

## Physics and Physical Oceanography Seminar

### A New Perspective on the Wetting of a Solid Surface by the Drops of an Emulsion

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**DATE:** Thursday, Feb 18, 2021

**TIME:** 3:30 pm

**Place:** Webex (link will be sent out)

**ABSTRACT:** Traditionally, the wetting of a solid surface by the drop of an emulsion has been thought to be mediated by the formation of a liquid bridge that connects the drop and the surface. In the presentation, experimental evidence of a different mechanism of the spreading of a drop on a surface will be presented. Experiments were conducted for liquid-liquid systems, wherein drops of higher density (glycerol) were allowed to settle under gravity in a lighter liquid phase (silicone oil) under conditions of weak gravitational body forces. The approach of the drop towards the substrate was visualized using Reflection Interference Contrast Microscopy (RICM), and the details of the film drainage dynamics and the spreading of the drop on the surface were recorded. The shapes of the film and the temporal variation of the minimum film heights matched theoretical expectations from the lubrication approximation, until the height reached few tens of nanometers, at which point a stable film was formed. Following this, islands were observed to grow on the substrate, one of which eventually merged with the parent drop to complete spreading. Wetting was thus manifested as a coalescence event between the parent drop and an island. The reasons for the arrest of film drainage and the appearance of the islands will be discussed. The effects of contact angle, surface roughness and the presence of surfactants on the wetting process will also be elucidated. The fundamental mechanism discovered here is expected to ultimately guide the design of emulsion-based coatings to have predefined spreading times.

**Speaker Bio:** Dr. Ramachandran obtained a Bachelor's degree in Chemical Engineering from the University Department of Chemical Technology, Mumbai, India, in 2001 and a Ph.D. in Chemical Engineering in the area of rheology of particulate suspensions from the University of Notre Dame in 2007. He was a post-doctoral scholar in the Department of Chemical Engineering at the University of California at Santa Barbara from 2007-2010. He is currently an Associate Professor in the Department of Chemical Engineering and Applied Chemistry at the University of Toronto. He directs the Laboratory of Complex Fluids, which works towards the establishment of fundamental knowledge in the fields of complex fluids and transport phenomena, with applications in diverse areas. Dr. Ramchandran is currently Canada Research Chair in Engineered Soft Materials and Interfaces. He was awarded the North American Mixing Forum Early Career Award in 2013, an Ontario Early Researcher Award in 2014, the 2014 Bill Burgess Teacher of the year Award from the University of Toronto for teaching large classes, the 2019 Canadian Journal of Chemical Engineering Lectureship Award, and a Humboldt fellowship for experienced researchers for 2020-2021.

ALL ARE WELCOME!