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EDUCATION

University of Kansas, Lawrence, KS

Ph.D., Bioengineering (Honors), 08/2008 – 08/2013

Dissertation: *Chemo-mechanical characterization of phase-separated dentin adhesives*

Committee: Anil Misra, Paulette Spencer, Stevin Gehrke, Sarah Kieweg, Jennifer Laurence

GPA 4.0/4.0

University of Missouri-Kansas City, Kansas City, MO

M.S., Civil Engineering, 08/ 2005 – 12/2007

Thesis: *Characterization of biomaterials using indigenously developed software SPF*

Committee: Ganesh Thiagarajan, Yong Wang, Anil Misra

GPA: 4.0/4.0

Indian Institute of Technology-Madras, India

B.S., Civil Engineering, (Minor: Applied Mechanics), 08/2004 – 09/2005

Thesis: *Biomimetic structures*

Advisor: Srinivasan M. Sivakumar

GPA: 8.0/10

EMPLOYMENT

Tennessee State University, Nashville, TN

Research Associate with TSU Nanomaterials Research Laboratory, 11/2013 - Present

1. Finite temperature atomistic to continuum bridging – Funded by NNSA-DOE, \$525,000
Derived work conjugate local stresses and local strain measures at the site of an atom for deformation at finite temperature. The approach is the first to define the stress conjugate to thermal vibration in addition to the virial stress, which is conjugate to strain. Molecular dynamics in the NVT ensemble on fcc Aluminum performed in LAMMPS reveals the contribution of thermal vibration to free energy and vibration stress as a precursor to onset of mechanical instability. [C.1, C.2, J.1, J.2]

2. Bond strength between super-hard ceramic coatings and polymers – Funded by NSF-EPSCOR, \$20,000,000 (Co-operative Agreement)

Estimated average bond strength of Rhenium Diboride coating on Teflon and HDPE using micro-tensile tests and image segmentation on failed surfaces. [P.1]

University of Kansas, Lawrence, KS

Graduate Researcher with Bioengineering Research Center, 08/2008 – 08/2013

1. Constitutive model for soft chemically active materials, Funded by University of Kansas Summer Fellowship, \$5000

Developed large-deformation poromechanics based on continuum mixture theory for collagen fiber network pre-tensioned by osmotic pressure of synovial fluid. The fiber network was modeled using the virial stress of interacting fibers. Osmotic pressure was simulated using chemical potential difference between interstitial synovial fluid and surrounding bath. Single element calculations demonstrated unique mechanics of articular cartilage: decreasing apparent Poisson's ratio under compression, effects of confinement, drainage and bath molarity on creep, in agreement with observed experimental phenomena. [J.4, J.5]

2. Chemo-mechanical characterization of polymer phases formed in dentin-adhesive interface of composite restorations, Funded by NIH-NIDCR, \$1,490,814
Applied Partial Least Squares (Machine Learning) to develop piecewise spectral intensity-composition correlations based on Beer's Law. Used correlation to construct phase-diagram from tie lines of separated phases from centrifugation. [C.7]. Designed coarse-grained constitutive model with parameters representing effective cross-link density, free volume and polymer-water interaction. The model was calibrated using instron mechanical testing and water sorption experiments. The trends in model parameters agreed with experimental results from stoichiometric calculations, dynamic mechanical analysis and solubility parameters. The model successfully predicted Jacobian of deformation for polymer swelling. [J.3]

StructurePoint, LLC, Skokie, IL
Structural Engineer, 06/2007 to 06/2008

Verification and validation, technical customer support for concrete design software: spBeam, spBeam, spWall, spColumn, spMat and spFrame.

University of Missouri-Kansas City, Kansas City, MO
Graduate Researcher with School of Dentistry and School of Engineering, 08/2005 – 06/2007

1. Multivariate statistical analysis of biological interfaces, Funded by NIH-NIDCR, \$113,268
Developed GUI based on principal component analysis and fuzzy c-means clustering (Machine Learning) to produce chemical and microstructural maps of biological interfaces obtained from Raman and FTIR microscopy. These maps were useful in separation of regions where univariate analysis was difficult due to spectral peak overlap. [J.8]

2. Hybrid reinforcement in flexural members using GFRP and mild steel – Funded by American Concrete Institute
Applied Euler beam theory to predict load-deformation curves for hybrid-reinforced concrete beams. The GFRP-mild steel reinforcement ratio was optimized to achieve maximum possible strength/weight ratio while retaining ductile failure.

Indian Institute of Technology-Madras, Chennai, TN, India
Undergraduate Researcher, Smart Materials and Structures Lab, 06/2004 to 07/2005

Determined geometric configuration of tensegrity structures by minimization of total potential energy. Described potential energy curve for twinning phenomenon in simplex under compressive loading. [C.10]

TEACHING EXPERIENCE

Tennessee State University, Nashville, TN

- Instructor: CVEN 3131, ENGR 1151, Spring 2018
- Instructor: PHYS 2010, 2020, 2120, Spring 2014 – Fall 2017
- Laboratory instructor: PHYS 2011, 2121, Spring 2014 – Fall 2017

Prairie View A&M University, Prairie View, TX

- Guest Lecture at NNSA MSIPP Summer Workshop: Introduction to Finite Element Method

University of Kansas, Lawrence, KS

- Guest Lecture: ME 990, Advanced Biomaterials, P. Spencer instructor, 09/2013
- Teaching Assistant, ME 765, Biomaterials, L. Friis instructor, Fall 2008
- Teaching Assistant, ME 755, Computer Simulation in Biomechanics, K. Fischer instructor, Spring 2009
- Teaching Assistant, ME 756, Biofluids, S. Kieweg instructor, Fall 2009
- Teaching Assistant, CE 861, Finite Element Method for Solid Mechanics, Spring 2010

University of Missouri-Kansas City, Kansas City, MO

Teaching Assistant, 06/2006 to 06/2007, Civil Engineering,

- Teaching Assistant, CE 422, Reinforced Concrete Design, G. Thiagarajan instructor, Fall 2005
- Teaching Assistant, CE 276, Strength of Materials, G. Thiagarajan instructor, Spring 2006
- Teaching Assistant, CE 275, Engineering Statics, G. Thiagarajan instructor, Spring 2007
- Tutor, Calculus I & II, MATH 210 and 220, School of Engineering, Spring 2007

PUBLICATIONS

Book Chapters

- B1. Q. Ye, F. Abedin, **R. Parthasarathy** and P. Spencer, “Photoinitiators in Dentistry: Challenges and Advances,” *Royal Society of Chemistry*, 2018, (in press)
- B2. A. Misra, V. Singh, and **R. Parthasarathy**, “Material-tissue interfacial phenomena: challenges in mathematical modeling,” *Mater. Interfacial Phenom. Contrib. from Dent. Craniofacial Reconstr.*, p. 253, 2016, doi: [10.1016/B978-0-08-100330-5.00010-8](https://doi.org/10.1016/B978-0-08-100330-5.00010-8)
- B3. A. Misra, O. Marangos, **R. Parthasarathy**, and P. Spencer, “Micro-scale analysis of compositional and mechanical properties of dentin using homotopic measurements,” in *Biomedical Imaging and Computational Modeling in Biomechanics*, Springer, 2013, pp. 131–141, doi: [10.1007/978-94-007-4270-3_7](https://doi.org/10.1007/978-94-007-4270-3_7)
- B4. P. Spencer, Q. Ye, J. Park, **R. Parthasarathy**, O. Marangos, A. Misra, B. S. Bohaty, V. Singh, and J. S. Laurence, “Dentin/adhesive interface in teeth,” in *Structural Interfaces and Attachments in Biology*, Springer, 2013, pp. 133–151., doi: [10.1007/978-1-4614-3317-0_7](https://doi.org/10.1007/978-1-4614-3317-0_7)

Journal Publications: Primary Contribution

- J1. **R. Parthasarathy**, Misra, A., Aryal, S.R., and Ouyang, L. (2018). "Phonon Dispersion Evolution in Uniaxially Strained Aluminum Crystal." *Continuum Mechanics and Thermodynamics (Under Review)*.
- J2. **R. Parthasarathy**, Misra, A., and Ouyang, L. (2018). "Finite-temperature Stress Calculations in Atomic Models using Moments of Position." *J. Computational Physics (Under Review)*.
- J3. A. Misra, **R. Parthasarathy**, Q. Ye, V. Singh, and P. Spencer, "Swelling equilibrium of dentin adhesive polymers formed on the water-adhesive phase boundary: Experiments and micromechanical model," *Acta Biomater.*, vol. 10, no. 1, pp. 330–342, 2014, doi: [10.1016/j.actbio.2013.09.017](https://doi.org/10.1016/j.actbio.2013.09.017)
- J4. A. Misra, **R. Parthasarathy**, V. Singh, and P. Spencer, "Micro-poromechanics model of fluid-saturated chemically active fibrous media," *ZAMM Zeitschrift fur Angew. Math. und Mech.*, vol. 95, no. 2, pp. 215–234, 2015, doi: [10.1002/zamm.201300071](https://doi.org/10.1002/zamm.201300071)
- J5. A. Misra, **R. Parthasarathy**, V. Singh, and P. Spencer, "Poromechanics parameters of fluid-saturated chemically active fibrous media derived from a micromechanical approach," *J. Nanomechanics Micromechanics*, vol. 3, no. 4, p. 4013002, 2013, doi: [10.1061/\(ASCE\)NM.2153-5477.0000069](https://doi.org/10.1061/(ASCE)NM.2153-5477.0000069)
- J6. **Parthasarathy, R.**, A. Misra, J. Park, Q. Ye and P. Spencer (2012). "Diffusion coefficients of water and leachables in methacrylate-based crosslinked polymers using absorption experiments." *Journal of Materials Science: Materials in Medicine* 23(5): 1157-1172, doi: [10.1007/s10856-012-4595-5](https://doi.org/10.1007/s10856-012-4595-5)
- J7. Q. Ye, **R. Parthasarathy**, F. Abedin, J. S. Laurence, A. Misra, and P. Spencer, "Multivariate analysis of attenuated total reflection Fourier transform infrared (ATR FT-IR) spectroscopic data to confirm phase partitioning in methacrylate-based dentin adhesive," *Appl. Spectrosc.*, vol. 67, no. 12, pp. 1473–1478, 2013, doi: [10.1366/13-07179](https://doi.org/10.1366/13-07179)
- J8. **R. Parthasarathy**, G. Thiagarajan, X. Yao, Y.-P. Wang, P. Spencer, and Y. Wang, "Application of multivariate spectral analyses in micro-Raman imaging to unveil structural/chemical features of the adhesive/dentin interface," *J. Biomed. Opt.*, vol. 13, no. 1, p. 14020, 2008, doi: [10.1117/1.2857402](https://doi.org/10.1117/1.2857402)

Journal Publications: Secondary Contribution

- J9. H. Li, S. Zhou, T. Johnson, K. Vercruyse, O. Lizhi, **R. Parthasarathy**, N. Phambu, A. J. Ropelewski, and T. W. Thannhauser, "Genome Structure of *Bacillus cereus* tsu1 and Genes Involved in Cellulose Degradation and Poly-3-Hydroxybutyrate Synthesis," *Int. J. Polym. Sci.*, vol. 2017, 2017, doi: [10.1155/2017/6192924](https://doi.org/10.1155/2017/6192924)
- J10. V. Singh, A. Misra, **R. Parthasarathy**, Q. Ye, and P. Spencer, "Viscoelastic properties of collagen-adhesive composites under water-saturated and dry conditions," *J. Biomed. Mater. Res. - Part A*, vol. 103, no. 2, pp. 646–657, 2015, doi: [10.1002/jbm.a.35204](https://doi.org/10.1002/jbm.a.35204)
- J11. D. Wang, C. Wang, J. Xu, B. Wu, L. Ouyang, **R. Parthasarathy**, and X. Chen, "Strain distribution and Raman spectroscopy in individual Ge/CdSe biaxial nanowires," *Jpn. J. Appl. Phys.*, vol. 54, no. 2, p. 25001, Feb. 2015, doi: [10.7567/JJAP.54.025001](https://doi.org/10.7567/JJAP.54.025001)

- J12. F. Abedin, Q. Ye, H. J. Good, **R. Parthasarathy**, and P. Spencer, “Polymerization-and solvent-induced phase separation in hydrophilic-rich dentin adhesive mimic,” *Acta Biomater.*, vol. 10, no. 7, pp. 3038–3047, 2014, doi: [10.1016/j.actbio.2014.03.001](https://doi.org/10.1016/j.actbio.2014.03.001)
- J13. V. Singh, A. Misra, **R. Parthasarathy**, Q. Ye, J. Park, and P. Spencer, “Mechanical properties of methacrylate-based model dentin adhesives: Effect of loading rate and moisture exposure,” *J. Biomed. Mater. Res. Part B Appl. Biomater.*, vol. 101, no. 8, pp. 1437–1443, 2013, doi: [10.1002/jbm.b.32963](https://doi.org/10.1002/jbm.b.32963)
- J14. P. Spencer, Q. Y. E. J. Park, A. Misra, B. S. Bohaty, V. Singh, **R. Parthasarathy**, F. Sene, S. E. de Paiva Goncalves, and J. Laurence, “Durable bonds at the adhesive/dentin interface: an impossible mission or simply a moving target?,” *Brazilian Dent. Sci.*, vol. 15, no. 1, p. 4, 2012, doi: [10.14295/bds.2012.v15i1.790](https://doi.org/10.14295/bds.2012.v15i1.790)
- J15. Q. Ye, J. Park, **R. Parthasarathy**, F. Pamatmat, A. Misra, J. S. Laurence, O. Marangos, and P. Spencer, “Quantitative analysis of aqueous phase composition of model dentin adhesives experiencing phase separation,” *J. Biomed. Mater. Res. Part B Appl. Biomater.*, 2012, doi: [10.1002/jbm.b.32675](https://doi.org/10.1002/jbm.b.32675)
- J16. Q. Ye, J. Park, J. S. Laurence, **R. Parthasarathy**, A. Misra, and P. Spencer, “Ternary phase diagram of model dentin adhesive exposed to over-wet environments,” *J. Dent. Res.*, vol. 90, no. 12, pp. 1434–1438, 2011, doi: [10.1177/0022034511423398](https://doi.org/10.1177/0022034511423398)

Conference Presentations (Abstract-Reviewed): Primary Contribution

- C1. **R. Parthasarathy**, S. Aryal, L. Ouyang, and A. Misra, “Separated Temporal and Spatial (SETS) Framework for Stress Calculation in Atomistic Models,” in *Engineering Mechanics Institute Conference*, 2017, San Diego, CA.
- C2. **R. Parthasarathy**, S. Aryal, L. Ouyang, and A. Misra, “Separated Temporal and Spatial (SETS) Framework for Stress Calculation in Atomistic Models,” in *Euromech Colloquium 579, Generalized and Microstructured Continua: New Ideas in Modeling*, 2017, Arpino, Italy.
- C3. **R. Parthasarathy**, S. Aryal, L. Ouyang, and A. Misra, “Atomistic to Continuum Homogenization,” in *Engineering Mechanics Institute Conference*, 2016, Nashville, TN.
- C4. A. Misra and **R. Parthasarathy**, “Nonlinear micro-poromechanics of fluid saturated active fibrous media,” in *Canadian Conference on Nonlinear Solid Mechanics*, 2013, Montreal, Quebec.
- C5. **R. Parthasarathy** and A. Misra, “Degree of swelling and sorption of chemically active materials modeled using granular micromechanics,” in *Engineering Mechanics Institute Conference*, 2013, Evanston, IL.
- C6. P. Spencer, Q. Ye, **R. Parthasarathy**, V. Singh, A. Misra, and J. S. Laurence, “Structure/Property of Model Dentin Adhesive Exposed to Wet Environments. Society for Biomaterials,” in *Society for Biomaterials Annual Meeting and Exposition*, 2013, Boston, MA.
- C7. Q. Ye, **R. Parthasarathy**, S. E. de Paiva Goncalves, J. Park, A. Misra, O. Marangos, and P. Spencer, “Aqueous Phase Properties of Model Dentin Adhesives Experiencing Phase Separation,” in *9th World Biomaterials Congress*, 2012, Chengdu, China.

- C8. **R. Parthasarathy** and A. Misra, “Micro-damage model for water saturated chemically active fibrous materials,” in *Engineering Mechanics Institute Conference*, 2012, Notre Dame, IN.
- C9. **R. Parthasarathy** and G. Thiagarajan, “Experimental testing of flexural behavior of beams reinforced with a hybrid combination of FRP and mild steel,” in *Proceedings of the Ninth Annual ACI Student Seminar on Cement and Concrete Research*, 2007, Columbia, MO.
- C10. **R. Parthasarathy**, V. PS, and S. Sivakumar, “Twinning like behavior in tensional integrity structures,” in *Proceedings of the International Conference on Smart Materials Structures and Systems*, 2005, Bangalore, India.

Conference Presentations (Abstract-Reviewed): Secondary Contribution

- C11. F. Abedin, Q. Ye, P. Spencer, **R. Parthasarathy**, J. S. Laurence, and A. Misra, “Hydrophilic-rich phase in dentin adhesive: Photo-polymerization and critical water content,” in *International Association for Dental Research*, 2013, Seattle, WA.
- C12. S. E. de Paiva Goncalves, Q. Ye, **R. Parthasarathy**, J. Park, A. Misra, O. Marangos, and P. Spencer, “Dentin adhesive in overwet environment: Photoinitiator composition and concentration,” in *International Association of Dental Research*, 2012, Seattle, WA.
- C13. A. Misra, V. Singh, **R. Parthasarathy**, O. Marangos, and P. Spencer, “Mathematical model for anomalous creep in model dentin adhesives,” in *International Association of Dental Research*, 2011, San Diego, CA.
- C14. Q. Ye, F. Pamatmat, and **R. Parthasarathy**, “Water compatibility and phase diagram of model dentin adhesives,” in *International Association of Dental Research*, 2011, San Diego, CA.

Poster Presentations:

- P1. A. Joaquim, O. Paul, R. Turner, **R. Parthasarathy**, L. Ouyang, Yu. A. Barnakov and F. R. Williams, The synthesis, mechanical and structural properties of piezoelectric Polyvinylidene fluoride doped with BaTiO₃ nanoparticles. in *255th American Chemical Society National Meeting*, 2018, New Orleans, LA.
- P2. **R. Parthasarathy**, J. Beam, F. Hoff, and C. Lukehart, “Characterization of bonding between super-hard ceramics and polymer substrate,” in *AVS Science and Technology of Materials, Interfaces and Processing 63rd International Symposium*, 2016, Nashville, TN.
- P3. **R. Parthasarathy**, A. Misra, Q. Ye, J. Park, and P. Spencer, “Chemo-mechanical characterization of phase-separated dentin adhesives,” 2013, in *2013 Sigma Xi Student Research Showcase*
- P4. **R. Parthasarathy**, A. Misra, and P. Spencer, “Application of soft tissue micromechanics model to condylar cartilage,” 2011, San Diego, CA.

HONORS AND AWARDS

Awards

Second Place, Graduate Engineering, Sigma Xi Research Showcase, 04/2013 [P.2]
 Outstanding Graduate Paper, American Concrete Institute, 04/2007

Honorable Mention, Pre-stressed Concrete Institute, 06/2007
Outstanding Graduate Student, University of Missouri – Kansas City, 06/2006

Fellowships

Summer Research Fellowship for \$5000, University of Kansas, 05/2010

Scholarships

Strobel Scholarship, University of Kansas, 08/2010

Pratibha Scholarship, Government of India, 09/2001 – 06/2005

CONFERENCE SESSIONS CHAIRED

- Minisymposium co-organizer and session co-chair, “Degradation and Healing in Particulate Systems – Session W1 – MS 71” **Engineering Mechanics Institute (EMI)** 2017, 06/4-06/7, 2017, Omni Hotel, San Diego, USA.

INVITED TALKS

- Vanderbilt University, Condensed Matter and Optics Seminar, 01/26/2018
- University of Kansas, Institute for Bioengineering Research, 06/2017
- Tennessee State University, 39th Annual Research Symposium, 04/2017
- Vanderbilt University, Department of Civil Engineering, 03/2016
- University of Kansas, Bioengineering Research Center, 09/2013
- Proceedings of the 9th Annual ACI Student Seminar, 09/2006

SOCIETIES AND HONORARIES

- Eng. Mechanics Institute, Granular Mechanics Committee member, 06/2017 to present
- Sigma Xi Scientific Research Society, Student Member, 04/2012- 2013
- KU Bioengineering Student Council, Treasurer, 01/2011-12/2011
- Structural Engineering Association of Kansas and Missouri, VP, 04/2006 – 06/2007

References:

- 1) Dr. Anil Misra, Ph.D., P.E.
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1530 W. 15th Street
Lawrence, KS 66045-7609
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- 2) Dr. Paulette Spencer, D.D.S., Ph.D.
Ackers Distinguished Professor, Mechanical Engineering
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- 3) Dr. Lizhi Ouyang, Ph.D.
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- 4) Neil Henson, Ph.D.,
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- 5) Charles M. Lukehart, Ph.D.
Research Professor of Chemistry
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- 6) Michael T. Ivy, Ph.D.
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