DROP IMPACTS: HIGH-SPEED IMAGING OF SPLASHING AND AIR ENTRAPMENT

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This seminar will describe experiments on two aspects of drop impacts on liquid surfaces. First, the splashing of secondary droplets into the air and secondly the entrainment of fine bubbles into the pool. Both aspects are important in many industrial phenomena and even in nature. Only recently have experimental techniques and numerical algorithms been able to resolve the full range of length and time-scales involved during the impact. Experiments using state-of-the-art high-speed video cameras, will be presented at video frame-rates as high as 5 million fps. This is used to identify the origins of the finest splashed droplets, as well as the multitude of air-bubbles trapped between the drop and the pool surface. In particular we probe the dynamics of the ejecta sheet and the sub-micron air-films separating the drop and pool at low impact Weber numbers [1]. Furthermore, close-up imaging reveals how the axisymmetry can be broken on the finest scales [2]. We will also use numerical simulations to show the vortical structures which occur inside the liquid [3]. Finally, new results will be shown for high impact velocities at over 20 m/s, generated by drops free-falling in a 25-m-long vacuum tube. This includes splashing at 1 km/s and convoluted ejecta shapes.

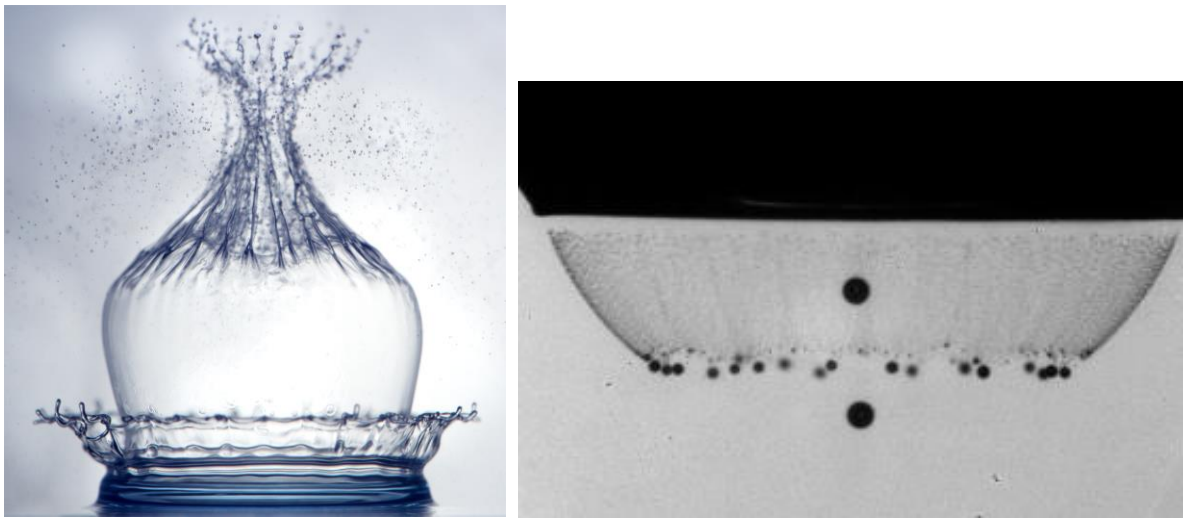

Figure 1: Splashing and air entrapment during drop impacts. Left image courtesy Aljedaani & Langley.

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REFERENCES:

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