Abstract Submitted for the MAR12 Meeting of The American Physical Society

The Life and Death of the Air Film Beneath an Impacting Drop JOHN KOLINSKI, Harvard School of Engineering and Applied Sciences, Cambridge, MA, USA, SHMUEL RUBINSTEIN, Weizmann Institute of Science, Physics of Complex Systems, Rehovot, Israel, L. MAHADEVAN, Harvard School of Engineering and Applied Sciences, Cambridge, MA, USA — Droplet impact is ubiquitous in our everyday experience; yet many mysteries associated with the phenomenon remain, including the role played by air during the impact process. When a liquid meets a solid surface in an atmosphere, it must drain the air beneath it before initiating contact. In spite of the relatively low viscosity of the air, recent experiments and simulations suggest that this drainage dominates the dynamics of drop impact. Here I present recent experimental work, wherein Total Internal Reflection (TIR) microscopy is used to directly observe the thin air films that develop above the impact surface. We find that the formation of the thin air film is insensitive to liquid viscosity over a range of impact velocities, confirming prior theoretical predictions of thin air film formation. Going beyond this, the viscous response of the drop is also found to be important - high viscosity liquids maintain a steep front that progresses outward as the breadth of the air film increases, whereas lower viscosity liquids broaden without a steep front, suggesting a transition in the kinematics of the air liquid interface.

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Date submitted: 11 Nov 2011

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