

**Andrew C. Rau**  
**Senior Associate**

**Professional Profile**

Mr. Andrew Rau is a Senior Associate in Exponent's Biomedical Engineering practice. Mr. Rau specializes in mechanical testing, solid mechanics, and stress analysis. He has experience developing and implementing customized protocols to evaluate the mechanical performance of medical devices, along with a broad range of consumer products and polymeric materials. Mr. Rau has an extensive knowledge of standards pertaining to the mechanical evaluation of medical devices, medical implants, biomaterials, as well as metallic and polymeric materials. He has developed and implemented numerous customized testing protocols, including biomechanical testing of cadaveric spines and functional spinal units (FSU), static and fatigue testing of consumer electronic products, and wear testing for total disc replacements and polymeric materials used in medical devices.

He has extensive experience operating axial/torsional mechanical load frames and designing custom fixturing to meet a variety of testing needs. Specifically, Mr. Rau has performed mechanical testing of spinal fusion devices and spinal instrumentation implanted in cadaveric vertebrae and designed customized fixturing for wear testing of spinal and orthopedic implants. He also has extensive experience with testing and evaluating materials for medical devices and other applications, including ultra-high molecular weight polyethylene (UHMWPE), polyether ether ketone (PEEK), as well as rate and temperature dependent stress-strain behavior of nitinol. Mr. Rau also has experience designing customized test systems for cyclic testing of large mechanical linkages and wear testing of bearings in consumer and medical products.

Mr. Rau's analytical capabilities include linear and non-linear finite element modeling of medical devices, theoretical fracture mechanics, as well as design optimization. Mr. Rau's research interests include verification and validation for computational modeling of medical devices. He serves as the Vice Chair of the ASME Codes and Standards committee *ASME V&V 40 Verification and Validation in Computational Modeling of Medical Devices*, and is currently active in developing guidance documents on V&V for computational modeling of stents, heart valves, and orthopedic devices. Specifically, Mr. Rau serves as the subgroup leader for the development of a V&V standard for computational modeling of heart valves.

Prior to joining Exponent, Mr. Rau was a research and teaching assistant in the Department of Mechanical and Nuclear Engineering at The Pennsylvania State University, where his research focused on the design and optimization of surgical instruments for minimally invasive surgery (MIS). Mr. Rau has experience with intellectual property submissions for medical devices, including the drafting of technical documentation for patent applications.

## **Academic Credentials and Professional Honors**

M.S., Mechanical Engineering, The Pennsylvania State University, 2010  
B.S., Mechanical Engineering, Lafayette College (*summa cum laude*), 2008

Tau Beta Pi; Sigma Xi

## **Licenses and Certifications**

Engineer in Training, Commonwealth of Pennsylvania, #ET011481

## **Patents**

Biopsy Device. Provisional Patent Application 61/237,959 (U.S.), filed Aug. 28, 2009.  
Surgical Tool. Provisional Patent Application 61/237,954 (U.S.), filed Aug. 28, 2009.

## **Publications**

Rau AC, Frecker M, Mathew A, Pauli E. Multifunctional forceps for use in endoscopic surgery—Initial design, prototype, and testing. *Journal of Medical Devices* 2011; 5(4):041001/1-10.

Rossmann JS, Rau AC. An experimental study of Wiffle ball aerodynamics. *American Journal of Physics* 2007; 75(12):1099–1105.

Rau AC. Design of a multifunctional endoscopic forceps for use in incisionless surgery. Master's Thesis, The Pennsylvania State University, 2010.

## **Conference Papers, Abstracts, and Presentations**

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

Rau AC, Frecker MI, Mathew A, Pauli E. Design of a multifunctional forceps for use in endoscopic surgery. *Proceedings, 2010 Design of Medical Devices Conference, Minneapolis, MN, April 13–15, 2010.*

Niebel C, Frecker M, Rau AC, Hayes G, Mathew A. Design of an endoscopic biopsy needle. *Proceedings, 2010 Design of Medical Devices Conference, Minneapolis, MN, April 13–15, 2010.*

Rau AC, Frecker MI. A review of scaling and performance considerations for articulating technologies. *Proceedings, ASME 2009 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), Oxnard, CA, September 21–23, 2009.*

Rau AC, Frecker MI, Mathew A. Design of a multifunctional tissue grasper and spreader for use in incisionless surgery. Presented at the ASME 2009 International Design Engineering Technical Conferences, ASME Student Mechanism and Robot Design Competition-Graduate Level Mechanisms Division, San Diego, CA, August 30–September 2, 2009.

Rossmann JS, Rau AC, Utela B. Experimental determination of elastomechanical properties of bovine veins. Proceedings, 2<sup>nd</sup> International Conference on Mechanics of Biomaterials and Tissues, Elsevier, Kauai, HI, December 9–13, 2007.

### **Peer Reviewer**

Design of Medical Devices Conference  
Conference on Smart Materials, Adaptive Structures and Intelligent Systems  
International Design Engineering Technical Conferences

### **Professional Affiliations**

American Society of Mechanical Engineers—ASME  
American Society for Testing and Materials—ASTM