Vignesh Thammanna Gurumurthy

Postdoctoral fellow, IIT-Madras

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Current position

Dec'18-Present **Institute Postdoctoral fellow**, *Chemical Engineering*,
Mentor: Prof. S. Pushpavanam,
Indian Institute of Technology (IIT) Madras, Chennai, India.

Research Interests

Computational and theoretical modelling of multiphase flows,
Contact line dynamics, Marangoni flows, and Compound drop dynamics.

Education

2014–2018 **Doctor of Philosophy**, *Mechanical Engineering*, **Marie Curie Fellow** ,
Technische Universität (TU) Darmstadt, Darmstadt, Germany.

2009–2012 **Master of Science**, *Mechanical Engineering*, CGPA: 9.2/10,
Indian Institute of Technology (IIT) Madras, Chennai, India.

2005–2009 **Bachelor of Engineering**, *Mechanical Engineering*, CGPA: 9.1/10,
Thiagarajar College of Engineering, Madurai, India.

Research Experience

Dec'18-Present **Postdoctoral fellow**, Chemical Engineering, IIT-Madras

Topic **Thermocapillary Migration of a Drop in a Viscosity-Stratified Liquid** (**Ongoing**)

Description The dynamics of a drop translating due to temperature induced surface tension gradient in an unbounded liquid is investigated analytically using perturbation techniques. The objective here is to quantify the effect of viscosity stratification of the ambient liquid on the migration of the drop.

Topic **Hydrodynamics of a Compound Drop in a Poiseuille Flow**

Description The dynamics of a compound drop (CD) released in a Poisueille flow under Stokes regime was investigated computationally. Here, the objective was to understand how the core-shell interaction influence each other, and in turn the deformation dynamics and cross-stream migration of CD. The two-phase flow is modelled using Volume-of-Fluid (VOF) method, and the two-dimensional simulations were performed using the open source code Basilisk.

Mentor Prof. S. Pushpavanam

April'14-Sep'18 **Ph.D. Candidate**, Mechanical Engineering, TU Darmstadt

Thesis **Dynamics of Corner Flows driven by Wettability**

Description The thesis focused on understanding the spontaneous and forced wetting of rivulets rising in the corners of a square capillary and open rectangular channel. The three dimensional numerical simulations were conducted using a modified two-phase flow solver in OpenFOAM. In addition, one-dimensional models were proposed to determine the temporal evolution of liquid heights under spontaneous and forced wetting conditions.

Advisors Prof. Ilia V. Roisman, Prof. Cameron Tropea, Prof. Stephen Garoff

April'17-May'17 **Internship**, Department of Physics, Carnegie Mellon University, Pittsburgh, USA

Topic **Forced Wetting in Square Capillaries**

Description The dynamics of rivulets under forced wetting was investigated experimentally. A square capillary was immersed into a liquid pool at a steady rate during which the temporal evolution of meniscus and rivulet heights were measured using high-speed imaging.

Supervisor Prof. Stephen Garoff

Sep'14-Dec'14 **Mini project**, TU Darmstadt

Topic **Particle Impact on Free Surfaces at Low Weber Numbers**

Description The dynamics of a rigid particle impacting on a liquid surface at low Weber numbers was investigated numerically. The gas-liquid surface was modelled using VOF method, and the motion of the particle by a moving mesh. The 3D simulations were performed by modifying existing solvers in OpenFOAM.

Advisors Prof. Ilia V. Roisman, Prof. Cameron Tropea

Oct'13–April'14 **Project Associate**, IIT Madras

Topic **Studies on Urea-Water Sprays**

Description The objective of this work was to characterize experimentally the urea-water sprays in a quiescent environment. High-speed imaging experiments of the urea-water sprays from a single hole injector were conducted, and parameters such as spray cone angle, penetration length were extracted from the images using matlab.

Supervisor Prof. T.N.C. Anand

Aug'12-July'13 **Project Associate**, IIT Madras

Topic **Investigation of Bubble Plumes**

Description A numerical investigation of the dynamics of bubble plumes rising in a quiescent fluid was carried out using Eulerian-Lagrangian approach. The objective is understand the influence of different flow conditions on the transition length of the bubble plume.

Supervisors Prof. Shamit Bakshi, Prof. Dhiman Chatterjee

2009-2012 **Graduate student**, IIT Madras

Thesis **Continuous Interface Reconstruction Algorithms based on Volume-of-Fluid Method**

Description The thesis focused on developing interface reconstruction algorithms for VOF method, which are essential for modelling two-phase flows. Two non-iterative algorithms were proposed, and their accuracy was demonstrated using a fortran code developed from scratch.

Supervisor Prof. Shamit Bakshi

Refereed Journal Articles

- **V. Thammanna Gurumurthy**, S. Pushpavanam, Hydrodynamics of a Compound Drop in Plane Poiseuille Flow, *Physics of Fluids*, 2020.
- **V. Thammanna Gurumurthy**, I.V. Roisman, C. Tropea, S. Garoff, Spontaneous Rise in Open Rectangular Channels under Gravity. *Journal of Colloid and Interface Science*, 2018.
- **V. Thammanna Gurumurthy**, D. Rettenmaier, I. V. Roisman, C. Tropea, S. Garoff, Computations of Spontaneous Rise of a Rivulet in a Corner of a Vertical Square Capillary. *Colloids and Surfaces A*, 2018.
- D. M. Kintea, J. Breitenbach, **V. Thammanna Gurumurthy**, I. V. Roisman, C. Tropea, On the Influence of Surface Tension during the Impact of Particles on a Liquid-Gaseous Interface. *Physics of Fluids*, 2016.
- **T.G. Vignesh**, Shamit Bakshi, Non-iterative Interface Reconstruction Algorithms for Volume of Fluid Method. *International Journal of Numerical Methods in Fluids*, 2013.

- **V. Thammanna Gurumurthy**, I.V. Roisman, C. Tropea, S. Garoff, Forced Wetting in Square Capillaries, Under preparation.
- **V. Thammanna Gurumurthy**, S. Pushpavanam, Thermocapillary migration of a drop in viscosity stratified liquids, Under preparation.

Conference Presentations

- **V. Thammanna Gurumurthy**, D. Rettenmaier, I.V. Roisman, C. Tropea, S. Garoff, Spontaneous Imbibition and Forced Wetting in Closed Square Capillaries and Open Rectangular Grooves, *AIChE*, Pittsburgh, United States of America, 2018.
- **V. Thammanna Gurumurthy**, D. Rettenmaier, I.V. Roisman, C. Tropea, S. Garoff, Spontaneous Rise of Rivulets in Square Capillaries, *ACS*, Pittsburgh, United States of America, 2018.
- **V. Thammanna Gurumurthy**, I.V. Roisman, C. Tropea, S. Garoff, Spontaneous Rise in Open and Closed Rectangular Channels under Gravity, *16th Conference of the International Association of Colloid and Interface Scientists* (IACIS), Rotterdam, Netherlands, 2018.
- **V. Thammanna Gurumurthy**, D. Rettenmaier, I.V. Roisman, C. Tropea, S. Garoff, Spontaneous Rise of Rivulets in Square Capillaries, *14th Zsigmondy Colloquium of the German Colloid Society*, Mainz, Germany, 2018.
- **V. Thammanna Gurumurthy**, I. V. Roisman, D. M. Kintea, C. Tropea, On Particle Impact on Free Liquid Surfaces at Low Weber Numbers, *13th Internatioinal Conference on Liquid Atomization and Spray Systems* (ICLASS), Taiwan, Germany, 2015.
- **V. Thammanna Gurumurthy**, I. V. Roisman, D. M. Kintea, C. Tropea, On Particle Impact on Free Liquid Surfaces at Low Weber Numbers, *15th Conference of the International Association of Colloid and Interface Scientists* (IACIS), Mainz, Germany, 2015.
- **T.G. Vignesh**, Shamit Bakshi, Static Interface Reconstruction using Piecewise Continuous Linear Interface Calculation **(PCLIC)**, 24^{th} *European Conference on Liquid Atomization and Spray Systems* (ILASS), Estoril, Portugal, 2011.

Technical Skills

Programming Languages	Fortran, C, Python	Other Packages	Matlab, Mathematica
CFD Packages	OpenFOAM, Gerris, Basilisk		

Honors and Awards

- **Best presentation** award in CHEMPLUS conducted in IIT Madras in February, 2020.
- **Institute Post-doctoral Fellowship** for pursuing postdoctoral work in IIT Madras from Dec'18-Present.
- **Marie Curie Fellowship** for pursuing doctoral studies in TU Darmstadt for the years 2014-2017.
- **Half Time Research Assistantship** for pursuing graduate studies in IIT Madras.
- **Secured district third** in Higher Secondary Examination, 2005.

Roles and Responsibilities

- Coordinator and instructor for a online workshop on Introduction to process simulation using Scilab for the students affiliated to Chhattisgarh Swami Vivekanand Technical University Bhilai, 21-23 September 2020.
- **Treasurer** for Marie Curie Alumni Association, German Chapter from 2014 till 2015.
- Organized a one-day Career workshop for Marie-Curie Fellows in Darmstadt on June 10, 2015.
- Web coordinator for the Complex Wetting project website from 2015 to 2017.
- Volunteer for *Frontiers of Liquid Atomization*, an Indo-US workshop, held at IIT Madras, Chennai, India, December, 2011.

References

Prof. Ilia V. Roisman
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Prof. Stephen Garoff
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