

## C. NADIR KAPLAN, Ph.D.

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### SCHOLARLY PROFILE

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Applied mathematician and theoretical & computational physicist trained in a broad array of areas, including materials science, geometry, soft matter and biological physics, elasticity, fluid mechanics, chemical physics, liquid crystals, statistical physics and thermodynamics.

My current research focuses on:

- Synthetic biomimetic assembly with implications on additive manufacturing,
- Theory of bioinspired signal integration in hydrogels with implications in bioengineering,
- Low-Reynolds-number multiphase flow of colloidal and biological suspensions.

My past research focused on:

- Drying-induced deposition in volatile suspensions,
- Molecular order/morphology coupling in liquid crystalline membranes made of chiral nanorods,
- Statistical mechanics of non-uniform spin systems: small-world networks, percolation, strongly correlated electronic systems, classical and quantum spin glasses with frozen disorder,
- Molecular dynamics simulations of water flow through carbon nanotubes.

### POSITIONS & EMPLOYMENT

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2019– **Assistant Professor of Physics**

Department of Physics, Virginia Tech, Blacksburg, VA

2016–19 **Research Associate in Materials Science & Mechanical Engineering**

Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA

Faculty advisor: Joanna Aizenberg

2012–16 **Postdoctoral Researcher in Applied Mathematics**

Paulson School of Engineering and Applied Sciences, Harvard University, Cambridge, MA

Faculty advisor: L. Mahadevan

### EDUCATION

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2012 **Ph.D. in Physics**, Brandeis University, Waltham, MA

Thesis: Colloidal membranes: The rich confluence of geometry and liquid crystals

Faculty advisor: Robert B. Meyer

2008 **M.S in Physics**, Koç University, Istanbul, Turkey

Thesis: Renormalization-group theory of classical and quantum systems with frozen disorder

Faculty advisor: A. Nihat Berker

2006 **B.S. in Engineering Physics**, Istanbul Technical University, Istanbul, Turkey

## PRESENTATIONS

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### Invited talks

#### *Morphing hard and soft matter by reaction-transport dynamics*

- 02/2019 Physics Department Colloquium, Virginia Tech, Blacksburg, VA
- 01/2019 Materials and Interfaces Department Seminar, Weizmann Institute of Science, Rehovot, Israel
- 12/2018 Ringberg Castle Seminar: Matter to Life, Kreuth, Germany
- 10/2018 Symposium on Organoid Organization, Center for Systems Biology Dresden, Germany

#### *Theoretical design of hard and soft biomimetic materials*

- 12/2018 Biomaterials Department Seminar, MPI of Colloids and Interfaces, Golm, Germany
- 12/2018 Cellular Biophysics Seminar, MPI for Medical Research, Heidelberg, Germany
- 12/2018 Institute Seminar, MPI for Intelligent Systems, Stuttgart, Germany
- 10/2018 Engineering and Natural Sciences Seminar, Kadir Has University, Istanbul, Turkey
- 08/2018 Squishy Physics Seminar, Harvard University
- 04/2018 Oculus VR, Redmond, WA
- 03/2018 Physics Department Seminar, University of California, Merced
- 03/2018 Mechanical and Industrial Engineering Department Seminar, Northeastern University

#### *Controlled growth and form of precipitating microsculptures*

- 07/2017 Society of Engineering Science 54th Annual Meeting, Northeastern University
- 06/2017 Gordon Research Conference on Crystal Growth, University of New England
- 06/2017 Gordon Research Seminar on Crystal Growth, University of New England
- 04/2016 Simons Center for Data Analysis, Simons Foundation
- 03/2016 Physical Mathematics Seminar, Massachusetts Institute of Technology (MIT)
- 12/2015 Squishy Physics Seminar, Harvard University

#### *Rational design of self-organization in chemical precipitation*

- 01/2017 Applied Mathematics Seminar, University of Waterloo, Canada

#### *Dynamics of evaporation-driven colloidal patterning*

- 12/2013 Istanbul Technical University, Turkey

#### *Evolution of colloidal deposits in evaporating fluid films*

- 10/2013 Kavli Meetings, Harvard University
- 06/2013 20th Statistical Physics Days, Erciyes University, Turkey

#### *Theory of colloidal monolayers assembled from chiral rod-like particles*

- 02/2012 University of Massachusetts, Amherst
- 02/2012 Condensed Matter & Biological Physics Seminar, Syracuse University

#### *Theory of chiral smectic A liquid crystalline membranes*

- 05/2010 The 19th Annual Student Research Symposium, Brandeis University

*The effect of chirality on self-assembly of attractive rod-like particles*

04/2010 MRSEC Seminar, Brandeis University

*Renormalization-group theory of  $d = 3$   $t - J$  models*

07/2006 Workshop on Solid State and Materials Chemistry, MPI Dresden, Germany

### Contributed talks

*Theory of non-equilibrium signal processing in hydrogels*

03/2018 APS March Meeting, Los Angeles, CA

*Controlled growth and form of precipitating microsculptures*

10/2017 NEW.Mech 2017, MIT

10/2017 19th Greater Boston Area Statistical Mechanics Meeting, MIT

08/2017 26th International Materials Research Congress, Cancun, Mexico

*Dynamics of water uptake in spreading bacterial colonies*

11/2016 APS DFD Meeting, Portland, OR

*Dynamics of clogging in drying porous media*

11/2014 APS DFD Meeting, San Francisco, CA

*Theory of the dynamics of evaporation-driven colloidal patterning*

03/2014 APS March Meeting, Denver, CO

*Unified theory of chiral smectic  $A$  monolayers and  $\pi$ -wall defects*

02/2012 APS March Meeting, Boston, MA

10/2011 13th Greater Boston Area Statistical Mechanics Meeting, Brandeis University

*Theory of depletion induced phase transition from chiral smectic  $A$  twisted ribbons to semi-infinite flat membranes*

11/2010 MRS Fall Meeting, Boston, MA

10/2010 12th Greater Boston Area Statistical Mechanics Meeting, Brandeis University

09/2010 44th New England Complex Fluids Meeting, Brandeis University

05/2010 103rd Statistical Mechanics Meeting, Rutgers University

*Theory of liquid crystalline membranes*

10/2009 60th Birthday Symposium in Honor of Nihat Berker, MIT

*Infinitely robust order and local order-parameter tulips in Apollonian networks with quenched disorder*

03/2009 APS March Meeting, Pittsburgh, PA

12/2008 100th Statistical Mechanics Meeting, Rutgers University

*Quantum induced asymmetric phase diagrams of spin-glass systems*

03/2008 APS March Meeting, New Orleans, LA

12/2007 98th Statistical Mechanics Meeting, Rutgers University

### Poster presentations

*Controlled growth and form of precipitating microsculptures*

06/2017 Gordon Research Conference on Crystal Growth, University of New England

11/2016 MRS Fall Meeting, Boston, MA

08/2015 Gordon Conference on Soft Matter, Colby-Sawyer College

*Dynamics of evaporative colloidal patterning*

11/2014 Wyss Institute Annual Retreat, Boston, MA

01/2014 AFOSR-MURI Annual Review Meeting, Harvard University

*Morphogenesis of spinose forms in terrestrial plants*

05/2014 9th Annual Plant Biology Symposium, Arnold Arboretum

*Chiral smectics A: Isolated membranes versus  $\pi$ -twist-wall defects*

06/2011 Gordon Conference on Liquid Crystals, Mount Holyoke College

**TEACHING****Instructor & Teaching Assistant**

Taught classes (~ 50 students) & problem sections (~ 20-25 students), graded assignments, held office hours.

Virginia Tech Physics

Electromagnetism, waves &amp; optics (Physics 2306 - undergraduate level, Fall 2019)

Harvard University

Patterns in fluids (Applied Math 217 - graduate level, Spring 2019)

Brandeis University

Introductory physics (Phys 11a – Fall 2008, Phys 11b – Spring 2009)

Graduate statistical physics and thermodynamics, (Phys 163a – Fall 2009, 2011)

Graduate quantum mechanics II, (Phys 162b – Spring 2011)

Feza Gürsey Research Institute, TÜBİTAK, Turkey

Phase transitions and renormalization group, Summer 2007, 2008

Koç University

Undergraduate statistical physics, (Phys 301 – Fall 2006)

Electricity and magnetism, (Phys 102 – Spring 2007)

Undergraduate solid state physics, (Phys 403 – Fall 2007)

Phase transitions and renormalization group, (Phys 409 – Spring 2008)

**Tutor**Istanbul Technical University

Introductory physics laboratories, 2002-04

**Advisor**

Senior Honors Thesis at Brandeis University, 2010

**AWARDS**

2018 Postdoctoral Award for Professional Development, Office of Postdoctoral Affairs, Harvard University

2010 The Stephan Berko Prize For Outstanding Graduate Research, Martin Fisher School of Physics, Brandeis University

- 2009 GSA Travel and Research Award, Brandeis University Graduate Student Association (GSA)
- 2008 Travel and Research Award, The Scientific and Technological Research Council of Turkey (TUBITAK)

## PROFESSIONAL ACTIVITIES

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- Reviewer for *Phys. Rev. Lett.*, *Phys. Rev. E*, *Nature Comm.*
- Co-organizer (with 2 faculty members, 3 postdocs, and staff) of the 9th Plant Biology Symposium (2014), Arnold Arboretum, Harvard University (100 attendants),
- Co-organizer (with 1 faculty member and staff) of the Annual Retreat (2017), Kavli Institute for Bionano Science & Technology, Harvard University (49 attendants),
- Organizer of Max Planck Schools "Matter to Life" Information Session at Paulson School of Engineering and Applied Sciences, Harvard University (2018).

## REFERENCES

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**Joanna Aizenberg**, Harvard University – Postdoctoral supervisor

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**L. Mahadevan**, Harvard University – Postdoctoral supervisor

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**Robert B. Meyer**, Brandeis University – PhD supervisor

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**Zvonimir Dogic**, University of California, Santa Barbara; Brandeis University – Collaborator

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