

Arindam Raj

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PROFESSIONAL EXPERIENCE

• Weinberg Family Postdoctoral Fellow, Chemistry, Northwestern University, USA

Advisor: Dr. Chad Mirkin

Nov 2023 - present

Research: Development of bottom-up DNA-bonded nanocomposites designs and advanced *in-situ* characterization methods

EDUCATION

• PhD, Mechanical Engineering and Materials Science, Yale University, USA

Advisor: Dr. Jan Schroers

Aug 2018 - Oct 2023

Research: Development of high-throughput diffusion measurement methodology, high-yield thermomechanical nanofabrication, and bulk metallic glass processing

• BTech-MTech, Materials Science and Engineering, Indian Institute of Technology Kanpur, India (Minors: Linguistics and Literature)

Advisors: Dr. Kantesh Balani, Dr. Shakti Gupta

August 2013 - June 2018

Research: Nanomechanics of protein adhesion and mechanics of carbon nanomaterials using molecular dynamics

RESEARCH INTERESTS

Multiscale design and characterization of structural materials; high-throughput, multiscale diffusion measurement techniques development; grain boundary engineering of defect-resilient microstructures; bottom-up assembly of nanomaterials; top-down thermomechanical nanofabrication; nanocomposites design and characterization.

PUBLICATIONS

Theme 1: High-throughput diffusion measurement

1. **A. Raj***, M. Aderibigbe*, E. Lund, Y.-X. Yang, S. Sohn, and J. Schroers, Local Deformation Mapping Reveals Diffusion through Microstructures, **Nature Communications**, *accepted*
2. **A. Raj**, M. Aderibigbe, and J. Schroers, High Resolution Mapping of Diffusion Characteristics in General Microstructures, **Diffusion Fundamentals**, 39 (2025)
3. **A. Raj**, Y. Xie, S. Sohn, M. Aderibigbe, N. Liu, G. Liu, P. Hosemann, and J. Schroers, Direct determination of diffusion flux in alloys via spatial separation of flux, **Acta Materialia**, 284, 1206153 (2025)
4. M. Aderibigbe, U. D. Schwarz, S. Sohn, **A. Raj**, B. L. Schroers, Y.-X. Yang, and J. Schroers, Temperature dependent deformation of microstructures revealed through thermo-mechanical nanomolding, *under review*

Theme 2: Bottom-up DNA-based Nanoassembly

5. **A. Raj**, A. C. Z. Leal, N. D. Rosenmann, C. Sharpe, R. dos Reis, T. Abbott, G. Winstone, V. P. Dravid, N. C. Gianneschi, and C. A. Mirkin, *In-situ* STEM Imaging of Colloidal Crystals based on Programmable Atom Equivalents (PAEs), *under review*
6. J. Aherns, I. A. Falk, **A. Raj**, R. E. Johnson, A. Guo, Y. Ma, J. P. Cavaliere, and C. A. Mirkin, Multi-Armed Protein-DNA Conjugates for Programmable Assembly of Alternating DNA Protein Multimer Structures, *under review*

Theme 3: Top-down Nanomolding-based Nanofabrication

7. **A. Raj**, N. Liu, G. Liu, S. Sohn, J. Xiang, Z. Liu, and J. Schroers Nanomolding of gold and gold-silicon heterostructures at room temperature, **ACS Nano**, 15(9), 14275-14284 (2021)
8. N. Liu, G. Liu, **A. Raj**, S. Sohn, D. Morales, J. Liu, and J. Schroers Unleashing nanofabrication through thermomechanical nanomolding, **Science Advances**, 7, eabi4567 (2021)
9. G. Liu, S. Sohn, N. Liu, **A. Raj**, U. D. Schwarz, and J. Schroers Single-crystal nanostructure arrays forming epitaxially through thermomechanical nanomolding, **Nano Letters**, 21(23), 10054-10061 (2021)
10. N. Liu, Y. Xie, G. Liu, S. Sohn, **A. Raj**, G. Han, B. Wu, J. J. Cha, Z. Liu, and J. Schroers General nanomolding of ordered phases, **Physical Review Letters**, 124(3), 053002 (2020)
11. N. Liu, Y.-X. Yang, C. Lu, S. A. Kube, **A. Raj**, S. Sohn, X. Zhang, M. B. Costa, Z. Liu, and J. Schroers, Realizing one-dimensional single-crystalline topological nanomaterials through thermomechanical epitaxy, **Matter**, 8, 9, 102128 (2025)

Theme 4: Amorphous Metallic Glass Materials Processing

12. Y. Xie, X. Huang, **A. Raj**, X. Li, R. Dhall, M. Balooch, A. Minor, J. Schroers, and P. Hosemann, Strengthening of Zr-based metallic glass at low dose helium ion irradiation, **Journal of Nuclear Materials**, 154943 (2024)

13. N. Liu, S. Sohn, M.Y. Na, G. H. Park, **A. Raj**, G. Liu, S. A. Kube, F. Yuan, Y. Liu, H. J. Chang, and J. Schroers Size-dependent deformation behavior in nanosized amorphous metals suggesting transition from collective to individual atomic transport, **Nature Communications**, 14 (1), 5987 (2023)
14. G. Liu, S. Sohn, S. A. Kube, **A. Raj**, A., Mertz, A. Nawano, A. Gilbert, M. D. Shattuck, C. O'Hern and J. Schroers Machine Learning versus Human Learning in Complex Materials Discovery and Science: Predicting Glass-Forming Ability of Metallic Glasses, **Acta Materialia**, 243, 118497 (2022)

Theme 5: Nanomechanics and Molecular Dynamics

15. **A. Raj**, N. Dhandhia, and K. Balani Adhesin protein interaction of *Staphylococcus Aureus* bacteria with various biomaterial surfaces, **ACS Biomaterials Science & Engineering**, 6(11), 6161-6172 (2020)
16. **A. Raj**, A. Mokhalingam, and S. S. Gupta Instabilities in carbon nanocone stacks, **Carbon**, 127, 404-411 (2018)

Review Papers

17. C. A. Mirkin *et al.*, 33 Unresolved Questions in Nanoscience and Nanotechnology, **ACS Nano**, 19, 36, 31933-31968 (2025)
18. T.R. Kyriakides, **A. Raj**, *et al.*, Biocompatibility of nanomaterials and their immunological properties. **Biomedical Materials**, 16(4), 042005 (2021)

CONFERENCE TALKS

- **A. Raj**, M. Aderibigbe, and J. Schroers. Connecting Features of Phase Diagram to Diffusive Flow in Alloys. Diffusion Fundamentals XI, Evanston, IL, 06/2025
- **A. Raj**, Y. Xie, N. Liu, G. Liu, S. Sohn, and J. Schroers. Connecting Features of Phase Diagram to Diffusive Flow in Alloys. Materials Research Society Fall Meeting, Boston, MA, 12/2022
- **A. Raj**, and J. Schroers. Local Deformation Mapping of Microstructures. Materials Research Society Spring Meeting, Honolulu, HI, 06/2022
- **A. Raj**, S. S. Gupta, and D. Verma. Pull-out instability in double-walled carbon nanocones. American Physical Society March Meeting, Baltimore, MD, 03/2016

MEDIA COVERAGE

- Better metals are now possible through a novel analysis method **ASM International**, September 1, 2026
- Better metals, with help from a small square with billions of holes **Yale Engineering**, July 29, 2026
- Yale Engineers develop breakthrough method for practical nanowire materials **Yale Engineering**, August 8, 2025
- Yale scientists uncover deformation mechanism of metallic glass at the nanoscale **Yale Daily News**, February 8, 2024
- Nanofabrication using thermomechanical nanomolding **Phys.org**, November 29, 2021

TEACHING EXPERIENCE

- Teaching Fellow for **Solid Mechanics & Materials Science Lab** (Spring 2020, Spring 2021, Fall 2021)
- Teaching Fellow for **Introduction to Materials Science** (Fall 2022)
- Teaching Fellow for grad level course, **Forces on the Nanoscale** (Spring 2022)
- Teaching Fellow for grad level course, **Solidification** (Spring 2023)

AWARDS AND AFFILIATIONS

- Weinberg Family Postdoctoral Fellow, International Institute for Nanotechnology, Northwestern University, 2026
- Proficiency Medal for the best undergraduate research, Indian Institute of Technology Kanpur, 2018
- Conference Travel Award, Yale Graduate Student Assembly, 2022
- Conference Travel Award, Northwestern University Office of Postdoctoral Affairs, 2025
- Member of Materials Research Society

PROFESSIONAL SERVICES

- Session Chair for Materials Research Society (MRS) Spring Severe Plasticity session, 2022
- Reviewer for US DOE Office of Science Graduate Student Research (SCGSR) program, 2024
- Poster session judge, Annual Biophysics Symposium, Northwestern University, 2025, 2026
- Postdoctoral Representative for the Chemistry CARES Committee, Northwestern University, 2023-2026
- Reviewer for American Chemical Society (ACS), American Institute of Physics (AIP)

SKILLS SUMMARY

- **Analysis.** Mechanics, Phase transitions
- **Material processing.** Alloying, Thermo-mechanical treatment, Sputtering, Bulk metallic glass processing, Colloidal assembly
- **Nanofabrication techniques.** Nanoimprinting, Ebeam lithography
- **Materials characterization.** Mechanical tests, Nanoindentation, Liquid Phase STEM, Liquid Phase SEM, XRD, Liquid Phase SAXS, Liquid Phase AFM
- **Molecular simulation packages.** Tinker, LAMMPS, NAMD