

Ananya Renuka Balakrishna

CONTACT INFORMATION	77 Massachusetts Avenue, 13-4026 Department of Materials Science and Engineering Massachusetts Institute of Technology Boston, MA 02139 USA	<i>Phone:</i> +1 (857)-829-9511 <i>E-mail:</i> ananyarb@mit.edu
RESEARCH INTERESTS	I develop and apply mathematical models (phase-field , phase-field crystal , cohesive-zone) to investigate the link between microstructures and material properties in energy storage (battery) and functional (ferroelectrics) materials.	
PROFESSIONAL APPOINTMENT	Massachusetts Institute of Technology , Cambridge, MA, USA Postdoctoral Fellow, Materials Science and Engineering Project: Continuum-modeling of microstructures in solid-state-batteries	Nov. 2016 – present
EDUCATION	University of Oxford , Oxford, UK PhD, Solid Mechanics and Materials Engineering Thesis: Application of a phase-field model to ferroelectrics National Institute of Technology Karnataka , Surathkal, India B. Tech, Mechanical Engineering Best Student Award (academic and extra-curricular recognition)	2016 2012
SCHOLARSHIPS & AWARDS	Brasenose Senior Hulme Scholarship (PhD academic excellence), 2015 Felix Graduate Scholarship (5 awarded across India), 2012 Cambridge International & Commonwealth Trust (Honorary scholar), 2012 DAAD-WISE Fellowship (Undergraduate Research), 2011 Falling-Walls London-Lab Winner, 2014	
GRANTS & FELLOWSHIPS	Lindemann Postdoctoral Fellowship (\$40,000) <i>3 awarded across the UK each year</i> British Federation of Women Graduates Award , 2015 (£2000) <i>Awarded among 377 applicants all over UK to further PhD research</i> Brasenose College annual grant (£1500) <i>University of Oxford</i> Graduate student travel grant (€500) <i>Administered by PIRE and NSF</i> Santander academic travel grant (£500) <i>Santander Bank</i>	
PUBLICATIONS	Renuka Balakrishna A and Carter WC. 2017. Combining phase field crystal methods with a Cahn-Hilliard model for binary alloys. Under review. arXiv preprint arXiv:1712.03503. Muench I, Renuka Balakrishna A, and Huber JE. 2017. Simulation of periodic, 3-dimensional domain patterns in tetragonal ferroelectrics. Under review.	

Renuka Balakrishna A, Huber JE, and Muench I. 2016. Nanoscale periodic domain patterns in tetragonal ferroelectrics: A phase-field study. *Physical Review B* 93 (17), 174120. DOI: 10.1103/PhysRevB.93.174120

Renuka Balakrishna A and Huber JE. 2016. Nanoscale domain patterns and a concept for an energy harvester. *Smart Materials and Structures* 25 (10), 104001. DOI: 10.1088/0964-1726/25/10/104001

Renuka Balakrishna A and Huber JE. 2015. Scale effects and the formation of polarisation vortices in tetragonal ferroelectrics. *Applied Physics Letters* 106 (9), 092906. DOI: 10.1063/1.4913917

Renuka Balakrishna A, Huber JE, and Landis CM. 2014. Nano-actuator concepts based on ferroelectric switching. *Smart Materials and Structures* 23 (8), 085016. DOI: 10.1088/0964-1726/23/8/085016

Renuka Balakrishna A, Muench I, and Huber JE. 2015. Study of periodic domain patterns in tetragonal ferroelectrics using phase-field methods. *Proceedings of ASME SMASIS conference*, Colorado Springs, USA. DOI: 10.1115/SMASIS2015-8823

Renuka Balakrishna A and Huber JE. 2014. Design optimisation of a ferroelectric nano-actuator using phase field modeling. *Proceedings of the MRS conference*, San Francisco, USA (mrss14-1674-j03-03). DOI: 10.1557/opl.2014.545

Manuscripts in preparation

Renuka Balakrishna A, Chiang Y-M, and Carter WC. 2017. Modeling phase-transitions in battery electrodes using multi-scale continuum methods. *Draft available*

Bucci G, Renuka Balakrishna A, Talamini B, Chiang Y-M, and Carter WC. 2017. Mechanical instability of electrode/electrolyte interfaces in solid-state batteries. *Draft available*

CONFERENCE TALKS & GRANTS

“Modeling Phase Transition in Lithium Batteries Using Multi-Scale Continuum Models”, *Batteries Gordon Research Conference and Seminar*, Ventura, CA, 2018 (Upcoming)

Invited Discussion leader

“Phase field crystal modeling of nanoscale electrodes”, *American Physical Society (APS) March Meeting*, Los Angeles, CA, 2018 (Upcoming)

“Phase Field Crystal Modeling of Coherent Interfaces in Lithium Batteries”, *231st Electrochemical Society meeting*, New Orleans, LA, 2017

“Phase Field Crystal Modeling Using Transformation Matrices – an Application to Lithium Battery Electrodes”, *MRS Fall Meetings and Exhibits*, Boston, MA, 2017

“Phase-field Modeling of Material Microstructures”, *Multiscale Theory and Computation Conference*, University of Minnesota, MN, 2017

Summer School – phase-field models, TU Munchen, 2017

Funded by ISAM, TopMath and the IGDK 1754

“Stability of laminate patterns in ferroelectrics” (poster), *From Grain Boundaries to Stochastic Homogenization: PIRE Workshop*, Leipzig, 2015

“Phase-field modelling of polarization patterns in ferroelectrics”, *9th European Solid Mechanics Conference*, Madrid, 2015.

“A conceptual design of a ferroelectric energy harvester”, MRS Spring Meetings and Exhibits, San Francisco, USA, 2015

“A conceptual design of a ferroelectric energy harvester”, ASME SMASIS Spring Meetings and Exhibits, Utah, USA, 2014
Best Student Paper award

“Nano-actuator concepts”, Falling-Walls London-Lab, London, 2015
Winner – represented UK in the finals held in Berlin, funded by AT Kearney

“Working principle of a nano-actuator based on ferroelectric switching”, the proceedings of ECCOMAS conference on Smart Struct. Mat., Turin, 2013

“Modelling and analysis of resonant beam micro-pressure sensor”, National Conference on MEMS and Smart Materials, Coimbatore, India, 2012
Best Paper – ISSS Undergraduate Award

“Sound energy harvesting using macro-fibre composites”, 8th European Solid Mechanics Conference, Graz, Austria, 2012

PROFESSIONAL ACTIVITIES

Teaching Experience

- **Teaching Faculty**, Oxford Royale Academy
Introduction to Engineering course to A-level students in summer 2014, 2015
Designed “Mathematics as an Engineering tool” course material for the summer school
- **Tutor**, Pembroke College, University of Oxford
Mechanics of Materials course, to undergraduate students Trinity term, 2015
- **Instructor**, Department of Engineering, University of Oxford
Laboratory demonstration on bridge-design and construction to undergraduates, 2015
- **Additional training**
Kaufman Teaching Certificate, MIT teaching and learning laboratory, 2018
Bringing Modeling and Simulation into My Classroom course, 2017 MRS Fall meeting
Leadership and management workshop for scientists, MIT EECS, 2017

Leadership and services

- Coordinating a multi-PI project on chemo-mechanics of batteries at MIT, 2017 – 2018
Involved in grant proposal application to the US Department of Energy, Office of Science
Organized weekly seminars, meetings and discussion sessions for the group
- Organized Postdoc seminars in the Department of Materials Science, MIT, Fall 2017
- MIT Postdoc rep. for **Congressional Visit Days**, MIT Science Policy Initiative, 2017
Discussed science policy issues and research budgets with Massachusetts state representatives in Congress, Washington D.C.
- **Basketball player**, University of Oxford (half-blues), Varsity matches 2013, 2014, English Basketball League 2012 – 2014, National Institute of Technology, India 2008 – 2012

Research Skills

- Programming languages: C++, Fortran, Mathematica
- Software packages: ANsys, ABAQUS, FEAP, Paraview

REFERENCES

W. Craig Carter

Professor of Materials Science and Engineering
Massachusetts Institute of Technology
77 Mass. Ave, 13-4053, Boston, MA 02139
Phone: +1 (617) 253-6048
Email: ccarter@mit.edu

John E. Huber

Associate Professor of Engineering Science
University of Oxford
Parks Road, Oxford, OX1 3PJ
Phone: +44 (1865) 283-478
Email: john.huber@eng.ox.ac.uk

Yet-Ming Chiang

Professor of Materials Science and Engineering
Massachusetts Institute of Technology
77 Mass. Ave, 13-4086, Boston, MA 02139
+1 (617) 253-6471
Email: ychiang@mit.edu

Ingo Muench

Assistant Professor of Engineering Science
Karlsruhe Institute of Technology
Institute for Structural Analysis, Karlsruhe, 76131
+49 (721)-608-422-89
Email: ingo.muench@kit.edu