Michael A.K. Liebschner, Ph.D., P.E.

Biomechanical Practice Leader

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Background

Along with a doctorate in Mechanical Engineering, Dr. Michael Liebschner is an internationally renowned and well-established scholar with more than 20 years of extensive expertise in the development and optimization of diagnostic and treatment options for orthopedic injuries. He has conducted multiple human subject trials on wearable diagnostic devices for bone injuries and for early detection of stress fractures and osteoporosis.

Dr. Liebschner's experience as a leading researcher includes more than 20 years of academic and corporate careers producing innovative and disruptive technology in the biomedical research field and medical device industry. He developed the first robotic system for fracture mechanics applications in the field of medical implant evaluation and is currently developing the first robotic system for intra-operative, patient-specific implant fabrication.

His primary areas of consulting expertise include injury consistency biomechanics, accident reconstruction, and medical device failures. As a forensic investigator, he performs biomechanical analysis on cases involving low-speed accidents, driver determination, falling objects, slip and falls, amusement rides, head and brain trauma, spinal injuries, medical procedure complications, and other accidental events. He has reconstructed accidents involving low-speed accidents, high-speed fatality collisions, pedestrian accidents, also falling objects events, medical device failures, surgical complications, and other types of accidents. Dr. Liebschner also has testified on patent infringement cases and provided expertise in patent valuation and intellectual property review. Dr. Liebschner is fluent in English and German.

Professional Engagements

- **Biomechanical Research/Development**
  - Robotic Implant Fabrication – Houston, TX (2018-2019), Developing the first robotic system for intra-operative, patient-specific implant fabrication.
  - Senior Prototype Engineering – Afghanistan (2014), Provided in-theatre rapid prototyping solution to problems of U.S. war fighters. Provided concept, solution, and testing of final solutions as part of the Rapid Equipping Force of the U.S. Military Tactical Prototyping Laboratory.
  - Biofabrication Test Bed – Houston, TX (2008-2018), Established a test bed for the biofabrication of artificial organs using direct fabrication, 3D printing, and robotics technology and founded a consortium to fast-track the technology into a clinical setting.

- Chiropractic Instrument Development – Houston, TX, and Phoenix, AZ (2008-2012), Invented and developed the most successful mechanical spine manipulation instrument used in chiropractic applications today.
- Biomechanical Testing – Houston, TX (2008-Present), Developed and executed programs for biomechanical testing of biomaterials and tissue analogs.
- Robotic Fracture System – Houston, TX (2000-2008), Developed the first robotic system for fracture mechanics applications in the field of medical implant evaluation.

Forensic Engagements

- **Biomechanical Evaluations**
  - Re-created accident scenario and experimentation to evaluate head injury risk from fallen hardhat.
  - Evaluated the circumstances of an upper arm fracture while in custody of law enforcement.
  - Re-created the effects of a falling garden tool onto the head.
  - Conducted biomechanical evaluation of injuries to an infant in automotive collisions.
  - Determined cause of failure in medical implant case – fatigue vs. overloading during rear-end vehicle impact.
  - Analyzed effect of non-seatbelt use on rear passenger injury from a frontal motor vehicle accident.
  - Through biomechanical evaluation, determined whether medical symptoms resulted from an alleged head injury or from a brain cyst.
  - Determined through human subject testing if head injury was consistent with forces created by a falling object.
  - Determined experimentally and mathematically if worker injury was consistent with occupational work.
  - Reconstructed the fatal shooting to determine the sequence of events.

- **Product Assessments**
  - Determined root cause of failure of a large-scale autoclave.
  - Evaluated damage to a meat injector system after transport and estimate its repair effort.
  - Evaluated damage to a robotic pharmacy storage system after flooding and establish repairability.

- **Expert Witness/Testimony**
  - Testified in multiple cases regarding injuries sustained during events, including cases of murder.

Professional Experience

- **Rimkus** **2016 – Present**
  - Biomechanical Practice Leader
    Provides consulting services to insurance carriers, law firms, and corporate clients. Evaluates and analyzes biomechanical systems, including voluntary and involuntary human motions. Provides human-injury impact analysis in vehicular accidents, amusement park ride accidents, and cases involving falls or falling objects. Performs occupant motion studies to determine injury potential/causation, seatbelt use, the effects of airbag interaction, and determination of occupant positions. Uses both computer and physical models to reconstruct those accidents and to measure the load and injury levels. Evaluates medical device/ hospital equipment failures and malfunctions.

- **Exponent Failure Analysis** **2012 – 2016**
  - Senior Associate
    Provided consulting services on matters of industrial problem solving, root-cause analysis, product defect litigation, intellectual property disputes, technology evaluation, strategic planning, and insurance issues.

Assisted clients with medical device testing for regulatory approval, designing and fabricating proof-of-concept prototypes, and evaluating technology for potential acquisitions, designed and developed innovative medical devices and fast-tracked that technology through the regulatory process. Tested and evaluated medical devices in terms of their electrical safety and compliance with IEC60601. Worked with small foundations on investment strategies and evaluated potential technology to advance their efforts. Supported U.S. Forces in Afghanistan as prototyping engineering while being deployed in austere and dangerous conditions in Afghanistan. Rapidly designed and fabricated prototypes to meet identified capability gaps for the U.S. Army. Communicated assessment of phases, milestones, and status of projects; command interest, current efforts, and future initiatives to executive leadership.

- **Baylor College of Medicine** **2008 – Present**
  - Associate Professor/Director – Bio-Innovations Laboratory

    Developed a reliable concept for artificial organ and large tissue segment biofabrication that can be utilized as an on-demand fabrication approach in emergency operations and during reconstructive surgery. Personally established a test bed for the biofabrication of artificial organs using direct fabrication and robotics technology. Founded a consortium to fast-track this technology into a clinical setting. Key person in the fabrication and evaluation of three rounds of prototype devices for ultra-portable, battery-operated devices intended for the treatment of acute and chronic back pain.

    Established a consortium with collaborators from industry and clinical partners. Personally headed a joint project between Neurosurgery, Orthopedic Surgery, and the Medical Examiner on the risk of standard care after a vehicular accident in causing spinal cord injury (SCI). It is estimated that patient management and the usage of neck collars cause more than 20% of all SCIs. Conducted interdisciplinary and clinically relevant research on the characterization of the biomechanical performance of various medical devices using a cadaveric model.

- **Michael E. Debakey Veterans Affairs Medical Center (MEDVAMC)** **2008 – Present**
  - Associate Professor/Co-Director – Biomechanics and Kinematics Laboratory

    Established the biomechanics and kinematics laboratory at the MEDVAMC. Conducted ovine brain tissue experiments in order to develop constitutive equations for the mechanical properties of brain tissue under dynamic impact loading, similar to what soldiers experience during an IED explosion. Established brain tissue testing protocols for the testing of human brain tissue. Developed computer models of the human head to simulate the effects of a blast on the brain. Personally launched an interdisciplinary research consortium on acceleration of stroke rehabilitation of veterans using robotic technology. Key person on the development of a handheld injury diagnostic device suitable for combat environments. Evaluated the repetitive loading characteristic of spinal implants used at the VA medical center. Initiated innovative research strategy for the training of young surgeons using haptic feedback. Currently, research includes investigating the increase of fracture risk of U.S. Veterans undergoing a rapid weight loss regime.

- **Rice University** **2000 – 2008**
  - Associate Professor/Director – Computational and Experimental Biomechanics Laboratory

    Discovered the internal competing mechanism between internal stress risers and apparent stiffness and strength recovery related to the biomechanics of vertebroplasty. Was the first to scientifically prove that vertebroplasty increases fracture risk of adjacent spinal segments. First laboratory to use robotics for fracture mechanics of the human spine and for generating 3D topography maps of the spinal range of motion before and after intervertebral disc treatment.

Developed a methodology for intra-operative 3D fluoroscopy for surgical evaluation. This patented procedure eliminates moving the patient to CT for follow-up evaluations and still obtains 3D images.

Key inventor and driving force behind the development and testing of a non-invasive and non-radiation-based bone diagnostic device for early detection of bone loss and stress fractures. Received numerous awards of excellence in research and education.

Education and Certifications

- **Mechanical Engineering, Ph.D.:** University of Vermont (1998)
- **Mechanical Engineering, M.S.:** Ruhr University Bochum, Germany (1995)
- **Prof. Cert. Electrical and Precision Engineering Staatliche Feintechnik Schule:** Germany (1989)
- **Licensed Professional Engineer** (2019)
- **Private Investigator License** (2016)
- **Warzone Deployment Training** (2013)
- **Rescue Diver, Rescue Diver Instructor, Dive Master** (1994)
- **Emergency Medical Technician, Part A** (1993)
- **Operator License for Forklifts, Gantry Cranes, Crane Arms** (1992)
- **Motor Vessel Boating License** (1985)

Continuing Education

- **Specialized Coursework:** Risk Management for medical devices and ISO 14971 (2015); Designing to Comply with IEC60601 series, 2nd and 3rd Edition Alignments (2013); Solidworks and interfacing with CNC and 3D Printing (2012); Adept Intermediate and Advanced Robot Programming (2010); Technology Entrepreneur Workshop (2003); CNC Machining (1989); Computer Aided Design (1987)

Publications

- **Authored 61 peer-reviewed journal publications on topics related to orthopedics and biomechanics.**
- **Authored 156 conference abstracts and proceedings on topics related to orthopedics and biomechanics.**
- **Authored 12 book chapters on topics related to orthopedics and biomechanics.**
- **Book editor on computer-aided tissue engineering.**