

Kranthi K. Mandadapu - CV/Resume

University of California at Berkeley
Chemical and Biomolecular Engineering
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EDUCATION

- **Ph.D. Mechanical Engineering** May 2007–May 2011
University of California at Berkeley
Thesis: Homogeneous Non-Equilibrium Molecular Dynamics Methods for Calculating the Heat Transport Coefficient of Solids and Mixtures
Mentor: Prof. Panayiotis Papadopoulos
Minors: Mathematics and Physics
Thesis Committee: Prof. Alexander Chorin and Prof. David Steigmann
- **M.S. Civil Engineering** August 2005–May 2007
University of California at Berkeley
Thesis: Cytoskeleton and Soft Glassy Rheology
Mentors: Prof. Sanjay Govindjee and Prof. Mohammad R. K. Mofrad
- **B.S. Civil Engineering** August 2001–May 2005
Indian Institute of Technology at Madras
Thesis: Multiscale Modeling of Mechanical Behavior of Polycrystalline Shape Memory Alloys
Mentor: Prof. Srinivasan M. Sivakumar
Minor: Applied Mechanics and Computational Physics

PROFESSIONAL APPOINTMENTS

- **Free Radicals Era Assistant Professor** July 2017–Present
Chemical and Biomolecular Engineering
University of California at Berkeley
- **Affiliated Faculty – Biophysics Graduate Group** July 2016–Present
University of California at Berkeley
- **Faculty Scientist – Chemical Sciences Division** July 2016–Present
Lawrence Berkeley National Laboratory
- **Post-Doctoral Scholar – Chemistry and Biophysics** August 2013–June 2016
University of California at Berkeley
Lawrence Berkeley National Laboratory
Mentors: Prof. David Chandler and Prof. George Oster
- **Post-Doctoral Scholar** July 2011–July 2013
Sandia National Laboratories at Livermore

HONORS AND AWARDS

- **Keynote Speaker, United States Association for Computational Mechanics Meeting, 2019.**
- **Departmental Teaching Award, Chemical and Biomolecular Engineering, 2019**

- **Free Radical Era Endowed Professorship, Chemical and Biomolecular Engineering, College of Chemistry, UC Berkeley, 2017-2020.**
- **Poster Prize, Berkeley Statistical Mechanical Meeting, 2018.**
- **Keynote Speaker, Annual Biophysical Society Meeting of Canada, 2016.**
- **Primary Invited Lecture, Gordon Research Conference (GRC), 2015.**
- **Poster Prize, Berkeley Statistical Mechanical Meeting, 2015.**
- **Invited Lecturer, DARPA DSRC Microsystem-Scale Energy Conversion, 2014.**
- **Editors Choice Award, The Journal of Chemical Physics, 2011.**
- **Block Grant Award, 2010** Department of Mechanical Engineering, University of California at Berkeley for distinguished academic record and promise for noteworthy achievement.
- **Prathibha Scholarship, 2001 – 2005**, Government of Andhra Pradesh in India for distinguished academic record at Indian Institute of Technology at Madras.
- **Prathibha Award, 1999**, Government of Andhra Pradesh in India for securing State 7th rank out of 600,000 students in Secondary Board Examination.

JOURNAL PUBLICATIONS

- **arXiv and Submitted:**

1. Epstein, J. M., and Mandadapu, K. K., Time reversal symmetry breaking in two dimensional non-equilibrium fluids, *arXiv:1907.10041*
2. Omar, Y., Sahu, A., Sauer, R. A., and Mandadapu, K. K., Non-axisymmetric shapes of biological membranes under induced curvature. *bioRxiv:688127*
3. Katira, S., Garrahan, J. P., and Mandadapu, K. K., Theory for glassy behavior of supercooled liquid mixtures, *arXiv:1903.08557*
4. Sahu, A., Omar, Y., Sauer, R. A., and Mandadapu, K. K., Arbitrary Lagrangian-Eulerian finite element formulation for curved and deforming surfaces: I. General theory and its application to two-dimensional fluids, *arXiv:1812.05086*
5. Mandadapu, K. K., Abali, E., and Papadopoulos, P., On the polar nature and invariance properties of a thermomechanical theory for continuum-on-continuum homogenization, *arXiv:1808.02540*
6. Tchoufag, J., Ghosh, P., Pogue, C. B., Nan, B., and Mandadapu, K. K., Mechanisms for bacterial gliding motility on soft substrates. *arXiv:1807.07529*
7. Hudson, A., and Mandadapu, K. K., On the nature of the glass transition in atomistic models of glass formers. *arXiv:1804.03769*
8. Paul, K., Zimmerman, Z., Mandadapu, K. K., Hughes, T. J. R., Landis, C. M., and Sauer, R. A., An adaptive space-time phase field formulation for dynamic fracture of brittle shells based on LR NURBS, *arXiv:1906.10679*

- **Published**

1. Epstein, J., Klymko, K., and Mandadapu, K. K., Statistical mechanics of transport processes in active fluids II: The equations of hydrodynamics for active brownian particles, *The Journal of Chemical Physics*, 150, 164111 (2019).
2. Zimmerman, C., Toshniwal, D., Landis, C. M., Hughes, T. J. R., Mandadapu, K. K., and Sauer, R. A., An isogeometric finite element formulation for phase transformations on deforming surfaces. *Computer Methods in Applied Mechanics and Engineering*, 351, 441–477 (2019).

3. Doubrovinski, K., Tchoufag, J., and Mandadapu, K. K., A simplified mechanism for anisotropic constriction in *Drosophila* prospective mesoderm, *Development*, 145, 24 (2018).
4. Dasbiswas, K., Mandadapu, K. K., and Vaikuntanathan, S., Topological localization in out-of-equilibrium dissipative systems, *Proceedings of National Academy of Sciences USA*, 115, E9031-E9040 (2018).
5. Katira, S., Garrahan, J. P., and Mandadapu, K. K., Solvation in space-time: Pre-transition effects in trajectory space, *Physical Review Letters*, 120, 260602 (2018).
6. Klymko, K., Mandal, D., and Mandadapu, K. K., Statistical mechanics of transport processes in active matter: The equations of hydrodynamics, *Journal of Chemical Physics* 147, 194109 (2017).
(Best Poster Award at Berkeley Statistical Mechanics Meeting)
– A shorter version of this article summarizing the main article is available on *arXiv*.
Mandal, D., Klymko, K., and Mandadapu, K. K., Generalized hydrodynamics of active polar fluids. *arXiv:1706.02284*.
7. Sahu, A., Sauer, R., and Mandadapu, K. K., The irreversible thermodynamics of curved lipid membranes, *Physical Review E* 96, 042409 (2017).
8. Mandadapu, K. K., and Hurley, J., Friction at the BAR leads to membrane breakup, *Cell*, 170, 14–16 (2017).
9. Sauer, R. A., Duong, T. X., Mandadapu, K. K., and Steigmann, D. J., A stabilized finite element formulation for liquid shells and its application to lipid bilayers, *Journal of Computational Physics*, 330, 436–466 (2017).
10. Mercer, B., Mandadapu, K. K., and Papadopoulos, P., Homogenization of high-frequency wave propagation in linearly elastic layered media using a continuum Irving-Kirkwood theory, *International Journal of Solids and Structures*, 96, 162-172 (2016).
11. Kshirsagar, S., Mandadapu, K. K., and Papadopoulos, P., Classical molecular dynamics simulations with a general interatomic potential for crystalline solids, *Computational Materials Science*, 120, 127-134 (2016).
12. *Katira, S., *Mandadapu, K. K., *Vaikuntanathan, S., Smit, B., and Chandler, D., Pre-transition effects mediate forces between transmembrane proteins in lipid bilayers, *eLife*, 5:e13150 (2016).
(Best Poster Award at Berkeley Statistical Mechanics Meeting)
13. *Katira, S., *Mandadapu, K. K., *Vaikuntanathan, S., Smit, B., and Chandler, D., The order-disorder transition in model lipid bilayers is a first-order hexatic to liquid phase transition, *arXiv:1506.04310*.
14. *Mandadapu, K. K., *Nirody, J., Berry, R., and Oster, G., Mechanics of torque generation in the bacterial flagellar motor, *Proceedings of National Academy of Sciences, USA*, 112, E4381-E4389 (2015).
15. Mercer, B., Mandadapu, K. K., and Papadopoulos, P., Novel formulations of microscopic boundary-value problems in continuous multiscale finite element methods, *Computer Methods in Applied Mechanics and Engineering* 286, 268-292 (2015).
16. Rangamani P., Mandadapu, K. K., and Oster, G., Protein-induced membrane curvature alters local membrane tension, *Biophysical Journal*, 107, 751-762 (2014).
17. Mandadapu, K. K., Jones, R. E., and Zimmerman, J. A., On the microscopic definitions of dislocation density tensor, *Mathematics and Mechanics of Solids* 19, 744-757 (2014).
18. Mandadapu, K. K., Templeton, J. A., and Lee, J. W., Polarization as a field variable from molecular dynamics simulations, *Journal of Chemical Physics*, 139, 054115-1-10 (2013).
19. Lee, J. W., Templeton, J. A., Mandadapu, K. K., and Zimmerman J. A., Investigation of various molecular dynamics models of electrical double layers in nanochannels, *Journal of Chemical Theory and Computation*, 9, 3051-3061 (2013).
20. Rangamani, P., Agrawal, A., Mandadapu, K. K., Oster, G., and Steigmann, D. J., Interaction between surface shape and intra-surface viscous flow on lipid membranes, *Biomechanics and Modeling in Mechanobiology*, 12, 833-845 (2013).

21. Ulz, M., Mandadapu, K. K., Papadopoulos, P., On the estimation of spatial averaging volume for determining stress using atomistic methods, *Modeling and Simulation in Materials Science and Engineering*, 21, 015010 (2013).
22. Jones, R. E., and Mandadapu, K. K., Adaptive Green-Kubo estimates of transport coefficients from molecular dynamics based on robust error analysis, *Journal of Chemical Physics*, 136, 154102 (2012).
23. Mandadapu, K. K., Sengupta, A., and Papadopoulos, P., A homogenization method for thermo-mechanical continua using extensive physical quantities, *Proceedings of Royal Society A : Mathematical, Physical and Engineering Sciences*, 468, 1696-1715 (2012).
24. Mandadapu, K. K., Jones, R. E., and Papadopoulos, P., A homogeneous non-equilibrium molecular dynamics method for calculating the heat transport coefficient of mixtures and alloys, *Journal of Chemical Physics*, 133, 034122 (2010). (**Editor's Choice in Journal of Chemical Physics**)
25. Mandadapu, K. K., Jones, R. E., and Papadopoulos, P., Generalization of the homogeneous non-equilibrium molecular dynamics method for calculating thermal conductivity to multi-body potentials, *Physical Review E*, 80, 047702 (2009).
26. Mandadapu, K. K., Jones, R. E., and Papadopoulos, P., A homogeneous non-equilibrium molecular dynamics method for calculating thermal conductivity with a three-body potential, *Journal of Chemical Physics*, 130, 204106 (2009).
27. Mandadapu, K. K., Govindjee, S., and Mofrad, M. R. K., On the cytoskeleton and soft glassy rheology, *Journal of Biomechanics*, 41, 1467-1478 (2008).
28. Guthikonda, V. S. R., Mandadapu K. K., Sivakumar, S. M., and Srinivasa, A. R., On smeared and micromechanical approaches to modeling martensitic transformations in shape memory alloys, *Nonlinear Analysis: Real World Applications*, 9, 990-1011 (2008).

Presentations:

1. Non-equilibrium thermodynamics and mathematical modeling of biological membranes, *United States Association for Computational Mechanics Meeting* (2019). **Invited Lecture**
2. Non-equilibrium thermodynamics and mathematical modeling of biological membranes, *Harvard University* (2019). **Invited Lecture**
3. Crystallization vs. Vitrification, *ACS Meeting, Orlando, Florida* (2019). **Invited Lecture**
4. Crystallization vs. Vitrification, *IBM Research, Almaden, San Jose* (2018). **Invited Lecture**
5. Dynamical facilitation theory for glass formers, *Unifying concepts in glassy physics, Bristol, United Kingdom* (2018). **Invited Lecture**
6. Phase transitions, pre-transition effects and interfaces in and out-of-equilibrium, *CPIMS (Condensed Phase and Interfacial Molecular Sciences) Program, LBNL, DOE* (2018).
7. General non-axisymmetric deformations of membranes and applications to endocytosis, *Biophysical Society Meeting* (2018).
8. Homogenization of thermo-mechanical continua using extensive physical quantities: Theory and Simulation, *Geosciences Division, Lawrence Berkeley National Laboratory* (2017). **Invited Lecture**
9. Consideration of phase transitions and mechanics in cell membranes, *UT Southwestern Medical School* (2017). **Invited Lecture**
10. Solvation at small and large scales in trajectory space mediated by dynamical phase transitions, *DOE (Condensed Phase and Interfacial Molecular Sciences) Meeting* (2017). **Invited Lecture**

11. The orderphobic effect: a general mechanism for membrane mediated forces for proteins, *American Chemical Society Meeting, San Francisco* (2017). **Invited Lecture - Symposium celebrating Peter Debye Award to Prof. Bruce Berne**
12. The orderphobic effect: a generic force for self-assembly of proteins in lipid bilayers, *Theory and Applications of Computational Chemistry, TACC* (2016). **Invited Lecture**
13. The orderphobic effect: a new paradigm for understanding membrane mediated assembly, reorganization and dynamics, *Annual Biophysical Society Meeting of Canada, Winnipeg* (2016). **Invited Lecture**
14. A homogenization method for continuous media based on extensive physical quantities. *Applied Mathematics Seminar, University of California at Berkeley* (2016). **Invited Lecture**
15. Homogenization of thermo-mechanical continua: Theory and Simulation. *Applied Mathematics Seminar, Collaboratory on Mathematics for Mesoscopic Modeling of Materials (CM4), PNNL, DOE* (2016). **Invited Lecture**
16. Molecular dynamics of complex systems: Phase transitions, interfaces and pretransition effects. *CPIMS (Condensed Phase and Interfacial Molecular Sciences) Meeting, DOE* (2015). **Invited Lecture**
17. The orderphobic effect: A generic force for assembly of proteins in lipid bilayers. *GRC Conference on the Chemistry and Physics of Liquids* (2015). (Joint work with Katira, S., Vaikuntanathan S., Smit, B., and Chandler, D.) **Invited Lecture**
18. Nontrivial correlation length distinguishes melt from glass in a large-scale atomistic non-equilibrium simulation of a glass transition. *APS March Meeting, San Antonio, TX* (2015). (Joint Work with Hudson, A., and Chandler, D.)
19. Physical principles of organization in biological membranes. Department of Chemical and Bio-molecular Engineering, *University of California, Berkeley* (2015). **Invited Lecture**
20. Physical principles of organization in biological membranes. Department of Chemical and Biological Engineering, *University of Wisconsin Madison* (2015). **Invited Lecture**
21. The orderphobic effect: A generic force for self-assembly of proteins in lipid bilayers, *Membrane Super-group Meeting, University of California, Berkeley* (2015). (Joint Work with Katira, S., and Vaikuntanathan, S.)
22. The orderphobic effect: A fundamental force for self-assembly of proteins in lipid bilayers, *Poster at Mini Stat-Mech Meeting, Berkeley* (2015). (Joint Work with Katira, S., and Vaikuntanathan, S.) **Poster Prize**
23. Energy transduction in the bacterial flagellar motor, *DARPA DSRC Microsystem-Scale Energy Conversion* (2014). (Joint work with Oster, G.) **Invited Lecture**
24. Polarization as a field variable from molecular dynamics simulations: Applications to water at solid interfaces. *Poster at Mini Stat-Mech Meeting, Berkeley* (2014).
25. Effect of protein induced spontaneous curvature on membrane surface tension. *USNCCM MMVMB II, Berkeley* (2014). (Joint Work with Rangamani, P., and Oster, G.)
26. Polarization as a field variable from molecular dynamics simulations: Applications to electrical double layers, *USNCCM, Raleigh* (2013). (Joint Work with Templeton, J. A., and Lee, J. W.)
27. Effect of protein induced spontaneous curvature on membrane surface tension. *Sandia National Laboratories* (2013). (Joint Work with Rangamani, P., and Oster, G.) **Invited Lecture**
28. Theoretical and computational aspects of homogenization in thermo-mechanical continua, *Multiscale Modeling Workshop, Sandia National Laboratories* (2013). (Joint work with Mercer, B., and Papadopoulos, P.) **Invited Lecture**

29. Homogeneous non-equilibrium molecular dynamics methods for calculating the heat transport coefficient of solids and mixtures, *Mini Statistical Mechanics Seminar, Department of Chemistry, University of California, Berkeley* (2013). (Joint Work with Jones, R. E., and Papadopoulos, P.) **Invited Lecture**
30. Polarization as a field variable from molecular dynamics simulations, *65th Annual meeting of American Physical Society, Division of Fluid Dynamics* (2012). (Joint work with Templeton, J. A., and Lee, J. W.)
31. Homogeneous non-equilibrium molecular dynamics methods for calculating the heat transport coefficient of solids and mixtures, *International Workshop on Computational Mechanics of Materials IWCMXXII* (2012). (Joint Work with Jones, R. E., and Papadopoulos, P.)
32. Homogeneous non-equilibrium molecular dynamics methods for calculating the heat transport coefficient of solids and mixtures, *Sandia National Laboratories* (2010). (Joint work with Jones, R. E., and Papadopoulos, P.) **Invited Lecture**
33. Equilibrium and non-equilibrium molecular dynamics methods for thermal conductivity calculations, *University of California at Berkeley* (2010). (Joint work with Jones, R. E., and Papadopoulos, P.)
34. Thermal conductivity calculations using homogeneous non-equilibrium molecular dynamics (HNEMD) method, *Indian Institute of Technology at Kanpur* (2008). (Joint work with Jones, R. E., and Papadopoulos, P.) **Invited Lecture**
35. Cytoskeleton and soft glassy rheology, *Summer Bioengineering Conference* (2007). (Joint work with Govindjee, S., and Mofrad, M. R. K.)

PROFESSIONAL SERVICE

- Graduate Admissions Committee, Chemical and Biomolecular Engineering, UC Berkeley 2016-Present
- External adviser for master's thesis of Mr. Yannick Omar at RWTH, Aachen University, Germany.
- Search Committee Member for a Theory Staff Scientist position at *Lawrence Berkeley National Laboratory*.
- Minisymposium Chair for a session on Membranes: Biological and Synthetic, *American Phphysical Society March Meeting*, San Antonio, Texas, 2015.
- Minisymposium Chair for a session on Micro- and Nano-Scale Modeling of hcp Alloys at *4th International Conference on Material Modeling*, Berkeley, California, May 27-29, 2015.
- Minisymposium Chair for a session on Non-linear elasticity at *4th International Conference on Material Modeling*, Berkeley, California, May 27-29, 2015.
- Conference co-organizer for *Multiscale Methods and Validation in Medicine and Biology II: Biomechanics and Mechanobiology (MMVMB II)*, Berkeley, February 13-14, 2014.
- Mini-Symposium co-organizer in *United States National Congress on Computational Mechanics US-NCCM*, Raleigh, July 22-25, 2013.
- Mini-Symposium co-organizer in *International Workshop on Computational Mechanics of Materials IWCMXXII*, Baltimore, September 24-26, 2012.
- Reviewed for
 1. *Department of Energy (DOE)*
 2. *Cell*
 3. *Proceedings of National Academy of Sciences USA*
 4. *Bulletin of Mathematical Biology*

5. *APL Bioengineering*
6. *Proceedings of Royal Society London Series A*
7. *eLife*
8. *Journal of Molecular Biology*
9. *Biophysical Journal*
10. *Nano Letters*
11. *Journal of Chemical Physics*
12. *Biomechanics and Modeling in Mechanobiology*
13. *Journal of Biomechanics*
14. *Mathematics and Mechanics of Solids*
15. *IEEE Transactions on Biomedical Engineering*
16. *International Journal of Heat and Mass Transfer*
17. *Journal of Applied Physics*
18. *Langmuir*
19. *Zeitschrift fur angewandte Mathematik und Physik*

- Ph.D. Students

1. Amaresh Sahu (Chemical and Biomolecular Engineering 2016 –)
2. Clay Batton (Chemical and Biomolecular Engineering 2016 –)
3. Jeffrey Epstein (Physics 2017 –)
4. Muhammad Hasyim (Chemical and Biomolecular Engineering 2017 –)
5. Yannick Omar (Chemical and Biomolecular Engineering 2018 –)
6. Alison Lui (Chemical and Biomolecular Engineering 2018 –) (Co-advised by Markita Landry)
7. Cory Hargus (Chemical and Biomolecular Engineering 2018 –) (Co-advised by Rui Wang)
8. Zach Lipel (Chemical and Biomolecular Engineering 2018 –)

- Post-doctoral Scholars

1. Joel Tchoufag (2016 –)
2. Shachi Katira (2016 –)
3. Alexander Hudson (2016 – 2018)
4. Pushpita Ghosh (2015 – 2016, Currently an INSPIRE faculty @ TIFR, Hyderabad)

- Undergraduate Researchers

1. Lewis Pan (2018 –)
2. Alec Glisman – Currently pursuing Ph. D. @ California Institute of Technology
3. Chatipat Loraipaboon – Currently pursuing Ph.D. @ University of Chicago
4. Bernardo Gouveia – Currently pursuing Ph.D. @ Princeton University

TEACHING EXPERIENCE

- Instructor for Mechanics and Physics of Lipid Bilayers, Fall 2017 (Advanced graduate course).
- Instructor for Transport Phenomena, Spring 2017, 2018, 2019 (Undergraduate course).
- Instructor for Advanced Transport Phenomena, Fall 2016, 2018 (Advanced graduate course).
- Teaching Assistant for Statistical Mechanics of Elasticity, Fall 2010.
- Notes for a short course on Modeling and Simulation of Multiscale Continuum Systems, International Center for Mechanical Sciences, Udine, Italy, June 28-July 2, 2010.
- Reader for Introduction to Continuum Mechanics, University of California at Berkeley, Fall 2008.
- Reader for Advanced Computer Programming, University of California at Berkeley, Spring 2008.
- Teaching Assistant for Introduction to Computer Programming, University of California at Berkeley, Fall 2007, Spring 2009, and Fall 2009.