

## Evgeniy Boyko

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### PERSONAL DETAILS

E-mail: [eboyko@princeton.edu](mailto:eboyko@princeton.edu) [eboyko@purdue.edu](mailto:eboyko@purdue.edu) [2evgboyko@gmail.com](mailto:2evgboyko@gmail.com)  
ORCID iD: <https://orcid.org/0000-0002-9202-5154>

### ACADEMIC DEGREES

- 10/2014 – 06/2020: Ph.D. (**direct track**), GPA: 98.1/100  
Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology, Haifa, Israel  
Co-supervised by Professor Moran Bercovici and Professor Amir D. Gat  
Research topic: “*Non-uniform electro-osmotic flow: From microscale flow patterning to fluid-structure interaction and instability.*”
- 03/2012 – 03/2015: B.Sc., *summa cum laude*, GPA: 93.4 /100  
Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology, Haifa, Israel  
“Reamim – Research and Development” excellence program for undergraduate students

### ACADEMIC APPOINTMENTS

- March 1, 2023: Assistant Professor, Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology, Haifa, Israel  
Leading the Complex Flows and Fluids Research Group  
Advising graduate and undergraduate students, teaching graduate and undergraduate level courses
- 10/2021 – Present: Postdoctoral Research Fellow  
Schools of Mechanical and Chemical Engineering  
Purdue University, West Lafayette, IN, USA  
Advisers: Professor Ivan C. Christov and Professor Osman Basaran  
Research topic: *Microscale non-Newtonian flows*
- 10/2020 – 10/2021: Postdoctoral Research Fellow  
Department of Mechanical and Aerospace Engineering  
Princeton University, Princeton, NJ, USA  
Adviser: Professor Howard A. Stone  
Research topic: *Fluid mechanics of non-Newtonian fluids in confined and narrow geometries*

## PROFESSIONAL EXPERIENCE

10/2014 – 06/2020: Graduate Research Assistant  
Microfluidic Technologies Laboratory; Fluids & Elasticity Research Group  
Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology, Haifa, Israel

## RESEARCH INTERESTS

- Theoretical research of fluid mechanics and transport phenomena
- Hydrodynamics of non-Newtonian fluids: flows of shear-thinning and viscoelastic fluids
- Flows of polymer solutions and melts: theory and simulations
- Interfacial phenomena and interfacial rheology
- Microfluidics, electrokinetics, electro-osmotic flows
- Fluid–structure interaction

## TEACHING EXPERIENCE

10/2014 – 09/2020: Lead Teaching Assistant, Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology, Israel

034013 *Fluid Mechanics I, undergraduate level*  
*Fall '14, '16-'18, Spring '15-'20*

034033 *Numerical Analysis, undergraduate level*  
*Fall '19*

035035 *Fluid Mechanics II, undergraduate level*  
*Fall '15-'19*

036008 *Compressible Flow, graduate level*  
*Fall '15-'16*

036086 *Flow and transport in micro-devices, graduate level*  
*Fall '19*

*Taught weekly frontal tutorials, held weekly office hours, wrote homework assignments and their solutions, wrote exams and their solutions, gave several guest lectures, and served as an instructor for final projects.*

*Participated in developing the curriculum for the new course Fluid Mechanics 1M 034055.*

## **PUBLIC PROFESSIONAL ACTIVITIES**

### **Reviewer for archived journals**

- Journal of Fluid Mechanics, Physical Review Fluids, Physical Review Letters, Physical Review Applied, Physical Review E, Journal of Non-Newtonian Fluid Mechanics, European Journal of Mechanics - B/Fluids, Physics of Fluids, Acta Mechanica, Proceedings A, Mathematical Modelling of Natural Phenomena.

## **MEMBERSHIP IN PROFESSIONAL SOCIETIES**

- American Physical Society, Division of Fluid Dynamics (APS DFD)
- European Mechanics Society (EuroMech)
- The Society of Rheology (SoR)

## **FELLOWSHIPS, AWARDS AND HONORS**

- 2021: Arie and Rebecca Shostakovsky Ph.D. Excellence Award
- 2021 – Present: Lillian Gilbreth Postdoctoral Fellowship at Purdue Engineering  
<https://engineering.purdue.edu/Engr/Research/GilbrethFellowships/awardees/AllAwardees/2020>
- 2020 – Present: Zuckerman Israeli Postdoctoral Scholarship  
<https://zuckerman-scholars.org/scholars/dr-evgeniy-boyko/>
- 2020 – 2021: Rothschild Postdoctoral Fellowship  
<https://www.yadhanadiv.org.il/rothschild-fellows>
- 2020 – 2022: Blavatnik Postdoctoral Fellowship at University of Cambridge (declined)
- 2020: Jacobs prize for best publication of the 2019 year from the Technion
- 2017 – 2020: Adams Fellowship Program of the Israel Academy of Sciences and Humanities  
<http://adams.academy.ac.il/fellow/evgeniy-boyko/?fromsearch>
- 2015 – 2020: Faculty's Excellence Scholarship (5x)
- 2015 – 2016: Technion Graduate School Scholarship for Traveling Students
- 2015: Dean's Graduate Studies Scholarship
- 2015: B.Sc. graduation *summa cum laude*
- 2013 – 2015: Technion President's List for academic achievements (4x)
- 2011: Central Commander's Excellence Award in counterterrorism

## **MENTORING UNDERGRADUATE FINAL RESEARCH PROJECTS**

- 2015 – 2016: Baheej Bathish, "Monte Carlo simulations of particle motion in three-dimensional electro-osmotic flow".
- 2017 – 2018: Israel Gabay, "Reciprocal theorem in fluid mechanics".

## PUBLICATIONS

### Theses

**Boyko E.**, Ph.D. dissertation entitled “Non-uniform electro-osmotic flow: From microscale flow patterning to fluid-structure interaction and instability,” Faculty of Mechanical Engineering, Technion, Israel, 2020. Advisers: Associate Prof. Moran Bercovici and Associate Prof. Amir D. Gat.

### Refereed papers in professional journals

1. **Boyko E.**, Rubin S., Gat A. D., and Bercovici M., (2015), “Flow patterning in Hele-Shaw configurations using non-uniform electro-osmotic slip”, *Phys. Fluids* **27**, [102001](#).
2. **Boyko E.**, Bercovici M., and Gat A. D., (2016), “Flow of power-law liquids in a Hele-Shaw cell driven by non-uniform electro-osmotic slip in the case of strong depletion”, *J. Fluid Mech.* **807**, [235-257](#).
3. **Boyko E.**, Bercovici M., and Gat A. D., (2017), “Viscous-elastic dynamics of power-law fluids within an elastic cylinder”, *Phys. Rev. Fluids* **2**, [073301](#).
4. Paratore F., **Boyko E.**, Kaigala G. V., and Bercovici M., (2019), “Electroosmotic Flow Dipole: Experimental Observation and Flow Field Patterning”, *Phys. Rev. Lett.* **122**, [224502](#).
5. **Boyko E.**, Eshel R., Khaled G., Gat A. D., and Bercovici M., (2019), “Elastohydrodynamics of a pre-stretched finite elastic sheet lubricated by a thin viscous film with application to microfluidic soft actuators”, *J. Fluid Mech.* **862**, [732-752](#).
6. **Boyko E.**, Eshel R., Gat A. D., and Bercovici M., (2020), “Non-uniform Electro-osmotic Flow Drives Fluid-Structure Instability”, *Phys. Rev. Lett.* **124**, [024501](#).
  - [Awarded the Jacobs prize for best publication of the 2019 year from the Technion.](#)
7. Arshavsky Graham S., **Boyko E.**, Salama R., and Segal E., (2020), “Mass Transfer Limitations of Porous Silicon-Based Biosensors for Protein Detection”, *ACS Sensors* **5**, [3058-3069](#).
8. **Boyko E.**, Ilssar D., Bercovici M., and Gat A. D., (2020), “Interfacial instability of thin films in soft microfluidic configurations actuated by electro-osmotic flow”, *Phys. Rev. Fluids* **5**, [104201](#).
9. **Boyko E.**, Bacheva V., Eigenbrod M., Paratore F., Gat A. D., Hardt, S., and Bercovici M., (2021), “Microscale Hydrodynamic Cloaking and Shielding via Electro-Osmosis”, *Phys. Rev. Lett.* **126**, [184502](#).
  - [Selected as Editors' suggestion.](#)
  - [Featured in Physics.](#)
10. Gabay I., Paratore F., **Boyko E.**, Ramos A., Gat A. D., and Bercovici M., (2021), “Shaping liquid films by dielectrophoresis”, *Flow* **1**, [E13](#).
11. **Boyko E.** and Stone H. A., (2021), “Flow rate–pressure drop relation for shear-thinning fluids in narrow channels: approximate solutions and comparison with experiments”, *J. Fluid Mech. (Rapids)* **923**, [R5](#).

12. **Boyko E.** and Stone H. A., (2021), “Reciprocal theorem for calculating the flow rate–pressure drop relation for complex fluids in narrow geometries”, [Phys. Rev. Fluids \(Letter\) 6, L081301](#).
13. **Boyko E.** and Stone H. A., (2022), “Pressure-driven flow of the viscoelastic Oldroyd-B fluid in narrow non-uniform geometries: analytical results and comparison with simulations”, [J. Fluid Mech. 936, A23](#).

### Submitted papers

14. **Boyko E.**, Stone H. A., and Christov I. C., (2022), “Flow rate–pressure drop relation for deformable channels via fluidic and elastic reciprocal theorems”, [Preprint: arXiv:2203.14112](#).

### Refereed papers in conference proceedings

15. Paratore F., **Boyko E.**, Gat A. D., Kaigala G. V., and Bercovici M., (2018), “Toward microscale flow control using non-uniform electro-osmotic flow”, [Microfluidics, BioMEMS, and Medical Microsystems XVI, 104910P](#).

## CONFERENCES

### Invited lectures at conferences

1. Boyko E., Gat A. D., and Bercovici M., “*Microscale deformations driven by various actuation mechanisms*”, Mini-symposium in memoriam of Antonio Castellanos Mata: Electrohydrodynamics, gas discharges, granular materials, St. Petersburg, Jun, 2017.
2. Boyko E. and Stone H. A., “*Dumbbell models for polymer flow in confined configurations*”, International Workshop of the Princeton Center for Theoretical Science (PCTS) on Viscoelastic Flow Instabilities and Elastic Turbulence, Princeton, Jan, 2021.
3. Boyko E. and Stone H. A., “*Flow rate–pressure drop relation for viscoelastic fluids in narrow non-uniform geometries*”, Flow Assurance Conference, Purdue Process Safety & Assurance Center (P2SAC) 2022 Spring Conferences, West Lafayette, May 2022. (oncoming)

### Invited lectures at seminars and academic symposia

4. Boyko E., “*Fluid–structure instability actuated by non-uniform electro-osmotic flow*”, Department of Mechanical Engineering, Ben-Gurion University, Israel, Feb, 2021.
5. Boyko E., “*Hydrodynamics of Complex Microscale Flows: From Electro-osmotic to Non-Newtonian Flows in Rigid and Soft Configurations*”, Special Fluid Mechanics Seminar, Purdue University, USA, Aug, 2021.
6. Boyko E. and Stone H. A., “*Flow rate–pressure drop relation for complex fluids in narrow geometries*”, SMatCH Seminar, Princeton, Sep, 2021.

## Contributed talks and posters

7. Boyko E., Rubin S., Gat A. D., and Bercovici M., “*2D Flow Patterning using Non-uniform Electroosmotic flow*”, The 33<sup>rd</sup> Israel Conference of Mechanical Engineering – ICME, Tel Aviv, Mar, 2015. (oral presentation)
8. Rubin S., Boyko E., Gat A., and Bercovici M., “*Elastic Surface Deformations Driven by Non-Uniform Electroosmotic Flow in a Hele-Shaw cell*,” Fluid & Elasticity 2015 conference, Biarritz, France, Jun, 2015. (oral presentation)
9. Rubin S., Boyko E., Gat A., and Bercovici M., “*Electroosmotic Flow in Hele-Shaw Configurations with Non-Uniform Surface Charge*”, Gordon Research Conference on Physics and Chemistry of Microfluidics, Mount Snow, Vermont, Jun, 2015. (oral presentation)
10. Boyko E., Rubin S., Gat A. D., and Bercovici M., “*2D Flow patterning in Hele-Shaw configurations using Non-Uniform Electroosmotic Slip*”, 68<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, Massachusetts, Nov, 2015. (oral presentation)
11. Boyko E., Bercovici M., and Gat A. D., “*Flow of power-law liquids in a Hele-Shaw cell driven by non-uniform electro-osmotic slip in the case of strong depletion*”, 69<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, Oregon, Nov, 2016. (oral presentation)
12. Boyko E., Bercovici M., and Gat A. D., “*Viscous-elastic dynamics of power-law fluids within an elastic cylinder*”, 69<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, Oregon, Nov, 2016. (oral presentation)
13. Boyko E., Gat A. D., and Bercovici M., “*Deformations of a pre-stretched elastic membrane driven by non-uniform electro-osmotic flow*”, 69<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, Oregon, Nov, 2016. (oral presentation)
14. Boyko E., Rubin S., Eshel R., Tulchinsky A., Gat A. D., and Bercovici M., “*Flow and deformations patterning with non-uniform electroosmotic slip*”, The Batsheva de Rothschild Seminar: Physics of Microfluidics, Sde-Boker, Jan, 2017. (oral presentation)
15. Boyko E., Gat A. D., and Bercovici M., “*Deformations of a pre-stretched and lubricated finite elastic sheet*”, Flow17 conference, Paris, Jul, 2017. (poster)
16. Eshel R., Boyko E., Gommed K., and Bercovici M., “*Experimental study of elastic deformation driven by electro-osmotic flow*”, Flow17 conference, Paris, Jul, 2017. (poster)
17. Boyko E., Gat A. D., and Bercovici M., “*Deformations of a pre-stretched and lubricated finite elastic membrane driven by non-uniform external forcing*”, 70<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, Colorado, Nov, 2017. (oral presentation)

18. Boyko E., Gat A. D., and Bercovici M., “*Elastic deformation instability in soft microfluidic configurations induced by non-uniform electro-osmotic flow*”, 9<sup>th</sup> Conference of the International Marangoni Association (IMA9), Guilin, Aug, 2018. (oral presentation)
19. Boyko E., Gat A. D., and Bercovici M., “*Elastic deformation instability in soft microfluidic configurations induced by non-uniform electro-osmotic flow*”, 12<sup>nd</sup> European Fluid Mechanics Conference (EFMC12), Vienna, Sep, 2018. (oral presentation)
20. Boyko E., Gat A. D., and Bercovici M., “*Elastic deformation instability in soft microfluidic configurations induced by non-uniform electro-osmotic flow*”, 71<sup>st</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Atlanta, Georgia, Nov, 2018. (oral presentation)
21. Boyko E., Eshel R., Gat A. D., and Bercovici M., “*Non-uniform electro-osmotic flow drives elastic deformation instability*”, 13<sup>th</sup> International Symposium on Electrokinetics (ELKIN), Boston, Massachusetts, Jun, 2019. (poster)
22. Boyko E., Bercovici M., and Gat A. D., “*Elastic instability in soft microfluidic configurations driven by non-uniform electro-osmotic flow*”, 13<sup>th</sup> International Symposium on Electrokinetics (ELKIN), Boston, Massachusetts, Jun, 2019. (poster)
23. Boyko E., Eshel R., Gat A. D., and Bercovici M., “*Elastic deformation instability in soft microfluidic configurations induced by non-uniform electro-osmotic flow*”, Fluid & Elasticity 2019 conference, Malaga, Jun, 2019. (oral presentation)
24. Boyko E., Bercovici M., and Gat A. D., “*Elastic instability in soft microfluidic configurations driven by non-uniform electro-osmotic flow*”, Harrington Symposium: Physics of Microfluidics, Austin, Texas, Jun, 2019. (poster)
25. Boyko E., Eshel R., Gat A. D., and Bercovici M., “*Non-uniform electro-osmotic flow drives fluid–structure instability*”, Harrington Symposium: Physics of Microfluidics, Austin, Texas, Jun, 2019. (poster)
26. Boyko E., Eshel R., Gat A. D., and Bercovici M., “*Non-uniform electro-osmotic flow drives fluid–structure instability*”, The Israel Society for Theoretical and Applied Mechanics Symposium – ISTAM, Haifa, Dec, 2019. (oral presentation)
27. Boyko E., Ilssar D., Bercovici M., and Gat A. D., “*Electro-osmotic-driven fluid–structure instability in soft microfluidic configurations with application to soft actuators*”, International Workshop on Micro-swimmers and Soft Robotics, Haifa, Feb, 2020. (poster)
28. Boyko E. and Stone H. A., “*Flow rate–pressure drop relation for complex fluids in narrow geometries*”, The Society of Rheology 92<sup>nd</sup> Annual Meeting, Bangor, Maine, Oct, 2021. (oral presentation)
29. Boyko E. and Stone H. A., “*Flow rate–pressure drop relation for viscoelastic fluids in narrow geometries*”, 74<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics, Phoenix, Arizona, Nov, 2021. (oral presentation)

30. Boyko E. and Stone H. A., “*Flow rate–pressure drop relation for viscoelastic fluids in narrow and confined non-uniform geometries*”, American Physical Society March Meeting 2022, Chicago, Illinois, March, 2022. (oral presentation)

### **Participation in organizing conferences**

- Contributed to all aspects of the organization of the Batsheva de Rothschild Seminar on Physics of Microfluidics, Jan 3-8 2017, Sde-Boker, Israel. 60 Participants, including 20 international PIs, 20 Israeli PIs, and 20 graduate students.
- Contributed to most aspects of the organization of the Harrington Symposium of Physics of Microfluidics, Jun 9-11 2019, Austin, Texas, USA. 40 Participants, including 20 PIs and 20 graduate students.
- Co-organizer (with Prof. I. C. Christov) of a focus session entitled “Microscale non-Newtonian flows: Confinement, Particles, Compliance, Instabilities and Beyond” at the American Physical Society March Meeting 2022, March 14-18 2022, Chicago, USA.