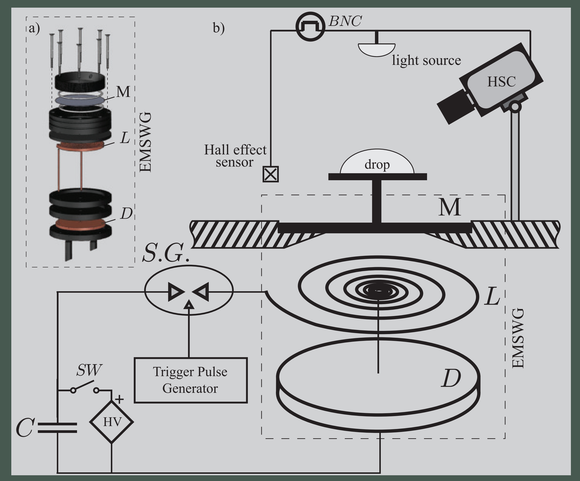
Disintegration of impulse-driven drops

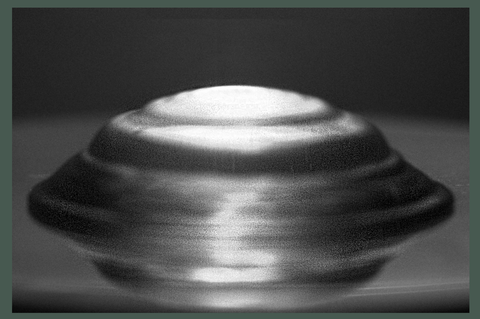
Hamed Habibi and Rouslan Krechetnikov

Experimental setup

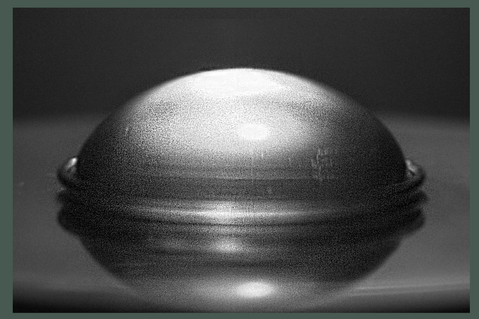


Experimental platform: (a) exploded view of an electromagnetic shock wave gun (EMSWG); (b) schematics of the key components: $C - 10\,\mu F$ capacitor, S.G. – sealed spark gap, D – thick copper disk, L – slab spiral coil, M – thin copper membrane, HV – high voltage power supply, HSC – high speed camera, *BNC* – Berkeley nucleonics corp, model 575 (pulse/delay generator). The capacitor is discharged to the coil through the sealed spark gap. Due to electromagnetic field interactions between the coil, membrane, and thick copper disk, the membrane is accelerated and impulsively drives the liquid drop seated on it. Changing the capacitor stored energy ($250 - 1000\,\mathrm{J}$) and the membrane thickness ($0.018 - 0.5\,\mathrm{mm}$) provides a wide range of initial drop accelerations, which in the most intense regimes lead to cupola and direct atomization.

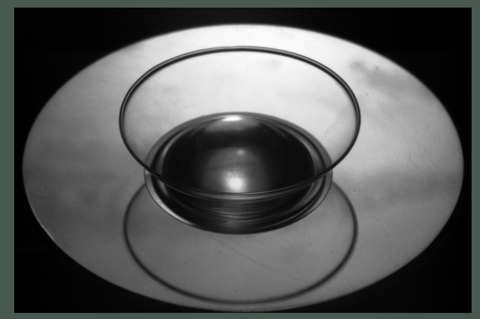
Observed morphologies



Ripple waves

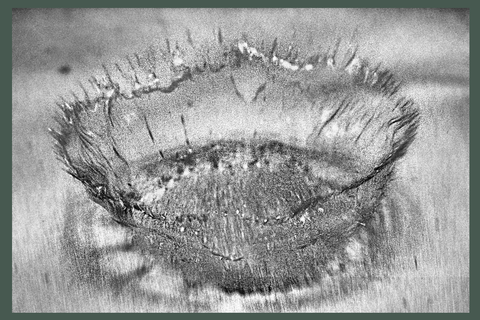


Ejecta

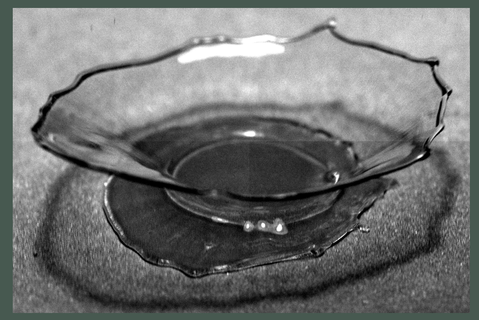


Crown without splash

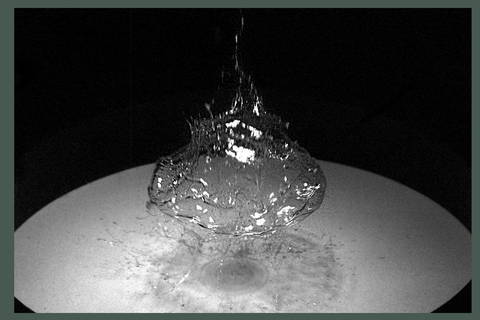
Crown splash



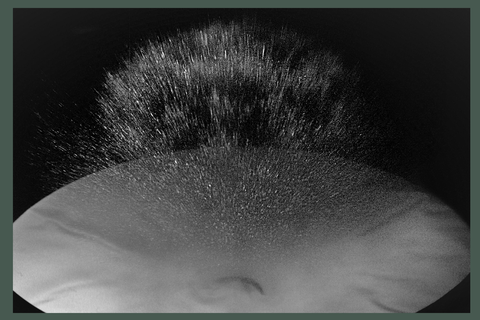
Microdroplet crown splash



Butterfly crown splash

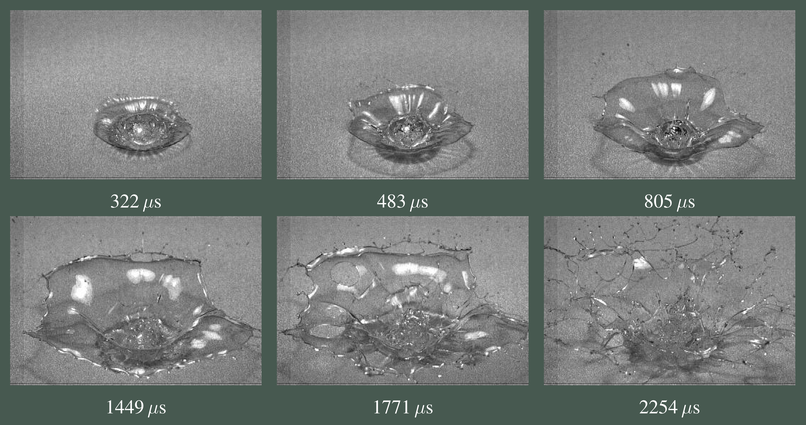


Cupola

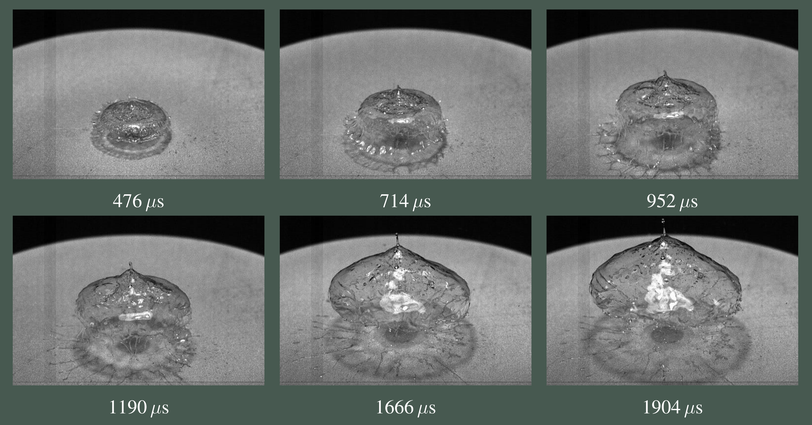


Atomization

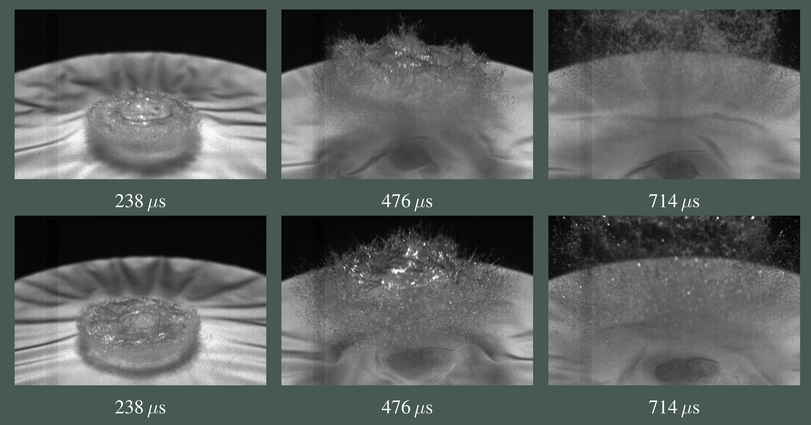
Butterfly crown splash—67%wt **water-glycerol.**



Cupola—50%wt **water-sucrose.**



Atomization—row 1: 22%wt **water-ethanol, row 2:** 67%wt **water-glycerol.**



Department of Mathematical & Statistical Sciences, University of Alberta, Edmonton, Canada

Email: krechet@ualberta.ca

Website: http://www.math.ualberta.ca/~rkrechet/