RANGANATHAN (RANGA) GOPALAKRISHNAN

UMRF Ventures Assistant Professor of Mechanical Engineering
310D Engineering Science Building, The University of Memphis, Memphis, TN 38152
Office Phone: +1-901-678-2580; Email: rgplkrsh@memphis.edu
Faculty page: http://www.memphis.edu/me/faculty/gopalakrishnan.php
List of publications: https://scholar.google.com/citations?user=tQrZ9j4AAAAJ&hl=en&oi=ao
Teaching videos: https://www.youtube.com/channel/UCDVmZHHXN5U5JJGMzWmgEsQ

Current as of **October 22, 2020**

Professional Experience:

- Assistant Professor, Department of Mechanical Engineering, The University of Memphis
  August 2016 – present
  UMRF Ventures Assistant Professor of Mechanical Engineering (Sep 2020 – Aug 2022)
  US Dept of Energy EARLY CAREER Award 2020 https://science.osti.gov/early-career

- Visiting Academic Fellow/Professor, Laboratoire des Sciences des Procédés et des Matériaux, University Paris XIII, July 1 – 20, 2018.

- Lecturer, Department of Mechanical and Industrial Engineering, The University of Iowa
  August 2015 to July 2016

- Postdoctoral Scholar in Chemical Engineering, University of California at Berkeley.
  October 2014 to July 2015. Supervisor: Prof. David B. Graves

- Postdoctoral Scholar in Chemical Engineering, California Institute of Technology.
  September 2013 to September 2014. Supervisor: Prof. Richard C. Flagan

Educational Background:

- Ph. D., University of Minnesota – Twin Cities, Minneapolis, MN, U. S. A. August 2013.
  Co-Advisers: Prof. Christopher J. Hogan Jr. and Prof. Peter H. McMurry
  Thesis Title: *Transition Regime Collisions in Aerosols*
  Recipient of 2012-13 University of Minnesota Doctoral Dissertation Fellowship
  Honorable Mention, University of Minnesota Best Dissertation Competition 2014

- Bachelor of Technology (Mechanical Engineering), National Institute of Technology, Tiruchirappalli, India. May 2008.

Teaching Record:

University of Minnesota – Twin Cities (as TA, Fall 2009 – Spring 2012)*:*

- ME 4031W: Basic Mechanical Measurements Laboratory
  Terms: Fall 2009, Fall 2010, Spring 2011, Fall 2011, Spring 2012
  Instructor: Prof. Peter H. McMurry
- ME 3332: Thermal Sciences II
  Term: Spring 2010
  Instructor: Prof. Christopher J. Hogan Jr.

The University of Iowa (as Lecturer, Fall 2015 – Spring 2016)*:*

ME 3351 Engineering Instrumentation (Fall 2015)
ME 4080 Experimental Engineering (Fall 2015, Spring 2016)
ME 4086 Mechanical Engineering Design Project (Spring 2016)
ME 3052 Mechanical Systems (Spring 2016)

The University of Memphis (as Assistant Professor, Fall 2016 – present)*:*

MECH 4309/6309 Gas Dynamics (Fall 2016)
MECH 4990/6990 Aerosol Engineering (Spring 2017, Spring 2021)
MECH 7341/8341 Engineering Analysis I (Fall 2017)
MECH 7378/8378 Introduction to Computational Fluid Dynamics (Spring 2018)
MECH 7342/8342 Engineering Analysis II (Spring 2018)
MECH 3331 Fluid Mechanics (Fall 2018, Spring 2020, Fall 2020)
MECH 3341 Numerical and Statistical Methods (Spring 2019, Fall 2019)
MECH 2311 Thermodynamics I (Fall 2019, Spring 2020)
MECH 3335 Fluid Mechanics Lab (Spring 2020, Fall 2020, Spring 2021)

Mentoring Record:

1. Mr. Rayhan Ahmed (PhD awarded May 2020)
2. Mr. Harjindar Singh Chahl (MS awarded May 2019)
3. Mr. Prashant Parajuli (MS awarded May 2019)
4. Mr. Ewe Jiun Chng (MS awarded May 2018)
5. Mr. Lekhnath Pokharel (MS awarded May 2018)

Current PhD Advisees: Li Li, Vikram Suresh, Nitesh Reddy Palagiri
Current MS Advisee: Andrei Fendley
Undergraduate Researchers: Joshua Redmond Go Felipe, Zhibo Liu, Ryan Montgomery

<u>Externally Sponsored Research Grants</u> (<u>$1,322,204</u> in total):

1. University of Minnesota Board of Regents (**Completed**)
   - "Fabrication of ultrasonic aerosol generators"
   - **Amount: $8,054**, Duration: May 1, 2019 – August 31, 2019

2. National Science Foundation Division of Physics (**Ongoing**)
   - **Project title:** An effective potential approach to the modeling of concentrated dusty plasmas
   - **Amount: $199,673**
   - **Duration:** July 1, 2019 – June 30, 2022
   - **Publicly released project abstract:** https://nsf.gov/awardsearch/showAward?AWD_ID=1903432

3. Department of Energy Office of Science – Fusion Energy Sciences (**Ongoing**)
   - **Project title:** Thermodynamics and Transport Models of Strongly Coupled Dusty Plasma Matter
   - **EARLY CAREER Award Amount: $750,695**
   - **Duration:** September 1, 2020 – August 31, 2025
   - **Publicly released project abstract:** https://pamspublic.science.energy.gov/WebPAMSExternal/Interface/Common/ViewPublicAbstract.aspx?rv=81050aaf-d943-419a-b14d-e911370cf527&rtc=24

4. Department of Energy Office of Science – Basic Energy Sciences (**Ongoing**)
   - **Project title:** Langevin Dynamics modeling of gas-phase ion-ion recombination
   - **Amount: $363,782**
   - **Duration:** September 1, 2020 – August 31, 2023
   - **Publicly released project abstract:** https://pamspublic.science.energy.gov/WebPAMSExternal/Interface/Common/ViewPublicAbstract.aspx?rv=412be1ad-8af3-4d68-ab51-53fc44ee8975&rtc=24

<u>The University of Memphis Internal Research Grants</u> (<u>$153,500</u> in total):

1. Herff Faculty Research Grant ($6,000)
2. Multiple FedEx Institute of Technology DRONES Research Awards ($37,500)
3. Multiple Green Fee Fund Campus Improvement Grants ($57,000)
4. Multiple FedEx Institute of Technology Development Grants ($30,000)
5. FedEx Institute of Technology Data Sciences Research Grant ($3,000)
6. UMRF Ventures Professorship 2020 – 2022 ($20,000)

Peer Reviewed Publications: (* - advisees of Dr. Gopalakrishnan)

Journal	2019 Impact Factor	# of publications
Journal of Aerosol Science	2.649	7
Aerosol Science and Technology	2.340	5
Journal of Chemical Physics	2.991	2
Physical Review E	2.296	2
Journal of Physics D: Applied Physics	3.169	1
Thin Solid Films	2.030	1
Powder Technology	4.142	1

1. **Gopalakrishnan, R.,** & Hogan, C. J. (2011), Determination of the transition regime collision kernel from mean first passage times. *Aerosol Science and Technology, 45: 1499-1509.*

2. **Gopalakrishnan, R.**, Thajudeen, T. & Hogan, C. J. (2011), Collision limited reaction rates for arbitrarily shaped particles across the entire diffusive Knudsen number range. *Journal of Chemical Physics, 135: 054302.*

3. **Gopalakrishnan, R.,** & Hogan, C. J. (2012), Coulomb-influenced collisions in aerosols and dusty plasmas. *Phys. Rev. E, 85: 026410.*

4. Thajudeen, T., **Gopalakrishnan, R.** & Hogan, C. J. (2012), The collision rate of non-spherical particles and aggregates for all diffusive Knudsen numbers. *Aerosol Science and Technology, 46(11): 1174-1186.*

5. Ouyang, H., **Gopalakrishnan, R.** & Hogan, C. J. (2012), Nanoparticle collisions and growth in the gas phase in the presence of singular attractive potentials. *Journal of Chemical Physics, 137: 064316.*

6. **Gopalakrishnan, R.**, Meredith, M. J., Larriba, C. & Hogan, C. J. (2013), Brownian dynamics determination of the bipolar steady charge distribution on sphere and non-spheres in the transition regime. *Journal of Aerosol Science, 63: 126-145*.

7. **Gopalakrishnan, R.**, Thajudeen, T., Ouyang, H. & Hogan, C. J. (2013), The unipolar diffusion charging of arbitrary shaped aerosol particles. *Journal of Aerosol Science, 64: 60-80*.

8. **Gopalakrishnan, R.**, McMurry, P. H., & Hogan, C. J. (2015), The electrical mobilities and scalar friction factors of modest-to-high aspect ratio particles in the transition regime. *Journal of Aerosol Science, 82: 24-39.*

9. **Gopalakrishnan, R.**, McMurry, P. H., & Hogan, C. J., (2015). The Bipolar Diffusion Charging of Nanoparticles: A Review and Development of Approaches for Non-Spherical Particles. *Aerosol Science and Technology, 49(12): 1181-1194*.

10. **Gopalakrishnan, R.**, Kawamura, E., Lichtenberg, A. J., Lieberman, M. A., & Graves, D. B., (2016) Solvated electrons at the atmospheric pressure plasma-water anodic interface *J. Phys. D: Appl. Phys., 49: 295205.* ***Selected by the Editorial Board of J. Phys. D: Appl. Phys. to feature in Highlights of 2016.***

11. Wong, C.-S., Goree, J. A., & **Gopalakrishnan, R.,** (2018) Experimental demonstration that a free-falling aerosol particle obeys a fluctuation theorem, *Physical Review E (Rapid Communication), 97: 050601(R)*.

12. Wong, C.-S., **Gopalakrishnan, R.**, and Goree, J. A., (2019) Fluctuation-theorem method of measuring a particle's mass without knowing its shape or density, *Journal of Aerosol Science, 129: 116-123*.

13. Pokharel*, L., Parajuli*, P., Li*, L., Chng*, E. J., and **Gopalakrishnan, R.,** (2019) An ultrasonic feeding mechanism for continuous aerosol generation from cohesive powders. *Aerosol Science and Technology, 53(3): 321-331*.

14. Chahl*, H. S. and **Gopalakrishnan, R.,** (2019) High potential, near free molecular regime Coulombic collisions in aerosols and dusty plasmas, *Aerosol Science and Technology, 53(8): 933-957*.

15. Ahmed*, R., & **Gopalakrishnan, R.** (2019), Computational study of electrostatic focusing of aerosol nanoparticles using an einzel lens, *Journal of Aerosol Science*, 105443 (2019).

16. Chng*, E. J., Watson, A. B., Suresh*, V., Fujiwara, T., Bumgardner, J. D., & **Gopalakrishnan, R.** (2019), Adhesion of electrosprayed chitosan coatings using silane surface chemistry, *Thin Solid Films*, 137454.

17. Li*, L., Chahl*, H. S. and **Gopalakrishnan, R.** (2020), Comparison of the predictions of Langevin Dynamics-based diffusion charging collision kernel models with canonical experiments, *J. Aerosol. Sci. 140, 105481*.

18. Ahmed*, R., Suresh*, V., Li*. L. and **Gopalakrishnan, R.** (2020)**,** Scalable generation of high concentration aerosol in the size range of 0.1–10 μm from commercial powders using ultrasonic dispersion, *Powder Technology* **376**, 52.

19. Li*, L. and **Gopalakrishnan, R.** (2020), An experimentally validated model of diffusion charging of arbitrary shaped aerosol particles. *Journal of Aerosol Science* 151: 105678.

Patent Applications: (* - advisees of Dr. Gopalakrishnan)

1. **Ranganathan Gopalakrishnan**, Lekhnath Pokharel*, Ewe Jiun Chng*, Rayhan Ahmed*, Jason Scott Presley, "SYSTEMS AND METHODS FOR DISPERSION OF DRY POWDERS", US 2020/0139336, A1, Appl. No. 16/556,257. https://patents.google.com/patent/US20200139336A1/en

Invited Presentations: (* - advisees of Dr. Gopalakrishnan)

1. Chahl*, H. S., & **Gopalakrishnan, R.** (presenter), Langevin dynamics modeling of gas-phase ion-ion recombination rates, 1st Symposium on Nonequilibrium Multiphase Systems, Saint Louis, MO USA December 7-8, 2018, Hosted at Washington University in Saint Louis (WUStL) by the Center for Aerosol Science and Engineering (CASE).

2. **Gopalakrishnan, R.** (presenter), Room temperature, solvent-free processing of ceramic coatings using Aerosol Deposition method, Invited seminar at the Department of Mechanical Engineering, University of Maryland – Baltimore County, March 8th, 2019.

3. Vikram Suresh*, Ewe Jiun Chng*, Joel Bumgardner and **Ranganathan Gopalakrishnan** (presenter), invited presentation titled "Evaluation of the Adhesion of Electrosprayed and Solution-Cast Chitosan Coatings on Titanium Surfaces", Session D2-TuA2, Abstract #292 at the International Conference on Metallurgical Coatings and Thin Films (ICMCTF) 2019, May 19 – 24, 2019, San Diego, CA, USA.

4. Rayhan Ahmed* (presenter), Vikram Suresh*, Li Li*, Prashant Parajuli*, Sanjay Mishra & **Ranganathan Gopalakrishnan**, invited presentation titled "One-step, Direct Write Aerosol Impact Consolidation Method for Fabricating Thin Films of TiO2 on Glass", in *Special Session: Spray AM - Direct Writing by Aerosol Deposition* at the 30th Annual International Solid Freeform Fabrication Symposium – An Additive Manufacturing Conference, Austin TX on August 12-14, 2019.

Mentions in the media:

- ***Movers & Shakers***, published on July 8, 2020 in the Daily Memphian: https://dailymemphian.com/section/businessmovers-and-shakers/article/15298/movers-shakers

- ***Research gains fuel U of M hopes for Carnegie R1 status***, published on August 31, 2020 in the Daily Memphian: https://dailymemphian.com/section/metroeducation/article/16502/carnegie-r1-research-park-u-of-m
- ***U of M edges closer to R1 status, feels confident about chances in 2021***, published on September 10, 2020 in the Memphis Business Journal: https://www.bizjournals.com/memphis/news/2020/09/10/university-of-memphis-r1-status.html
- ***U of M professor part of international effort to harness clean, abundant energy source***, published on September 28, 2020 in the Memphis Business Journal: https://www.bizjournals.com/memphis/news/2020/09/28/ranganathan-gopalakrishnan-university-of-memphis.html
- ***MIT Fusion Startup Gears Up for Reactor Design and Construction***, published on October 9, 2020 in Engineering News-Record: https://www.enr.com/articles/50293-mit-fusion-startup-gears-up-for-reactor-design-and-construction

Professional Service Record:

- Editorial Board Member, Nature Scientific Reports (2019 – present)
- Peer Reviewer, Aerosol Science and Technology (2013 – present), Journal of Aerosol Science (2014 – present), Nature Scientific Reports, Journal of Chemical Physics, Physical Chemistry Chemical Physics, ACS Materials Advances.
- Proposal Reviewer for the National Science Foundation, US Department of Energy
- Department of Mechanical Engineering, The University of Memphis
    - Member of the Undergraduate Curriculum Process Team (Aug 2016 – Nov 2018)
    - Member of the Graduate Curriculum Process Team (Nov 2018 – present)
    - Member of Faculty Search Committees (Fall 2017, Spring 2018, Summer 2020)
    - Chair of the Teaching Laboratory courses Committee (Fall 2019 – present)
    - Chair of the Graduate Student Recruitment Committee (Spring 2020 – present)