

Anirban Patra

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Education

- Georgia Institute of Technology, USA** 2009 – 2013
- *Ph.D.* in *Materials Science and Engineering*
 - Thesis: Modeling the mechanical behavior and deformed microstructure of irradiated bcc materials using continuum crystal plasticity (Advisor: Prof. David McDowell)

- Indian Institute of Technology Kharagpur** 2005 – 2009
- *B.Tech. (Hons.)* in *Metallurgical and Materials Engineering*

Research Specialization

Crystal plasticity, constitutive modeling, computational mechanics

Professional Experience

Indian Institute of Technology Bombay, Mumbai

- Associate Professor, *Apr. 2022 - present*
- Assistant Professor, *Oct. 2017 - Apr. 2022*

Los Alamos National Laboratory, Los Alamos, USA

- Postdoctoral Research Associate (Mentor: Dr. Carlos Tomé), *Apr. 2015 – Jun. 2017*

Third Wave Systems, Minneapolis, USA

- Computational Mechanics Engineer, *Jan. 2014 – Apr. 2015*

Other Professional Activities and Recognition

- *Editorial Advisory Board*: International Journal of Plasticity
- *Best Reviewer Award*: for Transactions of the Indian Institute of Metals (Springer Nature) at 77th Annual Technical Meeting (ATM 2023) of the Indian Institute of Metals
- *Reviewer*: International Journal of Plasticity, Modelling and Simulation in Materials Science and Engineering, Journal of Alloys and Compounds, Transactions of Indian Institute of Metals, Materials Characterization, Corrosion Science, Proceedings of the Royal Society A, Journal of Nuclear Materials, Metallurgical and Materials Transactions A, Journal of Applied Physics, Journal of the Mechanics and Physics of Solids, Acta Materialia, Journal of Materials Science, Mechanics of Advanced Materials and Structures, International Journal of Solids and Structures, Journal of Materials Engineering and Performance, Mechanics of Materials, ASTM Selected Technical Papers (STP), Materials (MDPI), Metals (MDPI)
- *Session Chair*: International Conference on Plasticity, Damage and Fracture 2024 (Panama City), Symposium on “Advances in Multiscale Modeling for Metallic Materials”, January 3-8 2024
- *Proposal Reviewer*: Science and Engineering Research Board
- *PhD Thesis Examiner*: IIT Kanpur
- *Reviewer*: Prime Minister’s Research Fellowship applications
- *Organizing Committee and Symposium Chair*: Structural Integrity Conference and Exhibition 2020 (SICE 2020), Symposium on “Structural Integrity of Gas Turbine Engine Materials”, December 2020
- *Session Chair*: Undergraduate Paper Competition, 49th Annual Technical Meeting of the Society of Engineering Science, Atlanta, GA, October 10-12, 2012

Service to the Department/Institute

- Member of Department Post-Graduate Committee, 2018-2021, 2024-present
- Admissions Coordinator, Thesis Project Coordinator and Seminar Coordinator for Materials, Manufacturing and Modeling (MMM) M.Tech. Program, 2018-2021
- Professor In-Charge, Deformation Simulation Laboratory Central Facility (Gleeble Thermomechanical Simulator and Dilatometer), 2019-present
- Department M.Tech. Admissions Coordinator, 2022-present
- Member of Department Committee for PhD Qualifier Examination, 2023
- Member of Department Equipment Management Committee, 2023-present

Teaching

- MM210: Numerical Methods for Materials Engineers, Core, Theory (newly designed course). Spring 2023-24
- MM203: Mechanics of Materials, Core, Theory (shared teaching). Spring 2020-21
- MM220: Computational Laboratory, Core, Lab (shared teaching). Spring 2018-19, Spring 2019-20, Autumn 2020-21, Autumn 2021-22, Spring 2022-23
- MM327: Mechanical Behavior of Materials, Core, Theory (shared teaching). Autumn 2020-21, Autumn 2021-22
- MM319: Mechanical Behavior of Materials, Core, Theory. Autumn 2022-23, Autumn 2023-24.
- MM445: Continuum Plasticity of Metals, Elective, Theory (newly designed course). Autumn 2019-20, Spring 2020-21, Spring 2021-22, Spring 2022-23
- MM655: Modeling and Analysis, Elective, Theory. Spring 2017-18, Spring 2018-19, Spring 2019-20.
- MM612: Computational Laboratory, Core, Lab (shared teaching). Spring 2018-19, Spring 2019-20, Spring 2020-21, Spring 2021-22

Outreach

- Organized short term course on Visco-Plastic Self Consistent (VPSC) crystal plasticity modeling, with lectures by Dr. Carlos Tomé, at IIT Bombay, Feb. 13-17, 2023.
- Delivered lecture on “Crystal plasticity modeling of deformation in metallic systems: formalism and applications” at the Continuing Education Program on Integrated Computational Materials Engineering, organized by Defence Metallurgical Research Laboratory, Feb. 23, 2023.
- Delivered lecture on “Applications of data science-based tools in metallurgy and manufacturing” in the short term professional course on “Basics of Data Science for Metallurgy and Manufacturing”, organized by Indian Institute of Metals, May 6-8, 2023.

Technology Development

- Developed ρ -CP, an open source, crystal plasticity solver for crystal plasticity finite element modeling of anisotropic deformation and microstructure-property correlations in polycrystalline ensembles:
<https://github.com/apatra6/rhocp>

Research Grants

As Principal Investigator:

- IIT Bombay - Industrial Research and Consultancy Centre (Seed grant project)
 - “Development of a computational toolkit for modeling the mesoscale deformation behavior of multiphase polycrystals and aggregates”, Nov. 2017 - Nov. 2022.

- Siemens Technology and Services
 - “Exploring the effect of microstructure variability on the creep properties of Ni-base superalloy turbine blades using a hierarchical modeling approach: from crystal plasticity simulations to data-driven high throughput turbine blade simulations”, Sept. 2018 - Sept. 2020.
- Science and Engineering Research Board - Core Research Grant scheme
 - “Quantifying geometrically necessary dislocations, backstress and residual strains using crystal plasticity finite element modeling, dislocation dynamics and experiments”, Jan. 2021 - Dec. 2023.
- Defence Metallurgical Research Laboratory
 - “Development of microstructure-based meso-scale crystal plasticity model for tensile and fatigue deformation in a nickel based superalloy processed via powder metallurgy (PM) route”, Jul. 2021 - present.

As Co-Principal Investigator:

- Aeronautics Research and Development Board - Gas Turbine Research Establishment / Defence Metallurgical Research Laboratory
 - “Development of finite deformation crystal plasticity model for creep-fatigue deformation in superalloys”, PI: P.J. Guruprasad, May 2018 - Mar. 2022.
- Science and Engineering Research Board - Industry Relevant Research and Development scheme and Tata Steel
 - “Microstructural engineering for improved hole expansion ratio in dual phase steels”, PI: I. Samajdar, Apr. 2019 - Sep. 2022.
- Board of Research in Nuclear Sciences
 - “Optimization of processing parameters for titanium alloy tubes”, PI: I. Samajdar, May 2022 - present.
- Airbus Group India Pvt. Ltd.
 - “Development of modules for (a) microstructural evolution during (i) heat treatment and (ii) solidification and (b) structure-property correlations in Ti-base alloys”, PI: M.P. Gururajan, June 2023 - present.

Consultancy Projects

- Honeywell Technology Solutions
 - “Modeling and control of cold rolling process”, as co-PI, PI: S. Jogwar, Jan. 2019 - Jun. 2021.
- Siemens Technology and Services
 - “Development of a physics-based constitutive model for the deformation behavior of bearing steels”, sole PI, Jun. 2020 - Sep. 2020.

Journal Publications

Google Scholar profile: <https://scholar.google.com/citations?user=kucb4SgAAAAJ&hl=en>

1. **Patra, A.**, McDowell, D.L., “Crystal plasticity-based constitutive modeling of irradiated bcc structures”, *Philosophical Magazine*, Vol. 92, 2012, pp. 861-887.
2. **Patra, A.**, McDowell, D.L., “Continuum modeling of localized deformation in irradiated bcc materials”, *Journal of Nuclear Materials*, Vol. 432, 2013, pp. 414-427.
3. **Patra, A.**, Zhu, T., McDowell, D.L., “Constitutive equations for modeling non-Schmid effects in single crystal bcc-Fe at low and ambient temperatures”, *International Journal of Plasticity*, Vol. 59, 2014, pp. 1-14.
4. **Patra, A.**, McDowell, D.L., “A void nucleation and growth based damage framework to model failure initiation ahead of a sharp notch in irradiated bcc materials”, *Journal of the Mechanics and Physics of Solids*, Vol. 74, 2015, pp. 111-135.

5. **Patra, A.**, Priddy, M.W., McDowell, D.L., “Modeling the effects of microstructure on the tensile properties and micro-fracture behavior of Mo-Si-B alloys at elevated temperatures”, *Intermetallics*, Vol. 64, 2015, pp. 6-17.
6. **Patra, A.**, McDowell, D.L., “Crystal plasticity investigation of the microstructural factors influencing dislocation channeling in a model irradiated bcc material”, *Acta Materialia*, Vol. 110, 2016, pp. 364-376.
7. Wen, W., Capolungo, L., **Patra, A.**, Tomé, C.N., “A physics-based crystallographic modeling framework for describing the thermal creep behavior of Fe-Cr alloys”, *Metallurgical and Materials Transactions A*, Vol. 48, 2017, pp. 2603-2617.
8. **Patra, A.**, Tomé, C.N., Golubov, S.I., “Crystal plasticity modeling of irradiation growth in Zircaloy-2”, *Philosophical Magazine*, Vol. 97, 2017, pp. 2018-2051.
9. **Patra, A.**, Tomé, C.N., “Finite element simulation of gap opening between the cladding and spacer grid in a fuel rod assembly using crystallographic models of irradiation growth and creep”, *Nuclear Engineering and Design*, Vol. 315, 2017, pp. 155-169.
10. Upadhyay, M., **Patra, A.**, Wen, W., Panzner, T., Van Petegem, S., Tomé, C.N., Lebensohn, R., Van Swygenhoven, H., “Mechanical response of stainless steel subjected to biaxial load path changes: cruciform experiments and multiscale modeling”, *International Journal of Plasticity*, Vol. 108, 2018, pp. 144-168.
11. Pokharel, R., **Patra, A.**, Brown, D.W., Clausen, B., Vogel, S.C., Gray, G.T., “An analysis of phase stresses in additively manufactured 304L stainless steel using neutron diffraction measurements and crystal plasticity finite element simulations”, *International Journal of Plasticity*, Vol. 121, 2019, pp. 201-217.
12. Thool, K.S., Mani, K.V., Srivastava, D., **Patra, A.**, Doherty, R.D., Samajdar, I., “Confirmation of dynamically recrystallized grains in hexagonal Zirconium through local internal friction measurements”, *Metallurgical and Materials Transactions A*, Vol. 50, 2019, pp. 5000-5014.
13. Thool, K.S., **Patra, A.**, Fullwood, D., Mani, K.V., Srivastava, D., Samajdar, I., “The role of crystallographic orientations on heterogeneous deformation in a Zirconium alloy: A combined experimental and modeling study”, *International Journal of Plasticity*, Vol. 133, 2020, 102785.
14. Ranjan, D., Narayanan, S., Kadau, K., **Patra, A.**, “Crystal plasticity modeling of non-Schmid yield behavior: from Ni₃Al single crystals to Ni-based superalloys”, *Modelling and Simulation in Materials Science and Engineering*, Vol. 29, 2021, 055005.
15. Ellis, B.D., Haider, H., Priddy, M.W., **Patra, A.**, “Integrated computational design of three-phase Mo-Si-B alloy turbine blade for high-temperature aerospace applications”, *Integrating Materials and Manufacturing Innovation*, Vol. 10, 2021, pp. 245-264.
16. Basu, S., Jaya, B.N., **Patra, A.**, Ganguly, S., Dutta, M., Hohenwarter, A., Samajdar, I., “The role of phase hardness differential on the non-uniform elongation of a ferrite-martensite dual phase steel”, *Metallurgical and Materials Transactions A*, Vol. 52, 2021, pp. 4018-4032.
17. Khandelwal, S., Basu, S., **Patra, A.**, “A machine learning-based surrogate modeling framework for predicting the history-dependent deformation of dual phase microstructures”, *Materials Today Communications*, Vol. 29, 2021, 102914.
18. Pai, N., Prakash, A., Samajdar, I., **Patra, A.**, “Study of grain boundary orientation gradients through combined experiments and strain gradient crystal plasticity modeling”, *International Journal of Plasticity*, Vol. 156, 2022, 103360.
19. Basu, S., **Patra, A.**, Jaya, B.N., Ganguly, S., Dutta, M., Samajdar, I., “Study of microstructure - property correlations in dual phase steels for achieving enhanced strength and reduced strain partitioning”, *Materialia*, Vol. 25, 2022, 101522.
20. Chaudhary, S., Guruprasad, P.J., **Patra, A.**, “Crystal plasticity constitutive modeling of tensile, creep

and cyclic deformation in single crystal Ni-based superalloys”, *Mechanics of Materials*, Vol. 174, 2022, 104474.

21. **Patra, A.**, Pai, N., Sharma, P., “Modeling intrinsic size effects using dislocation density-based strain gradient plasticity”, *Mechanics Research Communications*, Vol. 127, 2023, 104038.
22. Basu, S., Jaya, B.N., Seekala, H., Phani, P.S., **Patra, A.**, Ganguly, S., Dutta, M., Samajdar, I., “Correlative characterization and plasticity modeling of microscopic strain localizations in a dual phase steel”, *Materials Characterization*, Vol. 197, 2023, 112704.
23. Dhole, A., **Patra, A.**, Gupta, R., Gokhale, A., Samajdar, I., “Surface hardening through oxygen diffusion in niobium: the defining role of stress inhomogeneity in tensile embrittlement”, *Materials Science and Engineering: A*, Vol. 870, 2023, 144883.
24. **Patra, A.**, Chaudhary, S., Pai, N., Ramgopal, T., Khandelwal, S., Rao, A., McDowell, D.L., “ ρ -CP: Open source dislocation density based crystal plasticity framework for simulating temperature- and strain rate-dependent deformation”, *Computational Materials Science*, Vol. 224, 2023, 112182.
25. Chaudhary, S., Pai, N., Appa Rao, G., Alam, Z., Sankarasubramanian, R., Guruprasad, P.J., Samajdar, I., **Patra, A.**, “Competitive role of primary γ' precipitates and annealing twins on the heterogeneous deformation of a polycrystalline Ni-based superalloy: crystal plasticity modeling and experiments”, *Journal of Alloys and Compounds*, Vol. 967, 2023, 171783.
26. Pai, N., Manda, S., Sudhalkar, B., Syphus, B., Fullwood, D., de Kloe, R., Wright, S., **Patra, A.**, Samajdar, I., “Diffraction-based multiscale residual strain measurements”, *Microscopy and Microanalysis*, 2024, ozae011.

Manuscripts Submitted for Review

- **Patra, A.**, Tomé, C.N., “A dislocation density-based crystal plasticity constitutive model: Comparison of VPSC effective medium predictions with ρ -CP finite element predictions”.
- Pai, N., Samajdar, I., **Patra, A.**, “Microstructural and mechanistic insights into the tension - compression asymmetry of rapidly solidified Fe-Cr alloys: A phase field and strain gradient plasticity study”.
- Kumar, S., **Patra, A.**, Sahu, J.K., “Dislocation density-based constitutive model for cyclic deformation and softening of Ni-based superalloys”.

Other Technical Reports

1. **Patra, A.**, Wen, W., Martinez, E., Tomé, C.N., “Demonstration of finite element simulations in MOOSE using crystallographic models of irradiation hardening and plastic deformation”, Los Alamos National Laboratory, May 2016, LA-UR-16-23742.
2. **Patra, A.**, Tomé, C.N., “Interfacing VPSC with finite element codes: demonstration of irradiation growth simulation in a cladding tube”, Los Alamos National Laboratory, March 2016, LA-UR-16-21960.
3. **Patra, A.**, Wen, W., Martinez, E., Tomé, C.N., “A defect density-based constitutive crystal plasticity framework for modeling the plastic deformation of Fe-Cr-Al cladding alloys subsequent to irradiation”, Los Alamos National Laboratory, February 2016, LA-UR-15-27896.

Conference Presentations/Proceedings

1. **Patra, A.***, McDowell, D.L., “Crystal plasticity modeling of radiation damage in bcc structural materials”, *ANS Annual Meeting*, Hollywood, FL, June 26-30, 2011.
2. **Patra, A.***, McDowell, D.L., “Modeling localized deformation in irradiated bcc metals using continuum crystal plasticity”, *49th Annual Technical Meeting of the Society of Engineering Science*, Atlanta, GA, October 10-12, 2012.
3. **Patra, A.***, McDowell, D.L., “Crystal plasticity modeling of localized deformation in irradiated bcc

- metals”, *MRS Fall Meeting*, Boston, MA, November 25-30, 2012.
4. **Patra, A.**, McDowell, D.L.*, “Mesoscopic modeling of dislocation-defect interactions and flow localization in irradiated bcc metals”, *TMS Annual Meeting*, San Antonio, TX, March 3-7, 2013.
 5. Cochran, J.*, Daloz, W., Marshall, P., McDowell, D.L., **Patra, A.**, Wedding, C., Strbik, O., “Silicon and boron containing composites of molybdenum alloyed with manganese”, *MS&T '13*, Montreal, Canada, October 27-31, 2013.
 6. **Patra, A.***, Zhu, T., McDowell, D.L., “Constitutive equations for dislocation core spreading in bcc-Fe accounting for dislocation-dislocation interactions and finite temperature effects”, *MS&T '13*, Montreal, Canada, October 27-31, 2013.
 7. Tomé, C.N., **Patra, A.*¹**, Golubov, S.I., Barashev, A.V., “Modeling radiation-induced deformation of Zr-based polycrystals with novel mechanisms of radiation growth and creep”, *18th International Symposium on Zirconium in the Nuclear Industry*, Hilton Head, SC, May 15-19, 2016.
 8. **Patra, A.*¹**, McDowell, D.L., “Analysis of dislocation channeling in irradiated bcc materials using a crystal plasticity finite element framework”, *NuMat 2016*, Montpellier, France, November 7-11, 2016.
 9. **Patra, A.***, Tomé, C.N., “Coupled crystal plasticity-finite element modeling of irradiation growth and creep in Zircaloy-2”, *NuMat 2016*, Montpellier, France, November 7-11, 2016.
 10. **Patra, A.***, Tomé, C.N., “Microstructure-based modeling of irradiation growth in zirconium alloys using crystal plasticity”, *International Workshop on Mechanics of Energy Materials 2018*, Indian Institute of Technology Madras, Chennai, November 19-22, 2018 (invited).
 11. **Patra, A.***, Pokharel, R., Brown, D., Clausen, B., Vogel, S., Gray, G.T., “Residual stress analysis in additively manufactured 304L steel using combined experiments and modeling”, *Microstructural Engineering 2018-19*, Indian Institute of Technology Kanpur, Kanpur, March 30-31, 2019 (invited).
 12. Ranjan, D., Narayanan, S., **Patra, A.***, “Crystal plasticity modeling of the yield anomalies of Ni₃Al single crystals”, *International Conference on Advanced Materials and Processes for Defense Applications ADMAT 2019*, Hyderabad, September 23-25, 2019 (invited).
 13. Thool, K., **Patra, A.***, Fullwood, D., Samajdar, I., “Combined experiments and modeling to assess the residual strains in an annealed Zr alloy during interrupted tensile testing”, *International Conference on Plasticity Damage and Fracture 2020*, Riviera Maya, Mexico, January 3-9, 2020 (invited).
 14. Ranjan, D., **Patra, A.***, “Modeling the temperature-dependent non-Schmid yield behavior of Ni₃Al crystals”, *International Conference on Plasticity Damage and Fracture 2020*, Riviera Maya, Mexico, January 3-9, 2020 (invited).
 15. Ranjan, D.*, Narayanan, S., Kadau, K., **Patra, A.**, “Crystal plasticity modeling of the yield behavior of Ni₃Al crystals and Ni-base superalloys”, *14th WCCM and ECCOMAS Congress 2020*, Virtual Conference, January 11-15, 2021.
 16. Basu, S.*, **Patra, A.**, Jaya, B.N., Ganguly, S., Dutta, M., Samajdar, I., “A computational modeling framework for studying the microstructural factors inducing strain partitioning in Dual Phase steels”, *14th WCCM and ECCOMAS Congress 2020*, Virtual Conference, January 11-15, 2021.
 17. Chaudhary, S.*, Guruprasad, P.J., **Patra, A.**, “Crystal plasticity modeling of creep and fatigue deformation in Ni-based superalloy single crystals”, *8th International Conference on Creep, Fatigue and Creep-Fatigue Interaction (CF-8)*, Virtual Conference, IGCAR, Kalpakkam, August 24-27, 2021.
 18. Pai, N.*, Prakash, A., Samajdar, I., **Patra, A.**, “Study of near boundary gradient zones in an aluminum alloy using strain gradient crystal plasticity and experiments”, Virtual Presentation, *MS&T '21*, Columbus, USA, October 17-21, 2021.
 19. Pai, N.*, Samajdar, I., **Patra, A.**, “Study of the effect of gradient plasticity on the deformation of metallic systems via combined modeling and experiments”, *24th International Conference on Computer Methods in Mechanics (CMM) & 42nd Solid Mechanics Conference (SolMech)*,

Swinoujscie, Poland, September 5-8, 2022.

20. Chaudhary, S.*, Guruprasad, P.J., **Patra, A.**, “Crystal plasticity constitutive modeling of thermo-mechanical deformation in Ni-based superalloy single crystals”, *4th European Symposium on Superalloys and their Applications (EuroSuperalloys 2022)*, Bamberg, Germany, September 18-22, 2022.
21. Chaudhary, S., Pai, N., Samajdar, I., Guruprasad, P.J., **Patra, A.***, “Crystal plasticity constitutive modeling of thermomechanical deformation in Ni-based superalloys”, *Advances in Materials & Processing: Challenges & Opportunities (AMPCO '22)*, Indian Institute of Technology Roorkee, October 17-19, 2022 (invited).
22. Chaudhary, S.*, Pai, N., Appa Rao, G., Alam, Z., Sankarasubramanian, R., Guruprasad, P.J., Samajdar, I., **Patra, A.**, “Experimentally informed crystal plasticity model for predicting the deformation of a polycrystalline Ni-based superalloy”, *Indian Institute of Metals - Annual Technical Meeting (IIM-ATM) 2022*, Hyderabad, November 14-16, 2022.
23. Pai, N., Samajdar, I., **Patra, A.***, “Modeling grain-scale deformation phenomena using strain gradient plasticity”, *8th Asian Conference on Mechanics of Functional Materials and Structures (ACMFMS)*, Indian Institute of Technology Guwahati, December 11-14, 2022 (invited).
24. Pai, N., Samajdar, I., **Patra, A.***, “Modeling misorientation development and solute segregation during deformation and heat treatment in Al alloys: strain gradient crystal plasticity and phase field study”, *Platinum Jubilee Conference on Perspectives in Materials Research*, Indian Institute of Science, Bangalore, December 21-23, 2022 (invited).
25. Pai, N.*, Samajdar, I., **Patra, A.**, “Insights into the tension-compression asymmetry of additively manufactured alloys: a combined phase field-strain gradient plasticity study”, *29th International Conference on Processing and Fabrication of Advanced Materials*, Indian Institute of Technology Tirupati, September 6-8, 2023.
26. Chaudhary, S.*, Pai, N., Sudhalkar, B., Alam, Z., Sankarasubramanian, R., Guruprasad, P.J., Samajdar, I., **Patra, A.**, “Crystal plasticity model for cyclic softening of a polycrystalline Ni-based superalloy”, *29th International Conference on Processing and Fabrication of Advanced Materials*, Indian Institute of Technology Tirupati, September 6-8, 2023.
27. **Patra, A.***, “Leveraging high performance computing for crystal plasticity simulations using ρ -CP”, *Symposium on Materials and Computational Chemistry Applications on HPC Platform*, C-DAC, Pune, October 12-13, 2023 (invited).
28. Pai, N., Samajdar, I., **Patra, A.***, “Coupled phase field and strain gradient plasticity model for studying the microstructural origins of tension-compression asymmetry in rapidly solidified microstructures”, *International Conference on Plasticity, Damage and Fracture 2024*, Panama City, Panama, January 3-8, 2024 (invited keynote).
29. Singh, L.*, Chaudhary, S., Tomé, C.N., **Patra, A.**, “A dislocation density-based crystal plasticity constitutive model for the anisotropic deformation behavior of CP-Titanium”, *National Symposium of Research Scholars*, IIT Kanpur, March 9-10, 2024.

* indicates speaker, ¹ indicates poster presentation.

Other Invited Talks

- **Patra, A.***, McDowell D.L., “Modeling dislocation channels in irradiated bcc materials using continuum crystal plasticity”, Student Speaker, Monthly Meeting of the ASM Atlanta Chapter, Atlanta, GA, September 18, 2012.
- **Patra, A.***, McDowell D.L., “Modeling the mechanical behavior and deformed microstructure of irradiated bcc metals using continuum crystal plasticity”, NRE Seminar Series, Georgia Tech, Atlanta, GA, January 31, 2013.

- **Patra, A.***, McDowell D.L., “Modeling the mechanical behavior of irradiated bcc metals”, Department of Metallurgical and Materials Engineering, Indian Institute of Technology, Kharagpur, January 8, 2014.
- **Patra, A.***, “Crystal plasticity modeling of grain-scale deformation phenomena in metallic systems”, Indian Institute of Technology Bombay, Mumbai, June 3, 2020.
- **Patra, A.***, “Modeling microstructure-mechanical property correlations in multiphase materials for accelerated materials design”, Webinar on Scientific Computing in Materials Engineering, Indian Institute of Technology Kharagpur, September 25, 2021.
- **Patra, A.***, “Strain gradient plasticity modeling of grain-scale deformation phenomena”, Indian Institute of Technology Kanpur, June 30, 2022.
- **Patra, A.***, “High performance computing for crystal plasticity simulations using ρ -CP”, National Supercomputing Mission High Performance Computing Week, Indian Institute of Technology Madras, November 25, 2023.
- **Patra, A.***, “Crystal plasticity modeling of deformation in metallic systems using ρ -CP”, IITB-NUS Workshop on Materials Technologies, Indian Institute of Technology Bombay, February 26-27, 2024.

Student Supervision

Doctoral thesis:

As Advisor:

- Namit Pai (ongoing), Thesis: Development of strain gradient crystal plasticity models for metallic systems (co-advisor: I. Samajdar), Prime Minister’s Research Fellow.
- Suketa Chaudhary (ongoing), Thesis: Modeling elevated temperature deformation of Ni-based superalloys using crystal plasticity constitutive equations (co-advisor: P.J. Guruprasad), Prime Minister’s Research Fellow.
- Girish Kulkarni (ongoing), Thesis: Development of constitutive equations for modeling thermo-mechanical fatigue of cast iron exhaust manifolds.
- Lopamudra Singh (ongoing), Thesis: Modeling microstructure-mechanical property correlations in Ti alloys.
- Alanka Naga Satya Sai Mahesh (ongoing), Thesis: Finite element modeling of heat transfer and thermo-mechanical deformation in the roll bite during hot rolling (co-advisor: S. Chandra).

As Co-Advisor:

- Khushahal Thool (September 2022), Thesis: Orientation and temperature dependent deformation in commercial hexagonal close-packed zirconium (advisor: I. Samajdar).
- Soudip Basu (November 2023), Thesis: Engineering micro-strain localizations for improved hole expansion ratio in dual phase steel (advisor: B.N. Jaya, co-advisor: I. Samajdar).
- Bhargav Sudhalkar (ongoing), Thesis: Thermo-mechanical deformation of Ti alloys (advisor: I. Samajdar).

Masters thesis:

- Avinash Mishra, M.Tech. (June 2019), Thesis: Modeling fragmentation and steam explosion during melt water interactions.
- Saurabh Kumar Singh, M.Tech. (June 2019), Thesis: Modeling the effect of microstructural parameters on the mechanical properties of three phase Mo-Si-B alloys.
- Devraj Ranjan, M.Tech. (June 2020), Thesis: Crystal plasticity modeling of the yield behavior of Ni₃Al single crystals and Ni-base superalloys.
- Hasan Haider, M.Tech. (June 2020), Thesis: Computational design of three phase Mo-Si-B alloys for high temperature structural applications.

- Sarthak Khandelwal, B.Tech.+M.Tech. Dual Degree (June 2021), Thesis: An assessment of machine learning approaches for predicting the history-dependent deformation of dual phase steels.
- Adwitiya Rao, B.Tech.+M.Tech. Dual Degree (June 2021), Thesis: Crystal plasticity modeling of twinning-induced deformation in hcp magnesium.
- Parhitosh Sharma, M.Tech. (June 2021), Thesis: Modeling length scale effects using strain gradient J_2 plasticity.
- Aditya Kumar, M.Tech. (June 2021), Thesis: Modeling fatigue deformation of Ni-based superalloys.
- Preet Shah, B.Tech. + M.Tech. Dual Degree (August 2023), Thesis: Machine learning-based prediction of microstructure-property correlations.
- Manikandan Muruganandam, M.S. (Research) (ongoing), Thesis: Exploring anisotropic size effects in single crystals using discrete dislocation dynamics (co-advisor: P.J. Guruprasad).

Bachelors thesis:

- Aayush Anurag, B.Tech. (Dec. 2019), Thesis: Modeling the deformation behavior of metallic systems using dislocation density and damage based J_2 plasticity constitutive equations (awarded Undergraduate Research Award for exceptional research work).

Personal Information

Date of Birth: September 8, 1986

Place of Birth: Bishnupur, West Bengal, India