Class of '27 Lectures

Mathematical Sciences Department


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## Lecture 2

## "Droplet Splashing"


When a droplet of fluid hits a solid surface at high speed, common experience dictates that it leads to a spray of droplets. I will discuss our recent efforts to develop a first principles, mathematical description of the events leading to droplet splashing on a solid surface--and will argue that the essence of the phenomenon arises because of a singularity that occurs in the equations of motion before the droplet contacts the surface. Experiments have long showed that the most violent splashes are preceded by the ejection of a very thin fluid sheet from the vicinity of the contact point, though the fluid mechanical origin of this sheet has been completely unclear. From simulations and an asymptotic discussion beginning from the Navier Stokes equation, we demonstrate that the sheet originates before the droplet contacts the solid surface, and give detailed predictions for the characteristics of the sheet (thickness, speed, velocity). For a ~ 1mm droplet thrown at a surface at a few meters per second, the sheet ejects upwards at 100m/sec when the droplet is 10s of nanometers from the solid surface. Recent experiments probing these predictions will also be described. Finally we will discuss our current confusions regarding the effects of liquid viscosity.


Date: Tuesday, April 22, 2014
Time: 12:30 – 1:30 PM
Place: Amos Eaton 216

Host: Donald Schwendeman

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Refreshments: 4th Floor Amos Eaton @ 12:00pm

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