ME Seminar

Interface Evolution of Fluids at Nanoscale: Zooming in on Droplets

Dr. Sreehari Perumanath, University of Warwick

ABSTRACT

From water splashes to cloud formation, processes involving droplets are ubiquitous. Yet we know very little about their initial dynamics when two droplets coalesce or when a droplet wets a solid. Both coalescence and wetting are surface tension-driven processes where a liquid bridge grows in time. In the conventional fluid mechanics framework, as time is rolled back to the very beginning of these processes, one should observe singularities in bulk-flow parameters. In this talk, I will walk you through the mechanisms by which nature circumvents such singularities. Large scale molecular simulations reveal that, mediated by intermolecular attraction, the confronting interfaces of coalescing droplets 'zip together' in the initial stages until the bridge grows to a thermal-capillary length scale. Only after this stage does the dynamics follow the conventional framework. Towards the end, I will also discuss how coalescence-induced jumping of droplets from superhydrophobic surfaces facilitates heat transfer and their self-cleaning.

ABOUT THE SPEAKER

Dr Sreehari Perumanath is a Leverhulme Early Career Fellow at the University of Warwick's Mathematics Institute. His research primarily focusses on fluid interface evolution at nanoscale pivoting on its engineering applications. He earned his B.Tech in Mechanical Engineering from NIT Calicut (2013) and M.Tech in Thermal Science and Engineering from IIT Kharagpur (2015). After securing an international doctoral scholarship in 2016, he completed PhD in Engineering from the University of Edinburgh, UK in 2020. Following his graduate degrees, Dr Sreehari trained as a post-doctoral research associate at the University of Edinburgh before winning the prestigious Leverhulme Early Career Fellowship to join Warwick. His current research involves development of a multiscale computational framework to predict ice nucleation on various surfaces using fluctuating hydrodynamics.

December 4th, 2023 (Monday)
5:00 PM, MMCR