

MARK E. RENTSCHLER

Current Position	Associate Professor Department of Mechanical Engineering University of Colorado at Boulder 427 UCB, 1111 Engineering Drive Boulder, CO 80309-0427 Phone: 303.735.6149 Fax: 303.492.3498 E-mail: mark.rentschler@colorado.edu Website: http://amtl.colorado.edu LinkedIn YouTube Twitter Web of Science ResearcherID: F-2854-2014 ORCID: 0000-0002-5901-8358	
Education	University of Nebraska, Lincoln, NE Ph.D., Biomedical Engineering, May 2006 Thesis: <i>In vivo Abdominal Surgical Robotics: Tissue Mechanics Modeling, Robotic Design, Experimentation and Analysis</i> Advisor: Prof. Shane Farritor Massachusetts Institute of Technology, Cambridge, MA M.S., Mechanical Engineering, June 2003 Thesis: <i>Dynamic Simulation Modeling and Control of the Odyssey III Autonomous Underwater Vehicle</i> Advisor: Prof. Franz Hover University of Nebraska, Lincoln, NE B.S., Mechanical Engineering, <i>Summa cum laude</i> , May 2001 Thesis: <i>Mobile Highway Construction Barrel Robots</i> Advisor: Prof. Shane Farritor University of Technology of Belfort-Montbéliard, Belfort, France Automotive engineering exchange summer program Curriculum of automotive engineering	
Academic Positions	Associate Professor 07/2016-present Sylvia Norviel Cancer Research Faculty Fellow 02/2018-present Director, Faculty Innovation Ambassadors 10/2017-present Co-Founder and Director, Graduate Design Program 08/2010-present Co-Founder and Co-Director, Design Center Colorado 06/2012-present Associate Department Chair 07/2017-09/2018 Chair, Graduate Program 07/2017-09/2018 Chair, External Relations Committee 07/2014-06/2016 Assistant Professor 08/2008-06/2016 Department of Mechanical Engineering University of Colorado Boulder (CU-Boulder) Associate Professor (Secondary Appointment) 07/2016-present Medical Science Training Program (MSTP) – MD/PhD Training Faculty 10/2017-present Assistant Professor (Secondary Appointment) 08/2008-06/2016 Department of Surgery in the Division of Cardiothoracic Surgery University of Colorado Anschutz Medical Campus (CU-Anschutz)	

	Associate Professor (Affiliate)	<i>07/2016-present</i>
	Assistant Professor (Affiliate)	<i>03/2010-06/2016</i>
	Department of Bioengineering University of Colorado Denver (CU-Denver)	
	Postdoctoral Researcher	<i>06/2006-05/2007</i>
	Department of Surgery in the Division of Vascular Surgery University of Nebraska Medical Center, Omaha NE	
	Graduate Research Fellow	<i>06/2003-05/2006</i>
	Department of Mechanical Engineering University of Nebraska, Lincoln NE	
	Graduate Research Fellow	<i>08/2001-06/2003</i>
	Department of Mechanical Engineering National Defense Science and Engineering Graduate (NDSEG) Fellowship Massachusetts Institute of Technology	
	Research Associate	<i>06/2001-08/2001</i>
	NASA Academy Goddard Space Flight Center, Greenbelt MD	
Industry Positions	President and CEO	<i>06/2018-present</i>
	Aspero Medical, Inc., Boulder, CO	
	Guest Speaker, Workshop, and Lecturer	<i>01/2017-present</i>
	Industry consulting focused on "design thinking," including on-site guest speaking, workshops and interactive classroom lectures.	
	Patent Litigation	<i>01/2016-present</i>
	Subject matter expert in mechanical and biomedical engineering Expert witness in matters involving mechanical design, medical devices & surgical tools Engineering consultation Patent infringement analysis Claim chart preparation Expert reports, rebuttals, and declarations Deposition testimony experience Hearing testimony experience	
	Engineering Consulting	<i>01/2007-present</i>
	Design Engineering Biomedical Engineering Surgical Robotics Expert Biomedical Robotacist	
	Director of Operations	<i>05/2007-07/2008</i>
	Intellectual Property Portfolio Development Virtual Incision Corporation, Boston MA	
	Senior Engineer	<i>06/2006-05/2007</i>
	Robot Design and Development Virtual Incision Corporation, Omaha NE	

Licensure/ Professional Societies	Licensed Professional Mechanical Engineer (State of Colorado - PE.0042566)	2008-present
	American Society of Mechanical Engineers (ASME, #6116925)	1997-present
	Student Member	1997-2006
	Member	2006-2018
	Fellow	2018-present
	Institute of Electrical and Electronics Engineers (IEEE, #90031996)	2008-present
	Member	2008-2018
	Senior Member	2018-present
	Biomedical Engineering Society (BMES, #4011419)	2018-present
Honors and Awards	University of Colorado Research & Innovation Office <i>Faculty Fellow</i>	2019
	University of Colorado <i>Faculty Leadership Institute</i> Member	2018-2019
	<i>Fellow</i> , American Society of Mechanical Engineers (ASME)	2018
	University of Colorado representative at <i>Coalition for National Science Funding</i>	2018
	University of Colorado <i>Sylvia Norviel Cancer Research Faculty Fellow</i>	2018
	Department of Mechanical Engineering <i>Outstanding Graduate Educator Award</i>	2017-2018
	Nominated to attend the <i>NAE Frontiers of Engineering Symposium</i>	2018
	CEAS <i>Dean's Performance Award for Outstanding Junior Faculty</i>	2016
	<i>Annual award based on prior year's performance evaluations</i>	
	University of Colorado <i>Innovative Seed Grant Program Award</i>	2016
	Department of Mechanical Engineering <i>Outstanding Undergraduate Educator</i>	2015-2016
	University of Colorado <i>Provost's Faculty Achievement Award</i> for research	2015
	Design of Medical Devices Conference <i>3-in-5 Presentation Award Winner</i>	2015
	<i>Top ten paper authors present 3 slides in 5 minutes – top winner chosen by expert panel</i>	
	Department of Mechanical Engineering <i>Woodward Outstanding Faculty Award</i>	2014-2015
	Colorado Clinical and Translational Sciences Institute (CCTSI)	2014
	<i>Novel Clinical and Translational Methods Pilot Program Award (Co-PI)</i>	
	Department of Mechanical Engineering <i>Outstanding Graduate Educator Award</i>	2013-2014
	University of Colorado College of Engineering and Applied Science	2013
	<i>Charles Hutchinson Memorial Teaching Award</i>	
	University of Colorado <i>Innovative Seed Grant Program Award (Co-PI)</i>	2013
	Department of Mechanical Engineering <i>Outstanding Graduate Education Award</i>	2011-2012
	University of Colorado <i>Outstanding Graduate Student Mentor Faculty Award</i>	2011-2012
	Colorado Clinical and Translational Sciences Institute (CCTSI)	2011
	<i>Junior Faculty Pilot Award</i>	
	CU Engineering Alumni Magazine Feature	2010
	University of Colorado Boulder Technology Transfer <i>New Inventor of the Year</i>	2009
	University of Colorado Volleyball <i>Professor of the Match</i>	2009
CU-Boulder <i>Innovative Seed Grant Program Award</i>	2009	
BMW Group International <i>Passion for Innovation</i> Scientific Award Finalist (5 finalists out of 241 applicants from 25 countries)	2007	
University of Nebraska Outstanding Graduate Research Assistant Award for University-wide Best Research	2006	
Nominated for the Construction Innovation Forum (CIF) NOVA Award for "Robotic Traffic Barrels"	2005	
NASA Columbia Memorial Scholarship	2004-2006	
National Defense Science and Engineering Graduate (NDSEG) Fellowship	2001-2004	
Tau Beta Pi Centennial Graduate Fellowship	2001-2002	
Goddard Award for Excellence for outstanding research efforts and overall NASA Academy commitment	2001	

Invited Lectures

- “Enabling Mobile *In vivo* Robotic Surgery: from Micro-Patterned Materials to Autonomous Navigation,” University of Leeds, Seminar Presentation, Leeds, England, October, 2018.
- “Enabling Mobile *In vivo* Robotic Surgery: From Micro-Patterned Materials to Autonomous Navigation,” University of Utah, Seminar Presentation, Salt Lake City, UT, April, 2018.
- “Enabling the Next Generation of Surgical Devices: From Micro-Patterned Materials to Autonomous *In vivo* Navigation,” University of Washington, Seminar Presentation, Seattle, WA, March, 2018.
- “Micro-Patterned Materials to Enable *In vivo* Robotic Capsule Endoscope Locomotion,” MRS Spring Meeting, Invited Symposium Speaker on *A Soft Future – From Electronic Skin to Robotics and Energy Harvesting*, Phoenix, AZ, April, 2017. ***Noted as Scientific Highlight.**
- “Towards Autonomous Robotic Capsule Endoscopy,” IEEE International Conference on Intelligent Robots and Systems (IROS), Invited Symposium Speaker on *Frontiers of Endoluminal Robotic Surgery*, Daejeon, Korea, October, 2016.
- “Achieving *In vivo* Robotic Mobility using Micropatterned Treads,” Colorado School of Mines, Seminar Presentation, Golden, CO, September, 2014.
- “Achieving *In vivo* Robotic Mobility: Design, Experimental Testing, Contact Mechanics Modeling and Robotic Implementation of Micropatterned Treads,” Clarkson University, Seminar Presentation, Potsdam, NY, October, 2012.
- “Robotic Capsule Endoscopy: Measuring and Modeling Tissue-Robot Interactions,” Vanderbilt University, Joint Mechanical Engineering and Vanderbilt Initiative in Surgery and Engineering (VISE) Seminar Presentation, Nashville, TN, March, 2012.
- “Robotic Mobility Inside of the Human Body,” University of Colorado, Department of Mechanical Engineering Graduate Seminar Presentation, Boulder, CO, November, 2009.
- “*In Vivo* Abdominal Surgical Robotics: Tissue Mechanics Modeling, Robotic Design, Experimentation, and Analysis,” BMW Group International Passion for Innovation Scientific Award, Munich, Germany, September, 2007.
- “Virtual Incision Corporation – A Revolution in Minimally-Invasive Surgery,” LifeScience Alley Conference on Biomedical Science, Saint Paul, MN, December, 2006.
- “Mobile Robotics for *In vivo* Surgical and Battlefield Applications,” Army Research Office (ARO) Workshop on Mobility and Control in Challenging Environments, Olin College, Needham, MA, October, 2006.
- “Mobile *In vivo* Robotics for Laparoscopic Surgery,” University of Nebraska – Lincoln, Department of Mechanical Engineering, November, 2005.

Publications Theses

- Rentschler, M.**, *In Vivo Abdominal Surgical Robotics: Tissue Mechanics Modeling, Robotic Design, Experimentation, and Analysis*, Ph.D. Dissertation, University of Nebraska, Lincoln, NE, 2006.
- Rentschler, M.**, *Dynamic Simulation Modeling and Control of the Odyssey III Autonomous Underwater Vehicle*, Master's Thesis, Massachusetts Institute of Technology, Cambridge, MA, 2003.
- Rentschler, M.**, *Mobile Highway Construction Barrel Robots*, Bachelor's Thesis, University of Nebraska, Lincoln, NE, 2001.

Books, Book Chapters, and Magazine Articles

Rentschler, M., Oleynikov, D., "Will in vivo robotics be the future of minimally invasive surgery?" *Med Tech Business Review*. 1(4): 70-73, 2007.

Rentschler, M., "Undergraduates Benefit From Conducting Research," *Nebraska Blueprint*. Spring, 2001.

Journal Publications (peer-reviewed original articles)

Sun, X., Yu, L., **Rentschler, M.E.**, Wu, H., Long, R., "Delamination of a Rigid Punch from an Elastic Substrate Under Normal and Shear Forces," *Journal of the Mechanics and Physics of Solids*. 122: 141-160, 2019.

Formosa, G., Prendergast, J.M., Peng, J., Kirkpatrick, D., **Rentschler, M.E.**, "A Modular Endoscopy Simulation Apparatus (MESA) for Robotic Medical Device Sensing and Control Validation," *IEEE Robotics and Automation Letters*. 3(4): 4054-4061, 2018.

Lauff, C., Weidler-Lewis, J., O'Connor, K., Kotys-Schwartz, D., **Rentschler, M.E.**, "Prototypes as Intermediary Objects for Design Coordination in First-Year Design Courses," *International Journal of Engineering Education*. 34(3): 1085-1103, 2018.

Prendergast, J.M., Formosa, G.A., **Rentschler, M.E.**, "A Platform for Developing Robotic Navigation Strategies in a Deformable, Dynamic Environment," *IEEE Robotics and Automation Letters*. 3(3): 2670-2677, 2018.

Lauff, C., Kotys-Schwartz, D., **Rentschler, M.E.**, "What is a prototype? What are the roles of prototypes in companies?" *ASME Journal of Mechanical Design*. 140(6): 061102 (12 pages), 2018.

Kern, M.D., Long, R., **Rentschler, M.E.**, "A Representative Volume Element Model for the Adhesion between a Micro-Pillared Surface and a Compliant Substrate," *Mechanics of Materials*. 119: 65-73, 2018.

Fankell, D.P., Regueiro, R.A., Kramer, E.A., Ferguson, V.L., **Rentschler, M.E.**, "A Small Deformation Thermo-Poromechanics Finite Element Model and its Application to Arterial Tissue Fusion," *ASME Journal of Biomechanical Engineering*. 140(3): 031007 (11 pages), 2018.

**Editor's Choice Paper (less than 10% receive this honor)*

Prendergast, J.M., Perry, A., Patel, V., Lindley, E., **Rentschler, M.E.**, "Positioning Performance of Power and Manual Drivers in Posterior Spinal Fusion Procedures," *Applied Bionics and Biomechanics*. 2017: 7262841 (9 pages), 2017.

Han, F., Yang, X., Deng, Y., **Rentschler, M.**, Yang, D., Zhang, H., "SRAL: Shared Representative Appearance Learning for Long-Term Visual Place Recognition," *IEEE Robotics and Automation Letters*. 2(2): 1172-1179, 2017.

Kern, M., Qi, Y., Long, R., **Rentschler, M.E.**, "Characterizing Adhesion between a Micro-Patterned Surface and a Soft Synthetic Tissue," *Langmuir*. 33(4): 854-864, 2017.

Kramer, E.A., Cezo, J., Fankell, D. P., Taylor, K.D., **Rentschler, M.E.**, Ferguson, V.L., "Strength and Persistence of Energy-Based Vessel Seals Rely on Tissue Water and Glycosaminoglycan Content," *Annals of Biomedical Engineering*. 44(11): 3421-3431, 2016.

Fankell, D., Kramer, E., Cezo, J., Ferguson, V.L., Taylor, K.D., **Rentschler, M.E.**, "A Novel Parameter for Predicting Arterial Fusion and Cutting in Finite Element Models," *Annals of Biomedical Engineering*. 44(11): 3295-3306, 2016.

Sliker, L.J., Ciuti, G., **Rentschler, M.E.**, Menciassi, A., "Frictional Resistance Model for Tissue-Capsule Endoscope Sliding Contact in the Gastrointestinal Tract," *Tribology International*. 102: 472-484, 2016.

Kleck, C.J., Cullimore, I., LaFleur, M., Lindley, E., **Rentschler, M.E.**, Burger, E.L., Cain, C.M.J., Patel, V.V., "A New 3-Dimensional Method for Measuring Precision in Surgical Navigation and Methods to Optimize Navigation Accuracy," *European Spine Journal*. 25(6): 1764-1774, 2016.

Francisco, M., Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, "An Intestinal Manometry Force Sensor for Robotic Capsule Endoscopy: An Acute, Multi-Patient *In vivo* Animal and Human Study," *IEEE Transactions on Biomedical Engineering*. 63(5): 943-951, 2016.

Anderson, N., Kramer, E., Cezo, J.D., Ferguson, V., **Rentschler, M.E.**, "Bond Strength of Thermally Fused Vascular Tissue Varies with Apposition Force," *ASME Journal of Biomechanical Engineering*. 137(12): 121010 (6 pages), 2015.

Sliker, L.J., Kern, M.D., **Rentschler, M.E.**, "An Automated Traction Measurement Platform and Empirical Model for Evaluation of Rolling Micro-Patterned Wheels," *IEEE/ASME Transactions on Mechatronics*. 20(4): 1854-1862, 2015.

Cezo, J., Kramer, E., Schoen, J.A., Ferguson, V., Taylor, K., **Rentschler, M.E.**, "Tissue Storage *Ex Vivo* Significantly Increases Vascular Fusion Bursting Pressure," *Surgical Endoscopy*. 29(7): 1999-2005, 2015.

Terry, B.S., Wang, X., Schoen, J.A., **Rentschler, M.E.**, "A Preconditioning Protocol and Biaxial Mechanical Measurement of the Small Intestine," *International Journal of Experimental and Computational Biomechanics*. 2(4): 293-309, 2014.

Kern, M., Ortega, J., **Rentschler, M.E.**, "Soft Material Adhesion Characterization for *In vivo* Locomotion of Robotic Capsule Endoscopes: Experimental and Modeling Results," *Journal of Mechanical Behavior of Biomedical Materials*. 39: 257-269, 2014.

Zimkowski, M.M., **Rentschler, M.E.**, Schoen, J.A., Mandava, N., Shandas, R., "Biocompatibility and Tissue Integration of a Novel Shape Memory Surgical Mesh for Ventral Hernia: *In vivo* Animal Studies," *Journal of Biomedical Materials Research, Part B Applied Biomaterials*. 102(5): 1093-1100, 2014.

Beccani, M., Di Natali, C., Sliker, L.J., Schoen, J., **Rentschler, M.E.**, Valdastrì, P. "Wireless Tissue Palpation for Intraoperative Detection of Lumps in Soft Tissue," *IEEE Transactions on Biomedical Engineering*. 61(2): 353-361, 2014. *Cover Article

Cezo, J.D., Passernig, A., Ferguson, V., Taylor, K., **Rentschler, M.E.**, "Evaluating Temperature and Duration in Arterial Tissue Fusion to Maximize Bond Strength," *Journal of Mechanical Behavior of Biomedical Materials*. 30: 41-49, 2014.

Lyle, A.B., Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, "Preliminary Friction Force Measurements on Small Bowel Lumen when Eliminating Sled Edge Effects," *Tribology Letters*. 51(3): 377-383, 2013.

Cezo, J.D., Kramer, E., Taylor, K., Ferguson, V., **Rentschler, M.E.**, "Temperature Measurement Methods during Direct Heat Arterial Tissue Fusion," *IEEE Transactions on Biomedical Engineering*. 60(9): 2552-2558, 2013.

Wang, X., Sliker, L.J., Qi, H., **Rentschler, M.E.**, "A Quasi-static Model of Wheel-Tissue Interaction for Surgical Robotics," *Medical Engineering and Physics*. 35(9): 1368-1376, 2013.

Zimkowski, M.M., **Rentschler, M.E.**, Schoen, J.A., Rech, B.A., Mandava, N., Shandas, R., "Integrating a Novel Shape Memory Polymer into Surgical Meshes Decreases Placement Time in Laparoscopic Surgery: An *In vitro* and Acute *In vivo* Study," *Journal of Biomedical Materials Research Part A*. 101(9): 2613-2620, 2013.

Lyle, A.B., Luftig, J.T., **Rentschler, M.E.**, "A Tribological Investigation of the Small Bowel Lumen Surface," *Tribology International*. 62: 171-176, 2013.

Wang, X., Schoen, J.A., **Rentschler, M.E.**, "A Quantitative Comparison of Soft Tissue Compressive Viscoelastic Model Accuracy," *Journal of Mechanical Behavior of Biomedical Materials*. 20: 126-136, 2013.

- Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, "Measurements of the Contact Force from Myenteric Contractions on a Solid Bolus," *Journal of Robotic Surgery*. 7(1): 53-57, 2013.
- Lindley, E., Zimkowski, M., Patel, V., **Rentschler, M.**, "Pain Sensitivity Testing Using a Novel Computer-Controlled Pressure Algometer that Simultaneously Records Sympathetic Nervous System Responses to Pain Stimuli," *Journal of Pain*. 13(4): S9, 2012.
- Terry, B.S., Passernig, A.C., Hill, M., Schoen, J.A., **Rentschler, M.E.**, "Small Intestine Mucosal Adhesivity to *In vivo* Capsule Robot Materials," *Journal of Mechanical Behavior of Biomedical Materials*. 15: 24-32, 2012.
- Sliker, L.J., **Rentschler, M.E.**, "The Design and Characterization of a Testing Platform for Quantitative Evaluation of Tread Performance on Multiple Biological Substrates," *IEEE Transactions on Biomedical Engineering*. 59(9): 2524-2530, 2012.
- Sliker, L., Kern, M., Schoen, J.A., **Rentschler, M.E.**, "Surgical Evaluation of a Novel Tethered Robotic Capsule Endoscope using Micro-Patterned Treads," *Journal of Surgical Endoscopy*. 26(10): 2862-2869, 2012.
- Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, "Characterization and Experimental Results of a Novel Sensor for Measuring the Contact Force from Myenteric Contractions," *IEEE Transactions on Biomedical Engineering*. 59(7): 1971-1977, 2012.
- Terry, B.S., Schoen, J.A., Mills, Z., **Rentschler, M.E.**, "Single Port Access Surgery with a Novel Port Camera System," *Surgical Innovation*. 19(2): 123-129, 2012.
- Rentschler, M.E.**, Hart, K.D., Mitchell, M.B., "Initial Design and Evaluation of a Pediatric Intra-Cardiac Camera System for Ventricular Septal Defects," *ASME Journal of Medical Devices*. 6(1): 011001-1-011001-9, 2012.
- Terry, B.S., Mills, Z., Schoen, J.A., **Rentschler, M.E.**, "Single-Port-Access Surgery with a Novel Magnet Camera System," *IEEE Transactions on Biomedical Engineering*. 59(4): 1187-1193, 2012.
- Terry, B.S., Lyle, A., Schoen, J.A., **Rentschler, M.E.**, "Preliminary Mechanical Characterization of the Small Bowel for *In vivo* Robotic Mobility," *ASME Journal of Biomechanical Engineering*. 133(9): 091010-1-091010-7, 2011.
- Zimkowski, M., Lindley, E., Patel, V., **Rentschler, M.E.**, "Design and Evaluation of a Computer-Controlled Pressure Algometer," *ASME Journal of Medical Devices*. 5(3): 031002-1-031002-6, 2011.
- Sliker, L.J., Wang, X., Schoen, J.A., **Rentschler, M.E.**, "Micropatterned Treads for *In vivo* Robotic Mobility," *ASME Journal of Medical Devices*. 4(4): 041006-1-041006-8, 2010.
- Rentschler, M.E.**, Macdonald, S.A., "Design and Preliminary Evaluation of a Novel Brace for Boutonniere Deformity," *ASME Journal of Medical Devices*. 4(2): 021002-1-021002-7, 2010.
- Terry, B.S., Ruppert, A.D., Steinhaus, K.R., Schoen, J.A., **Rentschler, M.E.**, "An Integrated Port Camera and Display System for Laparoscopy," *IEEE Transactions on Biomedical Engineering*. 57(5): 1191-1197, 2010.
- Platt, S.R., Hawks, J.A., **Rentschler, M.E.**, "Vision and Task Assistance using Modular Wireless *In Vivo* Surgical Robots," *IEEE Transactions on Biomedical Engineering*. 56(6): 1700-1710, 2009.
- Rentschler, M.**, Reid, J., "The Development of a Material Model and Wheel-Tissue Interaction for Simulating Wheeled Surgical Robot Mobility," *Computer Methods in Biomechanics and Biomedical Engineering*. 12(2): 239-248, 2009.
- Joseph, J.V., Oleynikov, D., **Rentschler, M.**, Dumpert, J., Patel, H.R., "Microrobot Assisted Laparoscopic Urological Surgery in a Canine Model," *Journal of Urology*. 180(5): 2202-2205, 2008.
- Rentschler, M.**, Baxter, B.T., "Screening Aortic Drug Treatments through Arterial Compliance Measurements," *Current Vascular Pharmacology*. 6(4): 250-257, 2008.

Soares, R.F., Allen, D.H., Kim, Y.R., Berthelot, C., Soares, J.B, **Rentschler, M.E.**, “A Computational Model for Predicting the Effect of Tire Configuration on Asphaltic Pavement Life,” *International Journal on Road Materials and Pavement Design*. 9(2): 271-289, 2008.

Lehman, A.C., Berg, K.A., Dumpert, J., Wood, N.A., Visty, A.Q., **Rentschler, M.E.**, Platt, S.R., Farritor, S.M., Oleynikov, D., “Surgery with Cooperative Robots,” *Computer Aided Surgery*. 13(2): 95-105, 2008.

Rentschler, M., Platt, S., Berg, K., Dumpert, J., Oleynikov, D., Farritor, S., “Miniature *In vivo* Robots for Remote and Harsh Environments,” *IEEE Transactions on Information Technology in Biomedicine*. 12(1): 66-75, 2008.

Rentschler, M., Baxter, B.T., “Medical Therapy Approach for Treating Abdominal Aortic Aneurysm,” *Vascular*. 15(6): 361-365, 2007.

Rentschler, M., Iagnemma, K., Farritor, S., "Mechanical Design of Robotic *In vivo* Wheeled Mobility," *ASME Journal of Mechanical Design*. 129(10): 1037-1045, 2007.

Rentschler, M., Dumpert, J., Platt, S., Farritor, S., Oleynikov, D., "Natural Orifice Surgery with an Endoluminal Mobile Robot," *Journal of Surgical Endoscopy*. 21(7): 1212-1215, 2007.

Rentschler, M., Dumpert, J., Platt, S., Iagnemma, K., Oleynikov, D., Farritor, S., "An *In vivo* Mobile Robot for Surgical Vision and Task Assistance," *ASME Journal of Medical Devices*. 1(1): 23-29, 2007.

Rentschler, M., Baxter, B.T., "Pharmacological Approaches to Prevent Abdominal Aortic Aneurysm Enlargement and Rupture," *Annals of the New York Academy of Sciences*. 1085: 39-46, 2006.

Rentschler, M., Dumpert, J., Platt, S., Iagnemma, K., Oleynikov, D., Farritor, S., "Modeling, Analysis, and Experimental Study of *In Vivo* Wheeled Robotic Mobility," *IEEE Transactions on Robotics*. 22(2): 308-321, 2006.

Rentschler, M., Hover, F., Chryssostomidis, C., “System Identification of Open Loop Maneuvers Leads to Improved AUV Flight Performance,” *IEEE Journal of Oceanic Engineering*. 31(1): 200-208, 2006.

Rentschler, M., Dumpert, J., Platt, S., Ahmed, S., Farritor, S., Oleynikov, D., “Mobile *In Vivo* Robots Provide Sole Visual Feedback for Abdominal Exploration and Cholecystectomy,” *Journal of Surgical Endoscopy*. 20(1): 135-138, 2006.

Oleynikov, D., **Rentschler, M.**, Hadzialic, A., Dumpert, J., Platt, S., Farritor, S., “Miniature Robots Can Assist in Laparoscopic Cholecystectomy,” *Journal of Surgical Endoscopy*. 19(4): 473-476, 2005.

Technical Briefs (peer-reviewed original articles)

Prendergast, J.M., Perry, A., **Rentschler, M.E.**, “*Benchtop Testing of a Novel Robotic Capsule with Differential Drive Capabilities.*” *ASME Journal of Medical Devices*. 9(3): 030935(2 pp), 2015. *Selected as a Top Ten Paper

Anderson, N., Kramer, E., Cezo, J., Ferguson, V., **Rentschler, M.E.**, “Tissue Bond Strength as a Function of Applied Fusion Pressure,” *ASME Journal of Medical Devices*. 8(3): 030925(2 pp), 2014.

Terry, B.S., Francisco, M., Schoen, J.A., **Rentschler, M.E.** “Sensor for Measuring the Contact Force from Human Myenteric Contractions for *In vivo* Robotic Capsule Endoscope Mobility,” *ASME Journal of Medical Devices*. 7(3): 030911(2 pp), 2013.

Beccani, M., Di Natali, C., **Rentschler, M.E.**, Valdastrri, P. “Uniaxial Wireless Tissue Palpation Device for Minimally Invasive Surgery,” *ASME Journal of Medical Devices*. 7(2): 020919(3 pp), 2013.

Journal Publications (peer-reviewed review articles)

- Kramer, E.A., **Rentschler, M.E.**, "Energy-Based Tissue Fusion for Sutureless Closure: Applications, Mechanisms, and a Potential for Functional Recovery," *Annual Review of Biomedical Engineering*. 20: 1-20, 2018.
- Prendergast, J.M., **Rentschler, M.E.**, "Towards Autonomous Motion Control in Minimally Invasive Robotic Surgery," *Expert Review of Medical Devices*. 13(8): 741-748, 2016.
- Sliker, L.J., Ciuti, G., **Rentschler, M.E.**, Menciassi, A., "Magnetically-driven Medical Devices: A Review," *Expert Review of Medical Devices*. 12(6): 737-752, 2015.
- Rentschler, M.**, Oleynikov, D., "Recent *In vivo* Surgical Robot and Mechanism Developments," *J. of Surgical Endoscopy*. 21(9): 1477-1481, 2007.
- Lehman, A.C., **Rentschler, M.E.**, Farritor, S.M., Oleynikov, D., "The Current State of Miniature *In vivo* Laparoscopic Robotics," *Journal of Robotic Surgery*. 1(1): 45-49, 2007.
- Lehman, A.C., **Rentschler, M.E.**, Farritor, S.M., Oleynikov, D., "Endoluminal Minirobots for Transgastric Peritoneoscopy," *Minimally Invasive Therapy and Allied Technologies*. 15(6): 384-388, 2006.
- Rentschler, M.**, Platt, S., Dumpert, J., Farritor, S., Oleynikov, D., "*In Vivo* Laparoscopic Robotics," *International Journal of Surgery*. 4(3): 167-171, 2006.
- Oleynikov, D., **Rentschler, M.E.**, Dumpert, J., Platt, S.R., Farritor, S.M., "*In Vivo* Robotic Laparoscopy," *Surgical Innovation*. 12(2): 177-181, 2005.

Conference Presentations with Publication (peer-reviewed original paper)

- Schunk, C., Pearson, L., Acome, E., Morrissey, T., Correll, N., Keplinger, C.M., **Rentschler, M.E.**, Humbert, J.S., "System Identification and Closed-Loop Control of a Hydraulically Amplified Self-Healing Electrostatic (HASEL) Actuator," IEEE International Conference on Intelligent Robots and Systems, Madrid, Spain, October, 2018.
- Prendergast, J.M., Formosa, G.A., Heckman, C.R., **Rentschler, M.E.**, "Autonomous Localization, Navigation and Hausrtral Fold Detection for Robotic Endoscopy," IEEE International Conference on Intelligent Robots and Systems, Madrid, Spain, October, 2018.
- Lauff, C.A., Kotys-Schwartz, D., **Rentschler, M.E.**, "Prototyping Canvas: Building Purposeful Prototypes During Early Stage Design," ASME International Design and Engineering Technical Conference, Quebec City, Canada, August, 2018.
- Lauff, C.A., Kotys-Schwartz, D., **Rentschler, M.E.**, "Design Methods used during Early Stages of Product Development: Three Company Cases," ASME International Design and Engineering Technical Conference, Quebec City, Canada, August, 2018.
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- Lauff, C.A., Kotys-Schwartz, D., **Rentschler, M.E.**, "Perceptions of Prototypes: Pilot Study Compating Students and Professionals," ASME International Design and Engineering Technical Conference, Cleveland, OH, August, 2017.

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O'Connor, K., Lauff, C., Kotys-Schwartz, D., **Rentschler, M.E.**, "Learning and Identity at the Nexus of Practice: Mediated Discourse Analysis as a Methodology for Engineering Education Research," ASEE Annual Conference and Exposition, Seattle, WA, June, 2015.

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Lauff, C., Weidler-Lewis, J., O'Connor, K., Kotys-Schwartz, D., **Rentschler, M.E.**, "Undergraduate to Professional Engineering Design: A Disconnected Trajectory?," American Society for Engineering Education Zone IV Conference, Long Beach, CA, April, 2014.

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Beccani, M., Di Natali, C., **Rentschler, M.E.**, Valdastrri, P. "Wireless Tissue Palpation: Proof of Concept for a Single Degree of Freedom," IEEE International Conference on Robotics and Automation, Karlsruhe, Germany, May, 2013.

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Fankell, D., Regueiro, R., **Rentschler, M.**, "Simulating Arterial Tissue Fusion with a Large Deformation Thermo-Poromechanics Finite Element Model," Engineering Mechanics Institute Conference, Cambridge, MA, May, 2018.

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Kramer, E.A., Anderson, N.S. Taylor, K.D., Ferguson, V.L., **Rentschler, M.E.**, "The Role of Glycosaminoglycans in Tissue Adhesion during Energy-Based Vessel Sealing," International Society for Optics and Photonics (SPIE) Photonics West, San Francisco, CA, February, 2015.

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Calahan, K., Johannes, K., Long, R., **Rentschler, M.**, "Mapping Three-dimensional Micro-mechanics between Micro-pillars and Soft Gel Substrates for Biomedical Application," World Congress on Biomechanics, Dublin, Ireland, July, 2018.

Johannes, K.G., **Rentschler, M.**, "A Tunable Bio-Inspired Micro-Pillared Surface," World Congress on Biomechanics, Dublin, Ireland, July, 2018.

Rentschler, M., "Micro-Patterned Materials to Enable In vivo Robotic Capsule Endoscope Locomotion," MRS Spring Meeting, Invited Symposium Speaker on A Soft Future - From Electronic Skin to Robotics and Energy Harvesting, Phoenix, AZ, April, 2017. ***Noted as a Scientific Highlight of MRS Spring Meeting.**

Rentschler, M., "Towards Autonomous Robotic Capsule Endoscopy," IEEE International Conference on Intelligent Robots and Systems (IROS), Invited Symposium Speaker on Frontiers of Endoluminal Robotic Surgery, Daejeon, Korea, October, 2016.

Kramer, E., Ferguson, V. L., **Rentschler, M.E.**, "Biothermomechanics of Thermal Tissue Fusion: A Multi-Faceted Interaction," World Congress on Biomechanics, Boston, MA, July, 2014. (14-A-5404-WCB).

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Lindley, E.M., Spiegel, B., Zimkowski, M., **Rentschler, M.E.**, Blount, T., Milligan, K., Burger, E.L., Patel, V.V., "A New Method For Clinically Assessing Pain," American Academy of Orthopaedic Surgeons Annual Meeting, New Orleans, LA, March, 2014.

Kleck, C.J., LaFleur, M., Lindley, E.M., Clark, M., Burger, E.L., Cain, C.M.J., **Rentschler, M.E.**, Razavi-Shearer, D., Patel, V.V., "Pedicle Screw Precision with 3-Dimensional Imaging, Navigation, and Measurement," SICOT Orthopaedic World Congress, Hyderabad, India, October, 2013.

- Lindley, E.M., Spiegel, B., Milligan, K., Zimkowski, M., **Rentschler, M.E.**, Burger, E.L., Patel, V.V., "A New Method For Clinically Assessing Pain," SICOT Orthopaedic World Congress, Hyderabad, India, October, 2013.
- Lindley, E., Zimkowski, M., Patel, V., **Rentschler, M.E.**, "Pain Sensitivity Testing Using A Novel Computer-Controlled Pressure Algometer That Simultaneously Records Sympathetic Nervous System Responses to Pain Stimuli," American Pain Society Annual Scientific Meeting, Honolulu, HI, May, 2012.
- Mills, Z., Terry, B., Schoen, J.A., **Rentschler, M.E.**, "Single Port Access Surgery with a Novel Magnet Camera System," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-63963).
- Lyle, A., Terry, B., Schoen, J.A., **Rentschler, M.E.**, "An Experimental Evaluation of Small Bowel Friction Forces when Eliminating Edge Effects," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-63943).
- Kern, M., Sliker, L.J., Schoen, J.A., **Rentschler, M.E.**, "Preliminary In vivo Capsule Endoscopic Mobility Using Micro-Patterned Treads," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-63723)
- Sliker, L.J., Schoen, J.A., **Rentschler, M.E.**, "The Design and Experimental Evaluation of Micro-Patterned Treads for In vivo Robotic Mobility," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-63766).
- Cezo, J., Ferguson, V., **Rentschler, M.E.**, "Computational Modeling of Direct Heat Tissue Fusion," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-62134).
- Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, "Development and Characterization of a Novel Sensor for Measuring the Radial Force from Myenteric Contractions," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-62121).
- Wang, X., Qi, H.J., **Rentschler, M.E.**, "A Theoretical Study of Friction for In vivo Surgical Robotic Wheel-Tissue Interaction," ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November, 2011 (IMECE2011-62386).
- Wood, N., Lehman, A., **Rentschler, M.**, Farritor, S., Oleynikov, D., "A Robotic Assistant for Surgical Dissection," Medicine Meets Virtual Reality, Long Beach, CA, January, 2009.
- Lehman, A., Dumpert, J., Visty, A., **Rentschler, M.**, Farritor, S., Oleynikov, D., "Towards Cooperative Miniature Robots for Natural Orifice Transluminal Endoscopic Surgery," Minimally Invasive Robotic Association (MIRA) Congress, Rome, Italy, January, 2008.
- Berg, K., **Rentschler, M.**, Dumpert, J., Lehman, A., Platt, S., Oleynikov, D., Farritor, S., "Surgery with Cooperative Robots," Medicine Meets Virtual Reality Conference, Long Beach, CA, February, 2007.
- Rentschler, M.**, Berg, K., Dumpert, J., Platt, S., Oleynikov, D., Farritor, S., "In vivo Robotics during the NEEMO 9 Mission," Medicine Meets Virtual Reality Conference, Long Beach, CA, February, 2007.
- Rentschler, M.**, Dumpert, J., Lehman, A., Berg, K., Platt, S., Oleynikov, D., Farritor, S., "In Vivo Robots for Tele-Surgery During Long-Term Space Flight," American Institute of Aeronautics and Astronautics Space Conference, San Jose, CA, September, 2006.
- Boczko, J., Capello, S., Oleynikov, D., **Rentschler, M.**, Dumpert, J., Patel, H.R., Joseph, J.V., "Microrobots in Urology: Video Demonstration of Microrobot-Assisted Laparoscopic Prostatectomy and Nephrectomy in a Canine Model," The 24th World Congress of Endourology, Cleveland, OH, August, 2006.

Rentschler, M., Reid, J., “*LS-DYNA Simulation of In vivo Surgical Robot Mobility*,” The 9th International LS-DYNA Users Conference, Dearborn, MI, June, 2006.

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Rentschler, M., Dumpert, J., Platt, S., Iagnemma, K., Oleynikov, D., Farritor, S., “*In vivo Mobile Surgical Robotic Task Assistance*,” Design of Medical Devices Conference, Minneapolis, MN, April, 2006.

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Oleynikov, D., **Rentschler, M.**, Hadzialic, A., Dumpert, J., Platt, S., Farritor, S., “*Miniature Robots Can Assist in Laparoscopic Cholecystectomy*,” The Society of American Gastrointestinal Endoscopic Surgeons, Denver, CO, March, 2004.

Conference Posters (peer-reviewed original paper)

Prendergast, J.M., Perry, A., **Rentschler, M.E.**, “*Benchtop Testing of a Novel Robotic Capsule with Differential Drive Capabilities*,” ASME Design of Medical Devices Conference. Minneapolis, MN, April, 2015. **Selected as a Top Ten Paper and 3-in-5 Presentation Award*

Lauff, C., Weidler-Lewis, J., O’Connor, K., Kotys-Schwartz, D., **Rentschler, M.**, “*Cognitive Ethnographies of Heterogeneous Engineering Design*,” International Conference of the Learning Sciences (ICLS), Boulder, CO, June, 2014.

Anderson, N., Kramer, E., Cezo, J., Ferguson, V., **Rentschler, M.E.**, “*Tissue Bond Strength as a Function of Applied Fusion Pressure*,” ASME Design of Medical Devices Conference, Minneapolis, MN, April, 2014.

Conference Posters (peer-reviewed original abstract)

Anderson, N., Kramer, E., Cezo, J.D., Ferguson, V. L., **Rentschler, M.E.**, “*Tissue Bond Strength and Intraluminal Temperature as a Function of Applied Fusion Pressure*,” World Congress on Biomechanics, Boston, MA, July, 2014.

Kern, M., Ortega, J., **Rentschler, M.E.**, “*Soft Material Adhesion Characterization for In vivo Locomotion: Experimental and Modeling Results*,” World Congress on Biomechanics, Boston, MA, July, 2014.

Fankell, D., Ferguson, V.L., Taylor, K.D., **Rentschler, M.E.**, “*Impact of Heater Location and Ambient Conditions on Fusion Strength during Direct Heat Fusion*,” World Congress on Biomechanics, Boston, MA, July, 2014.

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- Sliker, L., Kern, M.D., Schoen, J.A., **Rentschler, M.E.**, “*Biologically Inspired Micro-Patterned Treads for Robotic Capsule Endoscope Mobility*,” Covidien R&D Summit, Westminster, CO, October, 2011.
- Terry, B.S., Schoen, J.A., **Rentschler, M.E.**, “*Experimental Measurements of the Radial Force from Myenteric Contractions on a Solid Bolus*,” Covidien R&D Summit, Westminster, CO, October, 2011.
- Schoen, J.A., Mills, Z., Terry, B.S., **Rentschler, M.E.**, “*A SILS-Specific Camera System*,” The Society of American Gastrointestinal Endoscopic Surgeons, San Antonio, TX, April, 2011.
- Schoen, J.A., Sliker, L., **Rentschler, M.E.**, “*A Locomotion System for Capsule Mobility*,” The Society of American Gastrointestinal Endoscopic Surgeons, San Antonio, TX, April, 2011.
- Schoen, J.A., Terry, B.S., Mills, Z., **Rentschler, M.E.**, “*Single Incision Laparoscopic Surgery with a Novel Port Camera System*,” The Society of American Gastrointestinal Endoscopic Surgeons, Landover, MD, April, 2010.
- Macdonald, S., **Rentschler, M.**, “*An Improved Splint Design for Boutonniere Deformity*,” ASME Summer Bioengineering Conference, Lake Tahoe, CA, June, 2009.
- Ruppert, A., Terry, B., **Rentschler, M.**, “*A Laparoscopic Camera-Enabled Cannula Port*,” ASME Summer Bioengineering Conference, Lake Tahoe, CA, June, 2009.
- Lehman, A., Dumpert, J., Visty, A., **Rentschler, M.**, Farritor, S., Oleynikov, D., “*Toward Natural Orifice Surgery with Cooperative Miniature Robots*,” The Society of American Gastrointestinal and Endoscopic Surgeons, Philadelphia, PA, April, 2008.
- Rentschler, M.**, Baxter, B.T., “*Preliminary Murine Aortic Tissue Material Properties from Pressure-Diameter Experiments*,” ASME Summer Bioengineering Conference, Keystone, CO, June, 2007.
- Platt, S., **Rentschler, M.**, Dumpert, J., Farritor, S., Oleynikov, D., “*In Vivo Robotic Cameras Can Enhance Imaging Capability During Laparoscopic Surgery*,” The Society of American Gastrointestinal Endoscopic Surgeons, Fort Lauderdale, FL, April, 2005.

Issued Patents

United States

- U.S. Patent No: 9,956,043; Issued May 1, 2018, “Methods, Systems, and Devices for Surgical Access and Procedures”
- U.S. Patent No: 9,883,911; Issued February 6, 2018, “Multifunctional Operations Component for Robotic Devices”
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- U.S. Patent No: 9,403,281; Issued November August 2, 2016, “Robotic Devices with Arms and Related Methods”
- U.S. Patent No: 9,339,169; Issued May 17, 2016, “Robotic Capsule Endoscope for Minimally Invasive Surgical Procedures, Micro-Patterned Treads for Friction Enhancement of a Robotic Capsule Endoscope in a Biological Environment, and Process for Fabrication of Micro-Treads”
- U.S. Patent No: 9,179,981; Issued November 10, 2015, “Multifunctional Operational Component for Robotic Devices”
- U.S. Patent No: 8,974,440; Issued March 10, 2015, “Modular and Cooperative Medical Devices and Related Systems and Methods”

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Canada

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Canada Patent No: 2,678,610; Issued July 7, 2015, “Methods, Systems, and Devices for Surgical Visualization and Device Manipulation”

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Europe

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Japan

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Japan Patent No: 5,864,634; Issued January 8, 2016, “Modular and Cooperative Medical Devices and Related Systems”

Japan Patent No: 5,864,628; Issued January 8, 2016, “Magnetically Coupleable Robotic Devices and Related Methods”

Japan Patent No: 5,753,570; Issued May 29, 2015, “Medical Delivery or Removal Apparatus”

**Teaching
Experience**

Course Instructor

University of Colorado Boulder
Department of Mechanical Engineering

MCEN 3025 Component Design

Instructor *Fall, 2015*
Instructor *Fall, 2014*
Instructor *Spring, 2014*

MCEN 4045 ME Design Project 1 (Senior Design I)

Faculty Advisor for two teams *Fall, 2010*
Faculty Advisor for three teams *Fall, 2009*
Faculty Advisor for three teams *Fall, 2008*

MCEN 4085 ME Design Project 2 (Senior Design II)

Faculty Advisor for two teams *Spring, 2011*
Faculty Advisor for three teams *Spring, 2010*
Faculty Advisor for three teams *Spring, 2009*

MCEN 5055 Advanced Product Design

Instructor *Spring, 2013*
Instructor *Spring, 2012*
Course Developer & Lead Instructor *Spring, 2011*
Course Developer & Co-Instructor *Spring, 2010*

MCEN 5065 Graduate Design I (Projects Course 1)

Instructor *Fall, 2018*
Instructor *Fall, 2017*
Instructor *Fall, 2015*
Instructor *Fall, 2014*
Instructor and Faculty Advisor for one team *Fall, 2012*
Course Developer & Co-Instructor and Faculty Advisor for one team *Fall, 2010*

MCEN 5075 Graduate Design II (Projects Course 2)

Instructor *Spring, 2019*
Instructor *Spring, 2018*
Instructor *Spring, 2016*
Instructor *Spring, 2015*
Instructor and Faculty Advisor for one team *Spring, 2014*
Instructor and Faculty Advisor for one team *Spring, 2013*
Instructor and Faculty Advisor for one team *Spring, 2012*
Course Developer & Co-Instructor and Faculty Advisor for one team *Spring, 2011*

MCEN 5228 Medical Device Design

Instructor *Spring, 2011*
Course Developer & Instructor *Spring, 2010*