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*

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

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,* **in press.** Preprint available at *bioRxiv* 2022.08.26.505425.
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 **Jun-Aug 2011**
New York University **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

- 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

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

Supplemental Instruction Leader **Sept 2010-May 2013**
Brandeis University Chemistry Department **Waltham, MA**
-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,** Perform for various Caltech fundraising and outreach events, Pasadena, CA (2013-2019).