



Exponent[®]
Engineering & Scientific Consulting

Gunjan Agarwal, Ph.D.

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Professional Profile

Dr. Agarwal specializes in mechanical engineering, numerical simulation methods and vehicle engineering. She has particular expertise in solid mechanics, finite element analysis, mechanical design and manufacturing. She has applied her mechanical engineering expertise to design and failure analyses across a wide array of fields, ranging from medical devices and consumer electronics to automotive crash safety, and complex mechanical response prediction for materials such as polymers, biomaterials, advanced composites, plastics and adhesives. Her numerical and computational analysis background includes extensive experience in investigation of structural interactions coupled with multiphysics effects including thermal, fluid, electrical, and acoustic behavior for a broad set of engineering applications. Dr. Agarwal's vehicle engineering background includes extensive experience in design and performance optimization for crashworthiness and occupant safety using simulation techniques, and leadership of large-scale test programs for homologation and new vehicle safety assessment in North America and Europe.

Dr. Agarwal has applied her expertise towards diverse technical challenges pertaining to medical equipment and medical devices, biomedical rehabilitation, wearables, soft robotics, microelectronics, electronic packaging, high power electronic devices, consumer products, sensors, thin-films, coatings, chip cooling, defense equipment, automobiles, machine tools and industrial machinery, and industrial production. In addition to numerical analysis, Dr. Agarwal is proficient in manufacturing and characterization techniques ranging from clean-room microfabrication and processing; thin film characterization; and microscopy, to mechanical testing for larger systems including material coupon; automotive component; sled; and full-vehicle crash testing.

Prior to joining Exponent, Dr. Agarwal was a Senior CAE Engineer at Tesla Inc. She developed an innovative solution to address a critical production bottleneck in the vehicle manufacturing ramp process, which has never been implemented previously in the automotive industry.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Massachusetts Institute of Technology (MIT), 2012

S.M., Mechanical Engineering, Massachusetts Institute of Technology (MIT), 2009

B.E., Manufacturing Processes and Automation Engineering, Netaji Subhas Institute of Technology, Delhi, India, 2007

Exceptional Individual Contribution Recognition Award from Senior Vice President of Engineering, Tesla Inc., 2017

Pappalardo Graduate Fellowship, MIT, 2007-2010

Best Research Presentation Award, ASME NEMB Conference, 2010

National Science Foundation (NSF) Summer Institute Fellowship, MIT, 2009

Prior Experience

Senior CAE Engineer, Crash Safety, Tesla Inc., 2017-2019

Research Scientist, École Polytechnique Fédérale de Lausanne, 2015-2017

Postdoctoral Associate, Massachusetts Institute of Technology, 2013-2015

Process Module, Yield and Integration Engineer, Intel Corporation, 2012-2013

Professional Affiliations

Sigma Xi

American Society of Mechanical Engineers

Society of Automotive Engineers

Languages

Hindi

Patents

US P0902-2NWO: Coating System and Method for E-Coating and Degasification of E-Coat Fluid During E-Coat, December 2018 (Agarwal G., Avudaiappan S., Lilywhite, C.).

Publications

Peer-Reviewed Journal Articles

Agarwal G, Robertson R, Sonar H., Paik, J. Design and Computational Modeling of a Modular, Compliant Robotic Assembly for Human Lumbar Unit and Spinal Cord Assistance. *Scientific Reports* 2017; 7, 14391.

Agarwal G, Besuchet N, Audergon B, Paik J. Stretchable Materials for Robust Soft Actuators towards Assistive Wearable Devices. *Scientific Reports* 2016; 6, 34224.

Agarwal G, Kazior T, Kenny T, Weinstein D. Modeling and Analysis for Thermal Management in GaN HEMTs using Microfluidic Cooling. *ASME Journal of Electronic Packaging* 2016; 139 (1), 011001.

Agarwal G, Paez L, Paik J. Design and Analysis of a Soft Pneumatic Actuator with Origami Shell Reinforcement. *Soft Robotics* 2016; 3 (3), 109-119.

Agarwal G, Livermore C. Shape-Selective Assembly of Anisotropic, Deformable Microcomponents Using Bottom-Up Micromanufacturing. *Micromachines* 2016; 7 (4), 68.

Moseley P, Florez JM, Sonar HA, Agarwal G, Curtin W, Paik J. Modeling and Design of Soft Pneumatic

Actuators. *Advanced Engineering Materials* 2015; 18(6).

Agarwal G, Servi A, Livermore, C. Size-Selective, Biocompatible, Manufacturable Platform for Structuring Deformable Microsystems. *Lab on a Chip* 2014; 14 (17), 3385 - 3393.

Agarwal G, Livermore C. Chip-Based Size-Selective Sorting of Biological Cells using High Frequency Acoustic Excitation. *Lab on a Chip* 2011; 11 (13), 2204-2211.

Agarwal G, Servi A, Eid F, Livermore C. Selective Self-Assembly of Polymer Structures Using Templated Assembly by Selective Removal. *IEEE Transactions on Nanotechnology* 2011; 10 (3), 617-625.

Peer-Reviewed Conference Proceedings

Agarwal G, Livermore C. Selectively Controlling the 2D Organization of Mammalian Cells. *Proceedings of 40th Annual Northeast Bioengineering Conference – NEBEC 2014, Boston, MA, 2014.*

Agarwal G, Livermore C. Template-Guided Size-Selective Sorting and Assembly of Mammalian Cells. *Proceedings of Foundations of Nanoscience (FNANO'12), Self-Assembled Architectures and Devices, Snowbird, UT, 2012.*

Agarwal G, Livermore, C. Chip-based Cell Patterning and Sorting using Templated Assembly by Selective Removal (TASR). *Proceedings of Microsystems Annual Research Conference, Waterville Valley, NH, 2012.*

Agarwal G, Livermore C. Templated Assembly by Selective Removal for Size-Selective Sorting of Biological Materials. *Proceedings of NEMB2010, ASME First Global Congress on Nano Engineering for Medicine and Biology, Houston, TX, 2010.*

Agarwal G, Servi A, Livermore C. Selective Sorting of Biological Materials using Templated Assembly by Selective Removal. *Proceedings of Microsystems Annual Research Conference, Boston, MA, 2010.*

Agarwal G, Servi A, Livermore C. Shape Selective Assembly in Deformable Systems using Templated Assembly by Selective Removal. *Proceedings of Foundations of Nanoscience (FNANO'09), Self-Assembled Architectures and Devices, Snowbird, UT, 2009.*

Agarwal G, Servi A, Livermore C. Templated Assembly by Selective Removal. *Proceedings of Microsystems Annual Research Conference, Waterville Valley, NH, 2009.*

Agarwal G, Gupta A, Singhi G, Sankar N, Khanna P. Design and Fabrication of an Agile Sorting and Feeding System. *Proceedings of the World Congress on Engineering and Computer Science - WCECS, San Francisco, CA, 2007.*

Agarwal G, Gupta A, Khanna P. Performance Analysis and Mathematical Modeling of a Vibratory Bowl Feeder. *Proceedings of the International Conference on Advances in Manufacturing and Technology Management, India, 2007.*

Agarwal G, Purohit R, Sahu P, Sagar R. The Fabrication and Performance Evaluation of GFRP-Abrasive Parting Off Wheels. *Proceedings of the Second International Conference on Recent Advances in Composite Materials, India, 2007.*

Agarwal G, Gupta A, Khanna P. Design, Fabrication and Analysis of a Reciprocatory Funnel Feeder. *Proceedings of the International Conference on Advances in Mechanical Engineering, India, 2006.*

Agarwal G, Kasturia N, Sharma P, Purohit R, Sahu P, Sagar R. To study the effect of grain size and die design on the cutting performance of glass fiber reinforced SiC abrasive cut-off wheels. *Proceedings of*

the 7th Asian – Pacific international conference on Industrial Engineering and Management Systems, Thailand, 2006.

Presentations

Computational Mechanics for Designing Novel Soft Robotic Systems. ETH Zurich, Switzerland, April 2016.

Mechanical Modeling and Design of Soft Pneumatic Actuators using the Finite Element Method. National Centre of Competence in Research (NCCR) Robotics, EPFL, Switzerland, November 2015.

Modeling Deformation in Soft, Selectively Assembled Microsystems. Department of Mechanical Engineering, Imperial College London, UK, March 2015.

Thermal Analysis and Microfluidic Cooling for Power Microelectronics. Oak Ridge National Laboratories, TN, September 2014.

Selective Micromanufacturing in Deformable Systems using Templated Assembly by Selective Removal. School of Engineering and Applied Sciences, Harvard University, MA, September 2014.

Managing High Thermal Dissipation in Power Microelectronic Devices using Microfluidic Cooling. Department of Mechanical and Industrial Engineering, Northeastern University, MA, June 2014.

Diverse Accessible Heterogeneous Integration and On-Chip Cooling. Defense Research Advanced Research Projects Agency (DARPA) PI Meeting, Santa Barbara, CA, November 2013.

Template-Guided Size-Selective Sorting and Assembly of Mammalian Cells. Foundations of Nanoscience (FNANO), Self-Assembled Architectures and Devices, Snowbird, UT, April 2012.

Chip-based Cell Patterning and Sorting using Templated Assembly by Selective Removal (TASR). Microsystems Annual Research Conference 2012, Waterville Valley, NH, January 2012.

Templated Assembly by Selective Removal (TASR) for Size-Selective Sorting of Biological Materials. ASME First Global Congress on Nano Engineering for Medicine and Biology (NEMB), Houston, TX, February 2010.

Selective Sorting of Biological Materials using Templated Assembly by Selective Removal (TASR). Microsystems Annual Research Conference 2010, Boston, MA, January 2010.

Shape Selective Assembly in Deformable Systems using Templated Assembly by Selective Removal (TASR). Microsystems Technology Laboratories (MTL) MEMS Seminar Series at Massachusetts Institute of Technology, MA, September 2009.

Shape Selective Assembly in Deformable Systems using Templated Assembly by Selective Removal (TASR). Foundations of Nanoscience (FNANO), Self-Assembled Architectures and Devices, UT, April 2009.

Shape Selective Assembly in Deformable Systems using Templated Assembly by Selective Removal (TASR). Micro-Nano Seminar Series in the Department of Mechanical Engineering, Massachusetts Institute of Technology, MA, March 2009.

Templated Assembly by Selective Removal (TASR). Microsystems Annual Research Conference 2009, Waterville Valley, NH, January 2009.

Additional Education & Training

Traffic Crash Reconstruction, Northwestern University Center for Public Safety, August 2020

Peer Reviewer

Soft Robotics

Soft Matter

Lab on a Chip

IEEE Transactions on Nanotechnology