, and has extensive experience conducting and reviewing fatigue testing programs to help validate heart valve fatigue performance.
- Catheters: Has helped manufacturers design and develop catheters, as well as validate fatigue performance and investigate failures.

- Surgical tools: Dr. James has conducted several failure analysis investigations of surgical tools that have fractured or failed during service. He has also helped manufacturers conduct surgical tool fracture, fatigue, corrosion, and embrittlement studies.
- Needles: Has conducted failure analyses to determine the cause of needle breaks, as well as examined the effect of manufacturing processes on needle sharpness.
- Neuro-implants: Has conducted failure analysis investigations of neuro-vascular implants, as well as helped manufacturers validate neuro-vascular device fatigue performance.
- Diabetes/insulin monitoring devices: Has conducted failure analyses of insulin monitoring devices, as well as assisted manufacturers with coating and electrode development.
- Obesity devices: Dr. James has helped manufacturers develop and test various obesity devices.
- Ventricular-assist devices: Has conducted failure analysis investigations, fatigue performance validation, and material selection of ventricular-assist devices.
- Corrosion testing: Experience with potentiodynamic, open-current leaching, galvanic, and fretting testing to assess expected implant corrosion performance.

**Turbines and Boilers**

Dr. James has conducted several investigations of turbine failures (from steam to aircraft). In addition to having worked for a boiler and pressure vessel company, he has also conducted several boiler failure investigations, including waterwall piping, header breaches, pump, bearing, and shaft issues.

- Steam turbine bearing failure analyses: evaluated the cause of fatigue and cavitation in a steam turbine bearing that failed within months of commissioning.
- Turbine shaft wear and coating analysis: analysis of turbine shaft wear at bearings and cold-spray coating techniques.
- Boiler failure analysis: including corrosion, corrosion fatigue, welding and joining, and creep-induced failures in boiler piping, heat exchangers, and waterwalls.
- Steam turbine compressor blade failure analysis: investigated the cause of failure of steam turbine compressor blades.

**Food/Chemical Processing**

Dr. James has conducted several failure analysis investigations of various food and chemical processing industry components. A representative list is shown below.

- Process piping weld specifications: Helped a food-processing plant revise their weld specification, testing, and validation procedures to eliminate leaks and stress-corrosion cracking of their 316L jacketed piping.
- Process piping failures: Examined the cause of leaks, fractures, and ruptures of piping and associated processing equipment. These failures have been caused by poor welding, vibration-induced fatigue, and stress-corrosion cracking.
- Ammonia refrigeration piping failures: Examined and determined the cause of failures in ammonia refrigeration units for ice cream and fruit processing plants. These failures have been caused by insufficient supports, vibration, and poor welds.
- Chemical processing valve: Determined the cause of failure of a large gate valve at a chemical processing plant. A combination of insufficient bolt torque and vibration resulted in insufficient bolt clamping force, which resulted in fatigue failure.
- Piping creep: Inspection of piping at a chemical processing plant revealed local bulging of adjacent piping. The cause of the failure was creep-rupture from excessive temperatures, and that the higher than desired temperatures occurred because of deposits that restricted cooling.

- Valve bolt failures: Bolts at a chemical processing facility fractured causing a large loss. Analysis indicated that the bolts fractured due to stress-corrosion cracking. Material and environmental changes were recommended to eliminate the problem.

**Fire Cause-and-Origin and Electrical Damage**

Dr. James has conducted dozens of metallurgical and materials analyses of components involved or implicated as the cause of a fire. His analyses often involve assessing and differentiating the presence of arc-induced damage, melting-induced alloying, high-temperature damage, and creep associated with fires or electrical damage. Listed below are selected cases.

- Wildfire analysis: Dr. James has investigated several electrical distribution components implicated as the cause or contributors to wildfires.
- Crude oil pipeline leak: analyzed and confirmed that a major crude oil leak was caused by arcing associated with an adjacent electrical sub-station.
- PTCRs: Evaluated positive temperature coefficient resistors (PTCRs) as potential sources of arcing and fires in compressor motors.
- Service boxes: Analyzed whether service box damage indicated the cause and origin of fires, or damage associated with fires that initiated elsewhere.

**Engineering Structures**

Besides piping and other infrastructure analyses, Dr. James has conducted metallurgical failure analysis investigations on many structural components, including several scaffolding and crane failures. Dr. James has also conducted risk analyses of electrical transmission structures based on corrosion, wear, fatigue and other degradation mechanisms. Listed below is a sampling of Dr. James' metallurgical analyses of engineering structures:

- Electrical tower collapse: Investigation of pre-existing cracks in an electrical line tower collapse, including the effects of potential strain aging and hydrogen embrittlement of the tower steel.
- Olympic stadium bolt failure: Examined the cause of bolt failures that occurred during construction of the Salt Lake City Olympic stadium.
- Swing scaffolding: A scaffolding supporting workers on the side of a building in Sacramento fractured, resulting in significant injuries. Metallurgical analysis, including fractography, metallography, fracture toughness, and tensile testing indicated the cause of the failure was overload.
- Paint Scaffolding: A hoist connection of a swing scaffolding fractured in San Francisco, resulting in significant injuries to one of the workers. Failure analysis indicated the hoist connection suffered bending-induced fatigue crack initiation and growth due to scaffold misuse.
- Bay Bridge scaffolding: Portions of an aluminum scaffolding used for painting the San Francisco/ Oakland Bay Bridge fractured, resulting in a worker's death. Metallurgical analysis, including fractography, metallography, and mechanical property testing, in combination with weld and structural analysis was used to determine the cause of the failure.
- Las Vegas sign welds: Analyzed welds that fractured in a high-rise sign during a windstorm to determine whether proper welding procedures were followed.
- Cranes: Dr. James has conducted several crane failures. These analyses have included root-cause assessment of wire rope, axle, rail, lug, and attachment cracking and fractures.

**Fire Protection**

Dr. James has extensive experience conducting failure analysis investigations of fire protection components. These analyses include determining the cause of many unintended sprinkler activations, as well as analysis of sprinkler piping leaks, separations, and ruptures. Selected examples of Dr. James' fire protection analyses are listed below:

- Fire sprinkler: Dr. James has conducted many failure analyses of fire protection sprinklers that either activated in the absence of a fire or did not activate as designed. These have included many fusible-link solder as well as glass-bulb sprinkler designs.
- Sprinkler pipe weld-o-let leaks: Examined the cause of sprinkler pipe weld-o-let leaks in a large government building. Assessed the leaks and the likelihood that any additional could occur after hydrotesting.
- Sprinkler Pipe: Dr. James has conducted several analyses of fire-protection sprinkler piping that ruptured or leaked. Causes of the failures have been ranged pitting (and possible microbial-influenced corrosion), grooving corrosion, improper roll-grooving, and freezing.
- Corrugated stainless steel piping: Investigated the cause of leakage in a corrugated welded stainless steel sprinkler piping. Fractographic and metallographic examination indicated sensitization and stress corrosion cracking.
- Fitting fracture: Dr. James had examined several fire sprinkler-system fitting fractures to determine the cause of failure.

**Aerospace and Motor Vehicle**

Dr. James has conducted several aerospace and motor vehicle failure analysis investigations. These investigations typically involve metallurgical and mechanical analyses to examine the cause of a component failure, or to assess the integrity or expected lifetime of a specific component.

- Lead investigator of a US Air Force-funded study to assess long-term cracking mechanisms in titanium and aluminum-alloy fuel and storage tanks.
- Crimped aluminum microcracks: Assessed whether microcracks present in crimped aluminum rocket components would be expected to propagate or decrease functionality in rocket-body housings.
- Cut copper conductors: Helped predict the remaining life of stranded copper conductors that had been cut during the fabrication of a satellite using both stress-life and fatigue-crack growth methodologies.
- Ultrasonic weld fatigue: Conducted analysis and testing to predict the fatigue performance of ultrasonically welded components in satellite applications.
- Airplane propeller shaft: Conducted a root-cause failure investigation of a propeller shaft that fractured in service. The subject shaft fractured due to unidirectional torsional fatigue.
- Steering knuckle investigation: A rash of steering knuckle failures was observed in specific sport utility vehicle. Dr. James led a metallurgical investigation into the cause of the failures and presented the results to NTSA on behalf of the client.
- Engine Mount: Determined whether a broken engine mount could have contributed to a vehicle crash. Analysis confirmed the mount fractured by overload, and therefore was broken during the crash, rather than causing it.
- Spot weld analyses: Dr. James has participated in several analyses to examine fractured spot welds following vehicle accidents. These analyses assess spot weld size and failure mode.
- Steering system failure analysis: Dr. James has investigated several steering system failures, including projection weld fractures and bellows cracking.
- Motorcycle gas tank ejection: Examined fasteners associated with the gas tank ejection following a motorcycle accident. Conducted testing to determine the amount of thread engagement necessary to recreate the accident bolt features as well as to retain the tank in an accident.

- Chopper weld failure analysis: Conducted a failure analysis investigation of broken welds in a custom chopper to assess failure mode and any welding issues.
- Wheel-off: Dr. James has conducted several investigations of wheel assemblies that became detached from the vehicle while driving. These studies have included fractographic examination of the bolts, loosening studies, torque versus pre-load calculations, examination of the effect of painted hubs, and Goodman-based fatigue calculations of fatigue life as a function of bolt torque and pre-load.
- Leaf spring failure analysis: Dr. James' Ph.D. thesis involved embrittlement, fracture, and fatigue of leaf-spring steel, and he has done several failure analysis investigations of leaf springs that fractured in service.
- Brake cylinder: Led the investigation of a fractured brake cylinder involved in a meter maid traffic accident. The investigation determined that the brake cylinder indeed fractured, resulting in the accident. Improper assembly, just prior to the accident, cracked the cylinder leaving it susceptible to failure.

**Sporting Goods**

Dr. James has conducted failure and life assessment analyses for both industrial and legal clients. Examples of these investigations are listed below:

- Bicycle fork analyses: Dr. James has conducted several examinations that have involved determining the cause of bicycle fork failures. He has also worked directly with manufacturers to examine potential metallurgical issues involving bicycle forks.
- Seat-post bolts: Conducted multiple failure investigations of broken seat-post bolts.
- Bicycle weld analysis: Assisted a bicycle manufacturer with the evaluation of novel welding materials and methods with metallurgical and mechanical testing.
- In-line skate bolt fatigue analysis: conducted fatigue testing and analysis for an in-line skate manufacturer. Based on results, recommended bolt grade, size, and torque levels to client.
- Skateboard trucks: Conducted analyses of several skateboard truck fractures, including metallography, fractography, and fracture mechanics.

**Electronics**

Dr. James has conducted failure analysis investigations and life testing for industrial and legal electronics clients. Representative analyses are listed below:

- Examination and analysis of sulfidation in consumer electronics printer mechanisms, including testing to determine the effect of liquid entrainment into the printer system.
- Ultrasonic welded ignition module: Conducted a failure analysis investigation of a diesel engine ignition module that had an ultrasonically-welded lead fracture that reportedly resulted in engine stall and an accident. Although severe post-fracture damage was observed, the lead fracture was determined to have been caused by thermal fatigue.
- Capacitor fatigue: Participated in an analysis to determine the cause of capacitor fractures. Fractographic analysis combined with finite element modeling indicated that the capacitors fractured in reverse-bending fatigue due to harmonic oscillation during service.
- Cables and strain reliefs: Dr. James has conducted several strain-relief failure analysis investigations for both electronics and medical device manufacturers. He has also conducted several fatigue life analyses, including testing, to assess and predict cable strain-relief fatigue performance.

## Editorships & Editorial Review Boards

*Journal of Failure Analysis and Prevention*

## Peer Reviews

ASM Handbook, Volume 19, Fatigue and Fracture

Journal of Failure Analysis and Prevention

Biomaterials

Materials Engineering and Performance

Acta Biomaterialia

ASM Handbook, Volume 12, Fractography