

Alicia Boymelgreen, PhD

9173 Carlyle Ave, Surfside, FL 33154 • 7189384245 • aboymelg@fiu.edu

CURRENT POSITION

Visiting Research Assistant Professor **2019-Present**
Department of Mechanical and Materials Engineering, Florida International University

EDUCATION

PhD in Mechanical Engineering **2012-2017**

Technion, Israel Institute of Technology, Israel

Dissertation title: Symmetry breaking in non-linear electrokinetic colloidal transport at the micro/nano scale

Advisors: Prof Touvia Miloh and Prof. Gilad Yossifon

MSc in Mechanical Engineering, *summa cum laude* **2008-2012**

Tel Aviv University, Israel

Dissertation title: Dipolophoresis of hydrodynamically asymmetric and dielectric Janus particles

Advisor: Prof Touvia Miloh

B.Eng (Mech), *Honors* **2002-2007**

Monash University, Australia

GRANTS

Awarded

NSF (#2038484) **\$397,120** **2020-2023**

CAS-MNP: Real time analysis of impact of nanoplastics on marine species using AI integrated microfluidics

PI: Alicia Boymelgreen, co-PI: Arif Sarwat, Terry Bradley

Pending

Office of Naval Research (DURIP)(#GRANT13107245) **\$199,907** **2021**

Spinning Disc Confocal Microscope for dynamic 3D imaging of nanoscale material repair

PI: Alicia Boymelgreen

HONORS AND AWARDS

Aryeh and Rivkah Shotosovsky award for outstanding Doctoral thesis **2017**

First prize - Langmuir Graduate Student Oral Presentation Award (ACS Colloids, Boston) **2016**

RBNI scholarship for excellence **2015-2016**

RBNI scholarship for excellence **2014-2015**

Gutwirth fellowship **2014-2015**

AES Travel award (Excellence based) **2014**

Poster represented Mechanical Engineering at Technion Board of Governors meetin **2014**

RBNI scholarship for excellence **2013-2014**

RBNI Travel grant **2013**

MENTORING

Golden Scholars Mentorship program, Florida International University **2019-present**

- Active mentor in program focusing on first year, first-generation minority students,
- Goals include increasing academic retention and success as well as support for post-graduate transitions

MNFL lab, Technion, Israel Institute of Technology **2014-2017**

- Responsible for the design of final year projects and dissertation topics to suit the timeframe and experience of multiple graduate and undergraduate students

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- Instructed and supervised students on research methods, manufacturing techniques, equipment usage, data analysis and paper/report composition.

RESEARCH EXPERIENCE

Visiting Assistant Research Professor, Florida International University, 2019-Present

Established multiple multidisciplinary collaborative projects including

1. Real time analysis of impact of nanoplastics on marine species using AI integrated microfluidics
2. Bottom-up fabrication of Boron Nitride Nanotube nano-scaffolding for neural network growth.
3. Effects of Near-wall interaction on active colloid mobility
4. Numerical modelling of solute transport in soil towards optimization of agricultural sensors
5. Characterization and Optimization of micro cargo transport systems

Graduate research assistant, Technion 2012-2017

- Pioneered a unique imaging method for 3D measurement of spatial orientation and complex flow patterns around colloids in microfluidic systems by integrating discrete particle tracking (PTV) and micro particle image velocimetry techniques (uPIV). This approach enabled a comprehensive understanding of system parameters such as particle-wall interactions in an active colloidal suspension.
- Mastered multiple microscope systems and techniques including SEM, epifluorescence, confocal microscopy and dual tagged lasers for microPIV.
- Automated data and image analysis using LabView, Matlab, Mathematica, Insight (uPIV).
- Cleanroom fabrication of micro/nano scale Janus particles and microfluidic devices.
- Design and fabrication of microfluidic devices, including electrokinetic and pressure driven systems.
- Development of theoretical models and numerical simulations (COMSOL) to complement experimental observations including evidence of a new active propulsion mechanism.

TEACHING EXPERIENCE

Lecturer – Ethics and Design Project Organization, Florida International University 2020-present

- Developed modules on (i) academic writing and presentation and (ii) global impact and diversity.
- Served as advisor and mentor on multiple senior design projects. Responsibilities include giving technical advice, guiding students in research and design processes and grading assignments.

Lecturer – Statics, Florida International University 2020-present

- Introduced a project-based component to the course where students use principle of trusses to maximise strength and predict failure of a bridge made of paddle-pop sticks.
- Aided students transition to remote learning through feedback surveys and customized lecture materials including animated power points to simulate dynamic problem solving.

Lecturer – Heat Transfer, Florida International University 2019-present

- Developed a presentation style combining electronic media and dynamic demonstrations to optimize use of limited contact hours, enabling maximum material coverage without loss of in-depth understanding.
- Introduced a project-based component to the course which encourages students to explore and apply their knowledge to real world applications.

Instructor - Experimental Methods, Technion 2013-2016

- Developed experiments simulating real-world engineering challenges to prepare students for industry.
- Preparation of instruction manual, supervision of experiment execution and report grading

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PUBLICATIONS

- [13] Boymelgreen,A.M., Miloh,T, Ramos, A, Garcia-Sanchez, P, Yossifon, G., “Stable orientation of active Janus spheres near a wall” (*in preparation*)
- [12] Boymelgreen,A.M., Miloh,T, Ramos, A, Garcia-Sanchez, P, Yossifon, G., “Influence of particle-wall interactions on electrokinetic mobility of active Janus spheres” (*in preparation*)
- [11] Huo,X, Wu,Y, Boymelgreen,A.M., Yossifon, G., “Analysis of cargo loading modes and capacity of an electrically powered active carrier”, *Langmuir*, 2019
- [10] Boymelgreen, A.M, Balli, T, Miloh, T, Yossifon, G., “Active Colloids as mobile microelectrodes for unified label free selective cargo transport”, *Nat. Comm*, 9, 2018
- [9] Boymelgreen, A.M, Yossifon, G., Miloh, T., “Propulsion of active colloids by self-induced field gradients”, *Langmuir*, 32, 9540, 2016
- [8] Zehavi, M, Boymelgreen, A.M, Yossifon,G, “Competition between Induced-Charge Electro-Osmosis and Electro-Thermal Effects around a Weakly-Polarizable Microchannel Corner”, *Phys. Rev. Applied* 5, 044013, 2016
- [7] Boymelgreen, A.M, Yossifon,G, “Observing electrokinetic Janus-particle wall interaction using micro-particle-image-velocimetry”, *Langmuir* 31, 8243, 2015
- [6] Ben-Bassat, D, Boymelgreen, A.M., Yossifon, G “The Influence of Flow Intensity and Field Frequency on Continuous-Flow Dielectrophoretic Trapping”, *J. Coll. Inter. Sci.*,15,442, 2015
- [5] Miloh, T, Boymelgreen, A.M., “Travelling wave dipolophoresis of ideally polarizable nanoparticles with double layer overlap”, *Phys. Fluids*, 26, 072101, 2014
- [4] Boymelgreen, A.M, Park,S, Yossifon,G, Miloh,T, “Spinning Janus doublets in uniform AC fields”, *Phys.Rev.E (Rapid Comm.)*, 89, 011003R, 2014
- [3] Boymelgreen, A.M, Miloh, T, “Alternating current induced-charge electrophoresis of leaky dielectric Janus particles”, *Phys. Fluids*, 24, 082003, 2012.
- [2] Boymelgreen, A.M, Miloh, T, “Induced-charge electrophoresis of uncharged dielectric spherical Janus particles”, *Electrophoresis*, 33, 870-879, 2012
- [1] Boymelgreen, A.M, Miloh, T, “A Theoretical Study of Induced-Charge Dipolophoresis of Ideally Polarizable Asymmetrically Slipping Janus Particles”, *Phys.Fluids*, 23, 072007, 2011

PATENTS

- [1] Boymelgreen, A.M, Yossifon, G., “Device and method for dielectrophoresis”, Patent filed with ISPTO 5/6/16

LECTURES IN CONFERENCES & WORKSHOPS

- [15] Boymelgreen, A.M, Balli, T, Yossifon, G, Miloh, T “Mobile Microelectrodes:”, ACS-Colloids, New York, USA (November 2017)
- [14] Boymelgreen, A.M, Balli, T, Yossifon, G, Miloh, T “Novel propulsion of active colloids by self-induced field gradients with potential for cargo transport”, APS-DFD, Portland, USA (November 2016)
- [13] Boymelgreen, A.M, Balli, T, Yossifon, G, Miloh, T “Novel propulsion of active colloids by self-induced field gradients with potential for cargo transport”, ACS - Colloids, BOSTON, USA (June 2016)
- [12] Boymelgreen, A.M, Balli, T, Yossifon, G, Miloh, T “Frequency dispersion of electrokinetically activated Janus particles”, APS-DFD, BOSTON, USA (November 2015)
- [11] Boymelgreen, A.M, Balli, T, Yossifon, G, Miloh, T “Frequency dispersion of electrokinetically activated Janus particles”, AICHE, Salt Lake City, USA (November 2015)

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- [10] Boymelgreen, A.M., Yossifon, G, Miloh, T , “Spinning Janus doublets driven in uniform AC electric fields”, Belfer Symposium, Israel (January, 2015)
- [9] Boymelgreen, A.M., Yossifon, G, Miloh, T , "On the effect of competition between dielectrophoresis and induced-charge electrophoresis on JP mobility.", Israel Society of Theoretical and Applied Mathematics, Tel Aviv, Israel (December 2014)
- [8] Boymelgreen, A.M., Zehavi, Yossifon,G, “3D experimental investigation of the interplay between dielectrophoresis and induced-charge electroosmosis around Janus particles”, American Physical Society: Division of Fluid Dynamics, San Francisco, USA (November 2014)
- [7] Boymelgreen, A.M., Zehavi, M, Yossifon,G, “Examining frequency dispersion in non-linear electrokinetic flow using μ PIV”, AIChE, Atlanta, USA (November 2014)
- [6] Boymelgreen, A.M., Yossifon, G, Miloh, T , “Frequency dispersion in dipolophoresis of Janus particles”, Israel Society of Theoretical and Applied Mathematics, Tel Aviv, Israel (December 2013)
- [5] Boymelgreen, A.M., Yossifon, G, Miloh, T, “Frequency dispersion in dipolophoresis of Janus particle”s, American Physical Society: Division of Fluid Dynamics, Pittsburgh, USA (November 2013)
- [4] Boymelgreen, A.M., Yossifon, G, Miloh, T, “An electrokinetically driven Janus micromixer: Stability and Rotation”, Society of Engineering Science, ASME Summer meeting, Rhode Island, USA (July 2013)
- [3] Boymelgreen, A.M., Yossifon, G, Miloh, T, “Stability and Rotation of Metallodielectric Janus particles”, Bifurcations and Instabilities in Fluid Dynamics, Haifa, Israel (July 2013)
- [2] Boymelgreen, A.M, Yossifon, G, Miloh, T, “Stability of Metallodielectric Janus spheres in AC electric fields”, Advances in Micro and Nano Fluidics, Notre Dame, USA (May 2013)
- [1] Boymelgreen, A.M., Miloh, T “Induced-Charge Electrophoresis of hydrodynamically asymmetric and dielectric Janus particles”, ICREA Symposium, Barcelona, Spain (July 2012)

POSTERS IN CONFERENCES & WORKSHOPS

- [3] Boymelgreen, A.M, Park,S, Yossifon,G, Miloh,T, “Persistently spinning Janus micromotors driven by induced-charge electrophoresis”, Technion Board of Governors meeting, Israel, 2014
- [2] Boymelgreen, A.M, Park,S, Yossifon,G, Miloh,T, “Persistently spinning Janus micromotors driven by induced-charge electrophoresis”, NanoIsrael, Israel, 2014
- [1] Boymelgreen, A.M, Park,S, Yossifon,G, Miloh,T, “Persistent Janus Micromotors Driven by Dipolophoresis”, Technion Research Day, Israel, 2013

*Underline denotes presenting author