Mihir R. Khadilkar

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Academic and professional experience

- **University of California Santa Barbara** — Santa Barbara, CA
  Postdoctoral Researcher at Materials Research Laboratory, UCSB — *2015-Present*
- **Cornell University** — Ithaca, NY
  Ph.D. (Physics) — *2015*
- **Cornell University** — Ithaca, NY
  M.S. (Physics) — *2013*
- **Indian Institute of Technology Bombay** — Mumbai, India
  B.Tech. (Engineering Physics) — *2009*

Research experience

- **Inverse methods for bulk-phase discovery in block-copolymers** — Santa Barbara, CA
  Postdoctoral research, Advisor: Prof. Glenn Fredrickson, U. C. Santa Barbara — *2015 - Present*
  - Developed a novel optimization method for targeted design of known and unknown bulk morphologies with block-copolymer formulations at nanoscale.
  - Combined self-consistent field theory methods with an efficient global optimization technique to search and stabilize desired structure or property in block-copolymers in high-dimensional parameter spaces in an automated fashion.
- **Self-assembly of polyhedral nanoparticles** — Ithaca, NY
  Ph.D. Thesis, Advisor: Prof. Fernando Escobedo, Cornell University — *2011 - 2015*
  - Used Monte Carlo and interfacial simulation techniques to probe thermodynamics of polyhedral nanoparticles, particularly, their binary mixtures.
  - Proposed guiding rules on self-assembly of binary mixtures of polyhedral nanoparticles based on individual phase behavior, aimed at novel material design applications.
  - Explored ways of designing colloidal binary superlattices using *enthalpic patches* (soft colloids) and *entropic patches* (shape anisotropy).
  - Explored self-assembly of monodisperse polyhedral nanoparticles under parallel-plate confinement

Publications

- Self-assembly of binary space-tessellating compounds: **Mihir R. Khadilkar** and Fernando A. Escobedo, *J. Chem. Phys.* **137**, 194907 (2012).
- Phase behavior of binary mixtures of hard convex polyhedra: **Mihir R. Khadilkar**, Umang Agarwal, Fernando A. Escobedo, *Soft Matter* **9**, 11557 (2013). Arxiv preprint

- Heuristic rule for binary superlattice coassembly: Mixed plastic mesophases of hard polyhedral nanoparticles: **Mihir R. Khadilkar**, Fernando A. Escobedo, *(Phys. Rev. Lett.)* **113**, 165504 (2014). Arxiv preprint
- Phase behavior of polyhedral nanoparticles in parallel plate confinement: **Mihir R. Khadilkar**, Fernando A. Escobedo, *Soft Matter* **12**, 1506 (2016).
- Inverse design of bulk morphologies in multiblock polymers using particle swarm optimization: **Mihir R. Khadilkar**, Kris T. Delaney and Glenn H. Fredrickson (*in preparation*).

Talks and presentations

- **Computational Fluid Design Consortium Meeting 2016, Santa Barbara (CA):** *February 2016*, Using particle swarm optimization for bulk phase discovery in block copolymer formulations
- **APS March Meeting 2015, San Antonio (TX):** *March 2015*, Designing entropy-driven binary ordered superlattices from polyhedral nanoparticles
- **Chemistry seminar, University of Utah (Salt Lake City, UT):** *January 2015*, Engineering ordered multicomponent structures with nanoparticles: story of polyhedral '*Lego-blocks*'
- **CECAM workshop on patchy colloidal particles, Vienna, (Austria):** *September 2014*, Using entropic and enthalpic patches for targeted binary superlattice assembly (Poster Presentation)
- **APS March Meeting 2014, Denver (CO):** *March 2014*, Binary Mixtures of Polyhedra: from phase-separation to superstructures
- **Cornell STEM colloquium, Ithaca (NY):** *July 2013*, Self-assembly of polyhedral nanoparticles
- **APS March Meeting 2013, Baltimore (MD):** *March 2013*, Self-assembly of binary tessellating compounds

Awards and honors

- Recipient of *Cornell Graduate Fellowship*, 2009, given to only a select students in the incoming graduate class every year at Cornell Physics.
- Recipient of *V. R. Rao Summer Fellowship* at Cornell University, 2011, given only to a *single* student every year in Physics department at Cornell.
- Recipient of *Summer Research Fellowship*, 2008, from Indian Academy of Sciences, given annually to *only twenty (20)* students across India.
- Recipient of prestigious *National Talent Search Scholarship*, awarded by the Government of India, 2002, given only to *a thousand (1,000)* students annually, from more than 150,000 applicants.
- Qualified for *Indian National Mathematics Olympiad*, 2003. (awarded to *500* students across India)
- Certificate of Silver Merit, in the 2nd *National Cyber Olympiad (India)*, 2003.

Teaching experience

- **Phys 1101/1102:** (Fall 2009, Summer 2013, Spring 2014): General Physics I/II: Guided more than 200 students in this lab based course on mechanics and Electromagnetism.
- **Phys 1112:** (Fall 2009): Classical Mechanics: Guided around 80 students in theory and experiments, graded exams, conducted office hours.

- **Phys 2208:** (Spring 2012): Fundamentals of Physics II: Guided around 60 students in this course based on electromagnetism and modern physics. Conducted recitation sessions, office hours, graded exams.

Previous research experience

- **FCIQMC- full CI Quantum Monte Carlo: a method development** — Ithaca, NY
  Research Project, Advisor: Dr. Cyrus Umrigar, Cornell University — *2009 - 2010*
- **Stochastic Series Expansion in Quantum Monte Carlo Simulations** — Mumbai, India
  Senior Thesis, Advisor: Prof. Kedar Damle, TIFR, Mumbai. — *2008-2009*
- **Topological analysis of funnel chaos in Rossler System** — Lille, France
  Project Advisor: Prof. Marc Lefranc, University of Lille — *May - July 2008*
- **Embedding Methods in quantum transport** — Dublin, Ireland
  Project Advisor: Prof. Stefano Sanvito, Trinity College Dublin — *May - July 2007*

Organizational and outreach experience

- **General Secretary, Department of Physics, IIT Bombay (India) (2008-09)**: Acted as a liaison between students and the academic body regarding curriculum and other academic issues. Planned several events including student seminars and annual Physics Olympiad organized by the department.
- **High school science outreach, Santa Barbara area**: Participated in science outreach events in local high school science nights, including hands-on demos on topics related to materials science.