

Shahrzad “Sherry” Towfighian, PhD
Mechanical Engineering Department, SUNY Binghamton
Binghamton, NY 13902-6000
stowfigh@binghamton.edu, office: (607) 777-5315
<https://www.binghamton.edu/labs/mems/>

Education

Jan. 2011

PhD in Mechanical Engineering, University of Waterloo, Canada

Sep. 2006

MASc in Mechanical Engineering, Ryerson University, Canada

Sep. 2001

Bachelor of Science in Mechanical Engineering, Amirkabir University of Technology, Iran

Academic Experience

Sep 2019- present

Associate Professor, Mechanical Engineering Department, Thomas J. Watson School of Engineering and Applied Science, State University of New York at Binghamton, USA

Aug 2013- Aug 2019

Assistant Professor, Mechanical Engineering Department, Thomas J. Watson School of Engineering and Applied Science, State University of New York at Binghamton, USA

June 2012- Mar 2013, Mar 2011 – May 2011

MITACS Postdoctoral Research Fellow, Ryerson University and University of Toronto, Canada

Publications

Refereed Published/Accepted Journal Papers:

1. M. Pallay, R. Miles, **S. Towfighian** (2019) “Merging parallel-plate and levitation actuators to enable linearity and tunability in electrostatic MEMS”, *Journal of Applied Physics*, In press.
2. D. Nelson, A. Ibrahim, **S. Towfighian** (2019) “A Tunable Triboelectric Wideband Energy Harvester”, *Journal of Intelligent Material Systems and Structures*, In Press.
3. M. Daeichin, M. Ozdogan, **S. Towfighian**, R. Miles (2019), “Dynamic Response of a Tunable MEMS Accelerometer Based on Repulsive Force”, *Sensors and Actuators: A Physical*, Vol. 289, pp. 34-43.
4. W. Yang, **S. Towfighian** (2019), “A Parametric Resonator with Low Threshold Excitation for Vibration Energy Harvesting”, *Journal of Sound and Vibration*, Vol. 446, pp. 129-143.
5. A. Ibrahim, M. Jain, E. Salman, R. Willing, **S. Towfighian** (2019) “A Smart Knee Implant Using Triboelectric Energy Harvesters”, *Smart Materials and Structures*, 28 (2), 025040 (11 pp).
6. D. Nelson, A. Ibrahim, **S. Towfighian** (2018) “Dynamics of a Threshold Shock Sensor: Combining Bistability and Triboelectricity”, *Sensors and Actuators: A Physical*, Vol. 285, pp. 666-675.
7. M. Pallay, **S. Towfighian** (2018), “A Reliable MEMS Switch Using Electrostatic Levitation”, *Applied Physics Letters*, 113(21), 213102.
8. W. Yang, **S. Towfighian** (2018), “Low frequency energy harvesting with a variable potential function under random vibration”, *Smart Materials and Structures*, 27 (11), 114004 (12 pages).
9. M. Pallay, **S. Towfighian** (2018), “A Parametric Electrostatic Resonator Using Repulsive Force”, *Sensors and Actuators: A Physical*, Vol. 277, pp. 134-141.
10. A. Ibrahim, A. Ramini, **S. Towfighian** (2018), “Experimental and Theoretical investigation of an impact vibration harvester with triboelectric transduction”, *Journal of Sound and Vibration*, Vol. 416, pp. 111-124.

11. M. Ozdogan, M. Daeichin, A. Ramini, **S. Towfighian** (2017), "Parametric Resonance of a Repulsive Force MEMS Electrostatic Mirror", *Sensors and Actuators: A Physical*, Vol. 265, pp. 20-31.
12. W. Yang and **S. Towfighian** (2017) "Internal resonance and low frequency vibration energy harvesting", *Smart Materials and Structures*, 26 (9), 095008 (11 pages).
13. Ibrahim, **S. Towfighian**, M. Younis (2017) "Dynamics of Transition Regime in Bi-stable Vibration Energy Harvesters", *Journal of Vibration and Acoustics*, 139 (5), 051008 (15 pages).
14. M. Pallay, M. Daeichin, and **S. Towfighian** (2017) "Dynamic behavior of an electrostatic MEMS resonator with repulsive actuation", *Nonlinear Dynamics*, 89 (2), pp. 1525-1538.
15. W. Yang, **S. Towfighian** (2017) "A hybrid nonlinear vibration energy harvester", *Mechanical Systems and Signal Processing*, 90, pp. 317-333.
16. C. Jin, D. Sharifikia, M. Jones, **S. Towfighian** (2016) "On the Contact of Micro-/Nano-Structural Interface Used in Vertical-Contact-Mode Triboelectric Nanogenerators", *Nano Energy*, Vol. 27, pp. 68-77.
17. M. Pallay, **S. Towfighian** (2017) "Parametrically Excited Electrostatic MEMS cantilever beam with Flexible Support", *Journal of Vibration and Acoustics*, 139(2), 021002 (8 pages).
18. M. Ozdogan, **S. Towfighian** (2016) "Nonlinear dynamic behavior of a bi-axial torsional MEMS mirror with sidewall electrodes", *Micromachines*, 7(42), 16 pages.
19. L. Liu, **S. Towfighian**, A. Hila (2015) "A Review of Locomotion Systems for Capsule Endoscopy", *IEEE Reviews in Biomedical Engineering*, Vol.8, Issue 1, pp. 138-151.
20. **S. Towfighian**, G. R. Heppler, and E. M. Abdel-Rahman (2012) "Low-Voltage Closed Loop MEMS Actuators", *Nonlinear Dynamics*, Vol. 69, Issue 1-2, pp. 565-575.
21. A. Seleim, **S. Towfighian**, E. Delande, E. M. Abdel- Rahman, G. R. Heppler (2012) "Dynamic Analysis of a Close-Loop Controlled Chaotic MEMS Resonator", *Nonlinear Dynamics*, Vol. 69, Issue 1-2, pp. 615-633.
22. **S. Towfighian**, A. Seleim, E. M. Abdel-Rahman, and G. R. Heppler (2011) "A large stroke electrostatic micro-actuator", *Journal of Micromechanics and Microengineering*, Volume 21, 075023 (12 pages).
23. **S. Towfighian**, G. R. Heppler, E. M. Abdel- Rahman (2011) "Analysis of a chaotic electrostatic Micro-oscillator". *Journal of Computational and Nonlinear Dynamics*, Vol. 6, Issue 1, 011001 (10 pages).
24. **S. Towfighian**, K. Behdinan, M. Papini, Z. Saghir, P. Zalzal, J. de Beer (2008) "Finite Element Modeling of low-speed reaming using reamers with irregular tooth spacing". *Journal of Sound and Vibration*, Vol. 318, no. 4-5, pp.868-883.
25. **S. Towfighian**, K. Behdinan, M. Papini, Z. Saghir, P. Zalzal, J. de Beer (2007) "Finite Element Modeling of low speed reaming vibrations with reamer geometry modifications". *Journal of Intelligent Manufacturing*, Vol. 18, no. 6, pp.647-661.

Conference Proceedings and Abstracts:

1. A. Ibrahim, G. Yamomo, R. Willing, **S. Towfighian** (2019) "Analysis of a triboelectric energy harvester for total knee replacement under gait loading", In Active and Passive Smart Structures and Integrated Systems XII (Vol. 10967, p. 109671D). International Society for Optics and Photonics.
2. A. Ibrahim, M. Jain, E. Salman, R. Willing, **S. Towfighian** (2018) "Feasibility of Triboelectric energy harvesting and load sensing in total knee replacement", ASME conference of Smart Materials, Adaptive Structures and Intelligent Systems, Sep 10-12, 2018, San Antonio, TX, USA, SMASIS 2018-8212, 8 pages.
3. M. Pallay, A. Ibrahim, **S. Towfighian** (2018) "A MEMS threshold acceleration switch powered by a triboelectric generator", ASME International Design Engineering Technical Conferences, Aug 26-29, 2018, Quebec City, QC, Canada, DETC 2018-85543, 10 pages.

4. A. Ibrahim, W. Yang, **S. Towfighian** (2018) "Internal resonance of T-shaped structure for energy harvesting with magnetic nonlinearity". *Proc. SPIE*. 10595. In *Active and Passive Smart Structures and Integrated Systems XII*, March 15, 2018, 105952E, 8 pages, International Society for Optics and Photonics.
5. W. Yang, **S. Towfighian** (2018) Parametric resonance of a magnetically coupled harvester. *Proc. SPIE*. 10595. In *Active and Passive Smart Structures and Integrated Systems XII*, March 15, 2018, 105952V, 7 pages, International Society for Optics and Photonics.
6. W. Yang, P. Alevras, **S. Towfighian** (2017) Investigation of Vibration Energy Harvesting using two cantilevers with random input, ASME conference of Smart Materials, Adaptive Structures and Intelligent Systems, Sep 18-20, 2017, Snowbird, UT, USA, SMASIS 2017-3860, 7 pages.
7. W. Yang, **S. Towfighian** (2017) A broadband Energy Harvester with internal resonance induced by two resonators, ASME International Design Engineering Technical Conferences, Aug 6-9, 2017, Cleveland, OH, USA, DETC 2017-67442, 8 pages.
8. A Ibrahim, A Ramini, **S. Towfighian** (2017) Modeling an impact vibration harvester with triboelectric transduction, ASME International Design Engineering Technical Conferences, Aug 6-9, 2017, Cleveland, OH, USA, DETC 2017-68283, 10 pages.
9. M. Pallay, **S. Towfighian** (2017) Parametric Excitation of a Repulsive Force actuator, ASME International Design Engineering Technical Conferences, Aug 6-9, 2017, Cleveland, OH, USA, DETC 2017-67381, 7 pages.
10. D. Sharifikia, C. Jin, **S. Towfighian** (2016) "Predicting the output of a triboelectric energy harvester undergoing mechanical pressure", *Proceedings of the ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Sep 28-30, 2016, Stowe, VT, USA, SMASIS 2016-9157, 8 pages.
11. Yang, **S. Towfighian** (2016) "Performance of a bi-stable resonator with random input vibrations", *Proceedings of the ASME International Design Engineering Technical Conferences*, Aug 21-24, 2016, Charlotte, NC, USA, DETC 2016-60324, 7 pages.
12. M. Ozdogan, **S. Towfighian** (2016) "A MEMS Microphone using repulsive force sensors", *Proceedings of the ASME International Design Engineering Technical Conferences*, Aug 21-24, 2016, Charlotte, NC, USA, DETC 2016-60171, 13 pages.
13. W. Yang, **S. Towfighian** (2016) "A Nonlinear Vibration Energy Harvesting based on Variable Double-Well Potential Function", *Proc. SPIE*. 9799, *Active and Passive Smart Structures and Integrated Systems 2016*, 979902, 10 pages, DOI: 10.1117/12.2218077.
14. A. Ibrahim, **S. Towfighian**, M. Younis, Q. Su (2016) "Magnetoelastic Beam with Extended Polymer for Low Frequency Vibration Energy Harvesting", *Proc. SPIE*. 9806, *Smart Materials and Nondestructive Evaluation for Energy Systems 2016*, 98060B, 15 pages, DOI: 10.1117/12.2219276.
15. L. Liu, **S. Towfighian**, Z. Jin (2015) "A Cylindrical Triboelectric Energy Harvester for Capsule Endoscopes", *Proceedings of the IEEE Biomedical Circuits and Systems Conference (BIOCAS)*, Oct. 22-24, 2015, Atlanta, Georgia, pp. 49-52.
16. J. Zhou, R. Miles, **S. Towfighian** (2015) "A Novel capacitive sensing principle for microdevices", *Proceedings of the ASME International Design Engineering Technical Conferences*, Aug 2-5, Boston, MA, DETC 2015-56554, 6 pages.
17. **S. Towfighian**, S. He, R. Ben Mrad (2014) "A Low voltage electrostatic micro actuator for large out-of-plane displacement", *Proceedings of the International Design Engineering Technical Conferences*, Aug 17-20, Buffalo, NY, Vol. 4, DETC2014-34283, 7 pages.
18. **S. Towfighian**, M. Ozdogan (2014) "Static modeling of a bi-axial micro-mirror with sidewall electrodes", *Proceedings of the ASME International Mechanical Engineering Congress and Exposition*, Nov 14-20, Montreal, QC, Canada, Vol. 10, IMECE 2014-38834, 10 pages.
19. Q. Dong, Y. Chen, and **S. Towfighian** (2014) "MEGA: an Energy Aware Algorithm for Self-Powered Wireless Sensor Networks in Sustainable Smart Infrastructure", *The 2nd Workshop on Green Broadband Access: Energy Efficient Wireless and Wired Network Solutions- IEEE GlobeCom*, Austin, Texas, Dec. 12, 2014.

20. **S. Towfighian**, A. Seleim, E. M. Abdel- Rahman, G. R. Heppler (2010) "Experimental validation for an extended stability electrostatic actuator", *Proceedings of International Design Engineering Technical Conferences*, Aug 15-18, Montreal, QC, Vol. 4, pp. 631-638.
21. **S. Towfighian**, G. R. Heppler, E. M. Abdel- Rahman (2010) "A low voltage controller for a chaotic micro resonator", *Proceedings of International Design Engineering Technical Conferences*, Aug 15-18, Montreal, QC, Vol. 4, pp. 639-644.
22. **S. Towfighian**, G. R. Heppler, E. M. Abdel- Rahman (2009) "Quadratic controller for a chaotic micro-resonator". Presented at the 2nd *Microsystems and Nanoelectronics Research Conference*, Oct 14, Ottawa, ON, Published in the *Proceeding of MNRC*, pp. 69-72.
23. **S. Towfighian**, E. M. Abdel-Rahman, and G. R. Heppler (2008) "Static and dynamic analysis of a bi-stable micro-actuator", *Proceedings of ASME International Mechanical Engineering Congress and Exposition*, Boston, MA, Oct 31- Nov 6, Vol. 13, pp. 421-431.

Journal Papers under Review:

1. M. Pallay, A. Ibrahim, R. Miles, S. Towfighian, Pairing electrostatic levitation with triboelectric transduction for high-performance self-powered MEMS sensors and actuators, *Physical Review Letters*, Under Review.
2. M. Daeichin, R. Miles, S. Towfighian, Experimental characterization of the electrostatic levitation force in MEMS transducers, *IEEE sensors Journal*, Under Review.

Federally Funded Projects

MEMS High Voltage Triboelectric Levitation: A Generactuator (Active)

Funding: National Science Foundation

Trainees: Nahid Hasan, Mohammad Alzgoool

Self-powered load sensor for total knee replacement (Active)

Collaborators: Ryan Willing (Western University), Emre Salman (SUNY Stony Brook)

Funding: National Institute of Arthritis and Musculoskeletal and skin diseases (NIAMS) at National Institute of Health

Trainees: Alwathiqbellah Ibrahim (postdoc), Nabid Hossain (PhD)

Repulsive sensors as a new approach to capacitive sensing (Active)

Collaborator: Ronald Miles (SUNY Binghamton)

Funding: National Science foundation

Trainees: Mehmet Ozdogan (PhD), Mark Pallay (PhD), Meysam Daeichin (PhD)

Start-up Projects

Vibration Energy Harvesting using nonlinear system properties (completed)

Funding: start-up

Trainees: Wei Yang (PhD), Alwathiqbellah Ibrahim (PhD)

Threshold shock Sensing using triboelectric effect (completed)

Funding: start-up

Trainee: Daniel Nelson (MS)

Low frequency Vibration Energy Harvesting using triboelectric material (completed)

Funding: start-up

Trainees: Lejie Liu (MS), Daniel Nelson (MS)

Teaching Experience

Dynamics of MEMS and Microsystems (graduate course)

Department of Mechanical Engineering, SUNY Binghamton

Fall 2013, 2014, 2016, 2018

Control Systems in Mechanical Engineering (undergraduate course)

Department of Mechanical Engineering, SUNY Binghamton

Spring 2014, 2015, 2016, 2017, 2018

Advanced Dynamics (graduate course)

Department of Mechanical Engineering, SUNY Binghamton

Fall 2015, 2017, Spring 2019

Advanced Mechanical Vibration (graduate course)

Department of Mechanical Engineering, SUNY Binghamton

Spring 2017, 2018

Student Supervision

Graduates at SUNY Binghamton

One PhD and four MS thesis graduates:

Alwathiqbellah Ibrahim

PhD Advisor, Co-advisor: Mohammad Younis

2014-2017

Daniel Nelson

MS Advisor

2016- 2018

Mark Pallay

MS Advisor

2014-2016

Mehmet Ozdogan

MS Advisor

2013- 2015

Lejie Liu

MS advisor

2013- 2015

Currently PhD student at University of Wisconsin- Madison

Current Postdoctoral Fellow at SUNY Binghamton

Alwathiqbellah Ibrahim

Postdoc Advisor on NIH project

2017-present

Current Graduate Students at SUNY Binghamton*Six current PhD students:*

Mark Pallay

PhD Advisor, Co-advisor: Ronald Miles
Expected graduation: Summer 2019

2016-present

Mehmet Ozdogan

PhD Advisor, Co-advisor: Ronald Miles
Currently intern at Xallent, Expected graduation: March 2019

2015-present

Wei Yang

PhD Advisor
Currently intern at Knowles, Expected graduation: Nov 2018

2014-present

Meysam Daeichin

PhD Advisor
Expected graduation: summer 2019

2015-present

Nabid Hossain

PhD Advisor
Expected graduation: summer 2020

2017-present

Nahid Hasan

PhD Advisor
Expected graduation: summer 2022

2018-present

Undergraduate Students at SUNY Binghamton*Senior Design Project students*

Daniel Miro-Quesada, Kenneth Garcia, Scott Anderson, David Wang	2014-2015
Qucheng Hong, Brandon A Jenkins, Cheng Lin, Gerry Lourenzatos, Edward Yeung, Yibin Wang	2014-2015
Quinn Wengler, Patrick Furlong, Bradley Litt	2015-2016
Xuewei Kong, Gamal M Alsaadi, Allison Zoghby, Thomas C Giunta	2017-2018

Undergraduate researchers at SUNY Binghamton

Mark Pallay, Mathew Jones, Max Hew (REU), Timothy Kilmer (SUNY STEM Research Passport Program), Rebecca Miles, Rebecca Schneider (NSF REU), Siaki Tetteh-Nartey (SUNY LSAMP)

Graduate Student Committee*PhD Committee Member*

Ruiyang Liu, Li Lu, Huyan Wang, Jonathan Walsh, Arwa Fraiwan, Van Lai Pham, Juan Wu

Masters Committee Member

Qi Dong

Campus Service

Oct 2014	MEMS session chair, 2014 Electronic Packaging Symposium at Binghamton University
Sep 2014-present	Mechanical engineering Department Committee member at SUNY Binghamton: Graduate Studies Committee, Hiring Search Committee, ME Department Seminar Series, Awards Committee, Watson Commencement committee.

Professional Service

Mar 2019-pres	Track Organizer for Energy Harvesting Symposium at ASME 2019 conference on smart materials, adaptive structures and intelligent systems
Mar 2019-pres	Secretary of the ASME energy harvesting technical committee
Feb 2019- pres	Symposium Organizer of the Dynamics of MEMS and NEMS at the 12 th International conference on Micro- and Nano Systems as part of ASME IDETC 2019
Aug 2018	Session Chair for VIB-3-3 Energy Harvesting and MNS-2-2 Microsystem Applications as part of ASME International Design Engineering technical Conference (IDETC) 2018
June 2018-pres	Guest Editor for Shock and Vibration
Mar 2018	Session chair of Piezoelectric Materials and Systems II at Active and Passive Smart Structures and Integrated Systems XII as part of SPIE Smart Structures conference 2018
Feb.- Aug. 2018	Symposium Organizer of the Dynamics of MEMS and NEMS at the 12 th International conference on Micro- and Nano Systems as part of ASME IDETC 2018
Oct 2017-pres	Member of the ASME Micro- and Nano- systems technical committee
Sep 2017	Session chair of Modeling and Characterization Symposium as part of ASME SMASIS 2017
Aug 2017	Symposium Organizer of the MEMS sensors and actuators at the 11 th International conference on Micro- and Nano Systems as part of ASME IDETC 2017
March 2017	NSF Panel Review (ECCS)
Sep 2016	Proposal Reviewer- John Evans Leaders Fund program at Canada Foundation for innovation
Aug 2016	ASME IDETC 2016 conference: (1) chair for MEMS sensors and Actuators session (2) Symposium Organizer for Emerging Areas in Micro- Nano Systems
Aug 2015	ASME IDETC 2015 conference: Session chair for Dynamics of MEMS and NEMS
Nov 2014	Chair for Computational Studies on MEMS and Nanostructures session at ASME IMECE 2014
Sep 2013-pres	Reviewer for journals/proceedings: Micromachines, Sensors, Journal of Vibration and Acoustics, Journal of Vibration and Control, Journal of Applied Physics, Nonlinear Dynamics, Smart Materials and Structures, Journal of Intelligent Material Systems and Structures, Nano Energy, Mechanical Systems and Signal processing, 2014-2018 ASME IDETC.

Memberships

American Society of Mechanical engineers
Institute of Electrical and Electronics Engineers

Awards

2018	<i>Symposium Organizer Award</i> at ASME IDETC 2018
2011	MITACS Elevate Postdoctoral Fellowship
2008-10	Canada NSERC Postgraduate Scholarship (doctoral level)
2008	Canada Ontario Graduate scholarship Award of Excellence