

CURRICULUM VITAE

ROSEANNA N. ZIA, PH.D.

Associate Dean of Research, College of Engineering
Wollersheim Professor, Mechanical and Aerospace Engineering
University of Missouri, Columbia
RZIA@missouri.edu

EDUCATION

California Institute of Technology

Ph.D. Mechanical Engineering. *Minor in Chemical Engineering.* June 2011.

Thesis: *Nonlinear microrheology: microviscosity, microdiffusivity, and normal stresses*

Advisor: Prof. John F. Brady

University of Michigan

M.Eng. Mechanical/manufacturing Engineering.

Thesis: *Multiple Output Dome Switch for Airbag Deployment Algorithm*

Advisor: Prof. Liwei Lin (presently at U.C. Berkeley)

University of Missouri

B.S.M.E. Mechanical Engineering. *Honors Scholar.*

Honor's Thesis: *FMEA Analysis for automotive transmission subassembly*

PROFESSIONAL EXPERIENCE

Associate Dean of Research, College of Engineering, University of Missouri	2023 – present
Wollersheim Professor, Mechanical & Aerospace Engineering, University of Missouri	2023 – present
Associate Professor with Tenure, Chemical Engineering, Stanford University	2021 – 2022
By Courtesy, <i>Mechanical Engineering</i> , Stanford University	2018 – present
Otterson Faculty Scholar, Stanford University	2021 – present
Assistant Professor, Chemical Engineering, Stanford University	2017 – 2020
Terman Faculty Fellow, Stanford University School of Engineering	2017 – present
Assistant Professor, Chemical & Biomolecular Engineering, Cornell University	2013 – 2017
James C. and Rebecca Q. Morgan Sesquicentennial Faculty Fellow, Cornell	2013 – 2017
Postdoctoral Scholar, Mechanical & Aerospace Engineering, Princeton University	2011 – 2012
Graduate Researcher, Mechanical Engineering, California Institute of Technology	2006 – 2011
Delphi Automotive Corp. Engineering Manager. Detroit, Michigan.	2001-2006

TEACHING ACTIVITIES:

University of Missouri:

1. MAE 3400 – Fluid Mechanics (undergraduate core) starting fall 2023

Stanford University:

1. ChemEng 422 – Suspension Mechanics (graduate elective designed by RNZ) 2018 – present
2. ChemEng 310 – Fluid Mechanics (graduate core) 2018 – present
3. ChemEng 120B – Heat and Mass Transport (undergraduate core) 2019 – present
4. ChemEng 699 – Colloquium 2017 – 2020

Cornell University:

5. CHEME 3230 – Fluid Mechanics (undergraduate core) 2013 – 2017
6. CHEME 7340 – Low-Reynolds Number Hydrodynamics (grad elective designed by RNZ) 2014 – 2017
7. CHEME 4900 – AIChE ChemE Car Project Team – Faculty Advisor 2013 – 2017
8. CHEME 4320 – Unit Operations Laboratory 2016

Short Courses:

Advanced Characterization & Modeling techniques for Colloids – EU Colloid & Interface Society, Heraklion, Greece (2022)

Colloidal Gels – Society of Rheology Conference (2021)

Colloidal Dispersions – FORTH / University of Crete (2019)

Colloidal Dispersions (w/ C. Macosko, G. Fuller, G. McKinley, & R. Ewoldt) – @ Stanford (2019)

Colloidal Gels – American Physical Society March Meeting (2016)

Microrheology (co-taught with E.M. Furst, U. Delaware) Society of Rheology Conference (2015)

Microrheology – 27th Intl. Conf. on Complex Fluids @ San Luis Potosi, Mexico (2015)

FELLOWSHIPS, HONORS AND AWARDS

- 2023 Sloan Foundation Research Award
2022 Named Dave Wollersheim Professor, University of Missouri
2021 Corrsin Lecturer, Johns Hopkins University Chemical Engineering
2021 Croft Lecturer, University of Missouri College of Engineering
2021 Lee Otterson Faculty Scholar, Stanford University
2020 Tau Beta Pi Teaching Award List, Stanford School of Engineering
2019 **PECASE** – Presidential Early Career Award for Scientists and Engineers
- Nominator: *Department of Defense*
2019 **PECASE** – Presidential Early Career Award for Scientists and Engineers
- Nominator: *National Science Foundation*
2017 Terman Faculty Fellow, Stanford University
2017 ONR Director of Research Early Career Award
2016 Associate Editor, *Journal of Rheology*
2016 Advisory Board Member, *Physics of Fluids*
2015 NAE Frontiers in Engineering
2015 Cornell College of Engineering (Sonny Yau '72) Teaching Award
2015 White House Workshop on the National Strategic Computing Initiative held by Executive Order of President Barack Obama
2014 ONR Young Investigator Award
2014 NSF CAREER Award (selected fall 2013)
2014 NAE Frontiers in Engineering Education
2014 Best Paper Award in Session, AIChE Area 1J Fluid Mechanics
2014 Cover of the *Journal of Rheology*, Special Issue, Volume 58, Issue 5
2014 Cover of the *Journal of Rheology*, Volume 58, Issue 1
2014 Cover of the Society of Rheology Bulletin, Q1
2014 Featured on NSF XSEDE Year 1 Retrospective Report
2013 Publication of the Year, *Journal of Rheology*
2013 NSF BRIGE Award, National Science Foundation
2013 Cover of the *Journal of Rheology*, Volume 57, Issue 2
2013 James C. and Rebecca Q. Morgan Faculty Fellow Cornell University
2012 Best Poster, Princeton University Research Symposium, Princeton University
2008-11 NDSEG Fellow (2008 – 2011) California Institute of Technology
2011 Everhart Lecturer, California Institute of Technology
2011 Graduate Dean's Award, California Institute of Technology
2010 P.E.O. Scholar Award, California Institute of Technology
2009 Best Overall Poster, Poster Symposium, California Institute of Technology
2008 First Place, Best Poster, International Congress on Rheology
2006-7 Moore Fellow, California Institute of Technology
Honors Scholar, University of Missouri
President, Pi Tau Sigma Honor Society for Mechanical Engineering, Univ. of Missouri chapter
Tau Beta Pi Engineering Honor Society
National Merit Special Scholarship

PUBLICATIONS *=CORRESPONDING AUTHOR. TOP 10 CITED ARTICLES †2014, ††2017, †††2019

- [49] J.L. Hofmann, T.S. Yang, A.M. Sunol and R.N. Zia; "Pre-loading of EF-Tu at ribosomal L7/L12 speeds translation elongation in *Escherichia coli*". *BioRxiv* [doi...]. *PNAS*, in review.
[48] J. L. Hofmann, A. J. Maheshwari, A. M. Sunol, D. Endy, and R. N. Zia*, "Ultra-weak protein-protein interactions can modulate proteome-wide searching and binding". *BioRxiv* doi.org/10.1101/2022.09.30.510365 & in review at *Cell Reports Phys. Science*.
[47] S.M. Fenton, B.K. Ryu, P. Padmanabhan, T.T.D. Nguyen, R.N. Zia, M.E. Helgeson; "Not too cold, not too crowded: identifying minimal conditions for solidification and thermal processing of colloidal gels". *PNAS*, in press.

- [46] A. Sunol and R. N. Zia, "Confined Brownian Suspensions: Equilibrium Diffusion, Thermodynamics, and Rheology". *Journal of Rheology*. **67**(2), 433–460.
- [45] A. Maheshwari, E. Gonzalez, A. Sunol, D. Endy, R. N. Zia* Molecular transport and packing underlie increasing ribosome productivity in faster growing cells. *mBio*. 10.1128/mbio.02865-22.
- [44] B.K. Ryu, S.M. Fenton, T.T.D. Nguyen, M.E. Helgeson, & R.N.Zia*, "Modeling colloidal interactions that predict equilibrium and non-equilibrium states", *Journal of Chemical Physics, Invited, Special Topic on Slow Dynamics*. DOI: 10.1063/5.0086650 (2022)
- [43] B. K. Ryu & R. N. Zia*, "Detailed Characterization of Tortuous Networks in Porous Media", *J. Rheology*, DOI: 10.1122/8.0000359 (2022)
- [42] A. Maheshwari, E. Gonzalez, A. Sunol, D. Endy, R. N. Zia* Molecular transport and packing underlie increasing ribosome productivity in faster growing cells. *BioRxiv* doi.org/10.1101/2021.10.27.466129. (2021)
- [41] C. Aponte-Rivera & R. N. Zia*, The confined Generalized Stokes-Einstein relation and its consequence on intracellular two-point microrheology, *J. Colloid & Interface Sci.* **609** 423-433
- [40] D. E. Huang & R. N. Zia*, "Toward a flow-dependent phase-stability criterion: osmotic pressure in sticky flowing suspensions", **Invited**, Special Topic, Depletion Forces and Asakura-Oosawa Theory, *J. Chem. Phys.* **155**, 134113 (2021)
- [39] E. G. Gonzalez, C. A. Aponte-Rivera, & R. N. Zia*, Impact of polydispersity and confinement on diffusion in hydrodynamically interacting colloidal suspensions. *J. Fluid Mech.* **925**(A35) (2021)
- [38] G. J. Ouaknin, Y. Su, & R. N. Zia*, Parallel accelerated Stokesian dynamics with Brownian motion, *J. Computational Physics* **442**, 110447 (doi.org/10.1016/j.jcp.2021.110447) (2021)
- [37] J. G. Wang & R. N. Zia*, Vitriification is a spontaneous non-equilibrium transition driven by osmotic pressure. *J. Phys. Condensed Matter, Invited, Special Issue on Glasses and gels: a crossroad of molecular liquids, polymers and colloids*. doi: 10.1088/1361-648X/abeec0 **33**, 184002 (2021)
- [36] L. C. Johnson & R. N. Zia*, Phase mechanics of colloidal gels: osmotic pressure drives non-equilibrium phase separation. *Soft Matter Emerging Investigators 2021, Invited*. **17**, 3784-3797(2021)
- [35] B. E. Dolata & R. N. Zia*, Faxén formulas for particles of arbitrary shape and composition. *J. Fluid Mech.* **910** (A22) 1-19 (2021)
- [34] J. G. Wang, X. Peng, Q. Li, D. Chen, G. B. McKenna and R.N. Zia*, "'Dense diffusion' in colloidal glasses: short-ranged long-time self-diffusion as a mechanistic model for relaxation dynamics" *Soft Matter* **16** 7370-7389 (2020)
- [33] B.E. Dolata & R.N. Zia*, Heterogenous dispersions as microcontinuum fluids, *J. Fluid Mech.* **888** 1-30 (2020).
- [32] E. Ong*, M. Ramaswamy, R. Niu, N. Lin, A. Shetty, R. Zia, G. McKinley, & I. Cohen, Stress decomposition in LAOS of dense colloidal suspensions, *J. Rheology*, **64**(2), 343–351 (2020). **Invited, Cover of Journal.**
- [31] A. J. Maheshwari, A. M. Sunol, E. Gonzalez, D. Endy, & R. N. Zia*, Colloidal hydrodynamics of biological cells: A frontier spanning two fields. *Phys. Rev. Fluids* **4**, 110506 (2019) **Invited Article.**
- [30] R. P. Mohanty & R. N. Zia*, Transient nonlinear microrheology in hydrodynamically interacting colloidal dispersions: flow cessation. *J. Fluid Mech.* **884**, A14 (2019)
- [29] D. E. Huang & R. N. Zia*, Sticky-probe active microrheology: Part 2. The influence of attractions on non-Newtonian flow, *J. Colloid & Interface Sci.* **562**, 293–306 (2019)
- [28] D. E. Huang & R. N. Zia*, Sticky, active microrheology: Part 1. Linear-response. *J. Colloid & Interface Science.* **554**, 580–591 (2019)
- +++ [27] L. C. Johnson, R. N. Zia*, E. Moghimi, & G. Petekidis, "Influence of structure on the linear response rheology of colloidal gels". *J. Rheol.*, **63**(4) 583-608 (2019).
- [26] H. C. W. Chu & R. N. Zia*, Toward a nonequilibrium Stokes-Einstein relation via active microrheology of hydrodynamically interacting colloidal dispersions. *J. Colloid & Interface Science.* **539**, 388-399 (2019).
- [25] J. C. Kuo, J. G. Gandhi, R. N. Zia & M. J. Paszek* "The Physical Biology of the Glycocalyx: A Cancer Perspective". *Nature Phys.* [10.1038/s41567-018-0186-9](https://doi.org/10.1038/s41567-018-0186-9) **14**(7): 658-669 (2018).
- [24] X. Peng, J. G. Wang, Q. Li, D. Chen, R.N. Zia*, & G.B. McKenna "Exploring the validity of time-concentration superposition in glassy colloids." *Phys.Rev.E* **98** 062602 (2018)
- [23] P. Padmanabhan and R. N. Zia*, "Gravitational collapse of colloidal gels: Non-equilibrium phase separation driven by osmotic pressure", *Soft Matter* **14**(17) 3265-3287 (2018) **Front Cover.**

- [22] L. C. Johnson, B. J. Landrum, and R. N. Zia*, "Yield of reversible colloidal gels during flow startup: the role of Brownian and glassy dynamics", *Soft Matter* **14**(18) 5048-5068 (2018)
- [21] R. P. Mohanty and R.N. Zia*, "The impact of hydrodynamics on stress formation, relaxation, & memory in colloidal dispersions: Transient, non-linear microrheology." *AIChE J. Invited: Futures Issue*. (2018)
- [20] C.A. Aponte-Rivera, Y. Su, and R.N. Zia*, "Equilibrium structure & diffusion in concentrated, hydrodynamically interacting suspensions confined in a spherical cavity", *J. Fluid Mech.* **836** (2018)
- [19] R. N. Zia* "Active & passive microrheology: Theory & simulation." *Ann. Rev. Fluid Mech.* **50**:1–33 (2018)
- [18] B. E. Dolata & R.N. Zia*, "Non-equilibrium pair interactions in colloidal dispersions". *J. Fluid Mech.* **836**: 694-739. (2018)
- [17] Y. Su, J.W. Swan, and R.N. Zia*, "Pair mobility functions for rigid spheres in concentrated colloidal dispersions: stresslet and straining motion." *J. Chem. Phys.*, **146** (12), 124903 (2017)
- [16] H.C.W. Chu and R.N. Zia*, "The non-Newtonian rheology of hydrodynamically interacting colloids via active, nonlinear microrheology." *J. Rheol.*, **61**(3), 551-574 (2017)
- [15] C.A. Aponte-Rivera and R.N. Zia*, "Simulation of hydrodynamically interacting particles confined by a spherical cavity." *Phys. Rev. Fluids* **1**(2), 023301 (2016)
- ††[14] B.J. Landrum, W.B. Russel, and R.N. Zia*, "Delayed yield in colloidal gels: Creep, flow, and re-entrant solid regimes." *J. Rheol.* **60** (4), 783 – 807 (2016). **Featured in UT Austin TACC Podcast.**
- [13] H.C.W. Chu and R.N. Zia*, "Active microrheology of hydrodynamically interacting colloids: normal stresses and entropic energy density." *J. Rheol.* **60** (4), 755 – 781 (2016)
- [12] N.J. Hoh and R.N. Zia*, "The impact of probe size on measurements of diffusion in active microrheology." *Lab on a Chip – Invited, Emerging Investigators Issue*, **16**, 3114 – 3129 (2016)
- [11] N.J. Hoh and R.N. Zia*, "Force-induced diffusion in suspensions of hydrodynamically interacting colloids." *J. Fluid Mech.* **795**, 739-783 (2016)
- [10] N.J. Hoh and R.N. Zia*, "Hydrodynamic diffusion in active microrheology of non-colloidal suspensions: the role of interparticle forces." *J. Fluid Mech.* **785**, 189-218 (2015)
- [9] R.N. Zia*, J.W. Swan, and Y. Su, "Pair mobility functions for rigid spheres in concentrated colloidal dispersions: force, torque, translation, and rotation." *J. Chem. Phys.* **143**, 224901 (2015)
- †[8] R.N. Zia*, B.J. Landrum, and W.B. Russel, "A micro-mechanical study of coarsening and rheology of colloidal gels: Cage building, cage hopping, and Smoluchowski's ratchet." *J. Rheol* **58**(5), (2014) **Invited.**
- †[7] J.W. Swan*, R.N. Zia, and J.F. Brady, "Large amplitude oscillatory microrheology." *J. Rheol.*, **58**(1), 1-41 (2014) **Cover of Journal.**
- [6] J.W. Swan and R.N. Zia*, "Active microrheology: fixed-velocity versus fixed-force." *Phys. Fluids*, **25**(8), 083303(1-23) (2013)
- [5] N.Y.C. Lin, S. Goyal, X. Cheng, R.N. Zia, F. Escobedo, and I. Cohen*, "Far-from-equilibrium sheared colloidal liquids: Disentangling relaxation, advection, and shear-induced diffusion." *Phys. Rev. E*, **88**, (2013)
- [4] R.N. Zia* and J.F. Brady, "Stress development, relaxation and memory in colloidal dispersions: transient nonlinear microrheology." *J. Rheol.*, **57**(2), (2013) **Cover of Journal.**
- [3] R.N. Zia* and J.F. Brady, "Microviscosity, microdiffusivity, and normal stresses." *J. Rheol.*, **56**, 1175-1208 (2012) **Publication of the Year.**
- [2] J.W. Swan, J.F. Brady, R.S. Moore, L. Dooling, N.J. Hoh, J. Choi, & R.N. Zia. "Modeling hydrodynamic self-propulsion with Stokesian Dynamics." *Phys. Fluids*, **23**(7), 071901(1-19) (2011)
- [1] R.N. Zia* and J.F. Brady. "Single particle motion in colloids: force-induced diffusion." *J. Fluid Mech.* **658**, 188-210 (2010).

CHAPTER IN BOOK

R. N. Zia & J. F. Brady. "Theoretical microrheology," in *Complex Fluids in Biological Systems: Experiment, Theory, and Computation*, ed. S. Spagnolie (Springer, NY, 2014)

FEATURE ARTICLES AND PODCASTS

Russ Altmann's *The Future of Everything*, April 4, 2022

Interviewed for *The New Yorker*, "A Journey to the Center of our Cells", J. Somers ([link to article](#))

Podcast, Texas Advanced Computing Center <https://www.tacc.utexas.edu/-/sudden-collapse-supercomputing-spotlight-on-gels>

EDITORIAL AND JOURNAL POSITIONS

- Associate Editor, **Journal of Rheology** (2016 – present)
- Editorial Board Member, **Physics of Fluids** (2016 – 2019)
- Editorial Board Member, **AIChE J** (2020 – present)
- Guest Editor, **PNAS** (Proceedings of the National Academy of Sciences) 2019
- Guest Editor, **PLOS One** 2017
- *Ad hoc* Journal peer reviewing (J. Rheol, JFM, PRL, PNAS, JCIS, Soft Matt., + others)