

# Asher Preska Steinberg

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## Education

**California Institute of Technology**, Pasadena, CA

Ph.D. in Chemistry

Apr 2019

Thesis advisor: Rustem F. Ismagilov

Thesis committee: Zhen-Gang Wang (chair), David A. Tirrell, Julie A. Kornfield

Thesis: *How polymers shape the physicochemical environment of the gut*

Thesis awarded Herbert Newby McCoy Award by the Division of Chemistry & Chemical Engineering at Caltech

**Brandeis University**, Waltham, MA

B.A. in Chemistry with highest honors

May 2013

B.A. in Physics

*summa cum laude*

Thesis advisor: Milos Dolnik

Thesis: *Growth dynamics of Turing patterns in the photosensitive CDIMA reaction*

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## Honors, Awards, & Fellowships

2020-present Life Sciences Research Foundation Postdoctoral Fellowship (Simons Foundation Awardee)

2019 Herbert Newby McCoy Award at Caltech (In recognition of the most outstanding achievements in research by a graduate student in the CCE Division)

2018-2019 Caldwell CEMI Graduate Fellowship at Caltech

2013-2018 National Science Foundation Graduate Research Fellowship

2013 Molly W. and Charles K. Schiff Memorial Award in Science at Brandeis University

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## Publications

10. [A. Preska Steinberg](#), O.K. Silander, E. Kussell. "Correlated substitutions reveal SARS-like coronaviruses recombine frequently with a diverse set of structured gene pools". *Proc Natl Acad Sci USA* **2023**, 120 (5), e2206945119.
9. [A. Preska Steinberg](#), M. Lin, E. Kussell. "Core genes can have higher recombination rates than accessory genes within global microbial populations". *eLife* **2022**, 11:e78533.
8. M. K. Porter, [A. Preska Steinberg](#), R. F. Ismagilov. "Interplay of motility and polymer-driven depletion forces in the initial stages of bacterial aggregation". *Soft Matter* **2019**, 15, 7071-7079.

7. A. Preska Steinberg, Z. G. Wang, R. F. Ismagilov. "Food polyelectrolytes compress the colonic mucus hydrogel by a Donnan mechanism". *Biomacromolecules* **2019**, 20 (7), 2675-2683.
6. A. Preska Steinberg, S. S. Datta, T. Naragon, J. C. Rolando, S. R. Bogatyrev, R. F. Ismagilov. "High-molecular-weight polymers from dietary fiber drive aggregation of particulates in the murine small intestine". *eLife* **2019**, 8:e40387.
5. S. S. Datta, A. Preska Steinberg, R. F. Ismagilov. "Polymers in the gut compress the colonic mucus hydrogel". *Proc Natl Acad Sci USA* **2016**, 113 (26), 7041-7046.
4. L. Haim, A. Hagberg, R. Nagao, A. Preska Steinberg, M. Dolnik, I. R. Epstein, E. Meron. "Fronts and patterns in a spatially forced CDIMA reaction". *Phys Chem Chem Phys* **2014**, 16 (47), 26137-26143.
3. A. Preska Steinberg, I. R. Epstein, M. Dolnik. "Target Turing Patterns and Growth Dynamics in the Chlorine Dioxide-Iodine-Malonic Acid reaction". *J Phys Chem A* **2014**, 118 (13), 2393-2400.
2. E. S. Thrall, A. Preska Steinberg, X. Wu, L. E. Brus. "The Role of Photon Energy and Semiconductor Substrate in the Plasmon-Mediated Photooxidation of Citrate by Silver Nanoparticles". *J Phys Chem C* **2013**, 117 (49), 26238-26247.
1. J. Palacci, S. Sacanna, A. Preska Steinberg, D. J. Pine, P. M. Chaikin. "Living Crystals of Light-Activated Colloidal Surfers". *Science* **2013**, 339 (6122), 936-940.

## Research Experience

**Kussell Group**

**June 2019-present**

**New York University**

**New York, NY**

**Advisor:** Dr. Edo Kussell

-Investigating the role of homologous recombination in microbial genome evolution using population genetics and computational biology.

**Ismagilov Group**

**Nov 2013-April 2019**

**California Institute of Technology**

**Pasadena, CA**

**Advisor:** Dr. Rustem F. Ismagilov

-Ph.D. thesis: How polymers shape the physicochemical environment of the gut  
 -Studied how dietary and host-secreted polymers shape the physicochemical environment of the gut using tools from polymer physics

**Epstein Group**

**Mar-May 2010, Sept 2011-May 2013**

**Brandeis University**

**Waltham, MA**

**Advisor:** Dr. Milos Dolnik

-Received highest honors for senior thesis, *Growth dynamics of Turing patterns in the photosensitive CDIMA reaction*  
 -Studied wavenumber locking of Turing patterns with spatial periodic forcing

**Brus Group**

**May-Aug 2012**

**Columbia University**

**New York, NY**

**Advisor:** Dr. Louis Brus

-Participated in Columbia University EFRC Research Program for Undergraduates

-Studied the photo-oxidation of citrate by plasmonic silver nanoparticles in a photo-electrochemical cell

**Center for Soft Matter Research**  
**New York University**

**Jun-Aug 2011**  
**New York, NY**

**Advisor:** Dr. Paul Chaikin

-Participated in NYU MRSEC 2011 Research Experience for Undergraduates program  
-Studied non-equilibrium properties of active suspensions of artificial light-activated microswimmers as a framework for understanding the physics of active matter

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## **Talks and Presentations**

- Nov 2022: "Mutational correlation functions reveal patterns of homologous recombination across the bacterial pangenome". AIChE Annual Meeting, Phoenix, AZ. (Talk & Poster)
- Aug 2022: "Core genes can have higher recombination rates than accessory genes within global microbial populations". Molecular Genetics of Bacteria and Phages Meeting, University of Wisconsin, Madison, WI. (Poster)
- July 2022: "Core genes can have higher recombination rates than accessory genes within global microbial populations". GRC on Microbial Stress Response, Mt. Holyoke College, South Hadley, MA. (Poster)
- March 2022: "Core genes can have higher recombination rates than accessory genes within global microbial populations". American Physical Society March Meeting. (Virtual Talk)
- June 2019: "How polymers shape the physicochemical environment of the gut". McCoy Award Symposium, Caltech, Chemistry and Chemical Engineering, Pasadena, CA. (Talk)
- June 2019: "The physics of the gut: How polymers shape a microbial home". GRC on Molecular Mechanisms in Evolution, Stonehill College, Easton, MA. (Poster)
- Sept 2018: "High-molecular-weight polymers from dietary fiber drive aggregation of particulates in the murine small intestine". Caltech CCE Seminar Day, Caltech, Chemistry and Chemical Engineering, Pasadena, CA. (Talk)
- Sept 2018: "High-molecular-weight polymers from dietary fiber drive aggregation of particulates in the murine small intestine". Frontiers in Soft Matter and Macromolecular Networks, University of San Diego, San Diego, CA. (Talk)
- July 2018: "Polymers compress the colonic mucus hydrogel". Mechanobiology Symposium: The Mechanome in Action, UC Irvine, Irvine, CA. (Talk & Poster)
- Sept 2017: "Polymers compress colonic mucus hydrogel in vitro and in vivo". Frontiers in Soft Matter and Macromolecular Networks, University of San Diego, San Diego, CA. (Talk)
- Mar 2017: "Physics of the gut: How polymers dynamically structure the gut environment". American Physical Society March Meeting, New Orleans, LA. (Talk)

## Patent Applications

1. Polymeric compositions and related systems and methods for regulating biological hydrogels  
US Patent Application 15/399,711 (filed: 1/5/17)  
Inventors: R. F. Ismagilov, S. S. Datta, A. Preska Steinberg, S. R. Bogatyrev
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## Mentoring & Teaching Experience

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| <b>Ismagilov Group</b>                                    | <b>Oct 2017-Dec 2018</b> |
| <b>California Institute of Technology</b>                 | <b>Pasadena, CA</b>      |
| <b>Graduate Rotation Students mentored</b>                |                          |
| - Fall term 2018: Robert Grayson (Chemical Engineering)   |                          |
| - Winter term 2018: Michael Porter (Chemical Engineering) |                          |
| - Fall term 2017: Thomas Naragon (Chemistry)              |                          |

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| <b>Supplemental Instruction Leader</b>  | <b>Sept 2010-May 2013</b> |
| <b>Brandeis University Chemistry Department</b>   | <b>Waltham, MA</b>        |
| -Led review sessions, proctored quizzes, attended classes, and answered questions students had about course material for the General Chemistry course |                           |

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## Outreach & Additional Activities

- Volunteer**, Physics demos for Caltech educational outreach event, 626 Night Market, Arcadia, CA (Sept 2018).
- Volunteer**, Chemistry experiment demos, March for Science – Pasadena, Pasadena Memorial Park, Pasadena, CA (Mar 2017).
- Volunteer**, Judge for Caltech Summer Undergraduate Research Fellowship Seminar Day, Caltech, Pasadena, CA (Oct 2016).
- Caltech Jazz Band**, Performed for various Caltech fundraising and outreach events, Pasadena, CA (2013-2019).