Cavitation changes “splash” into “crown”

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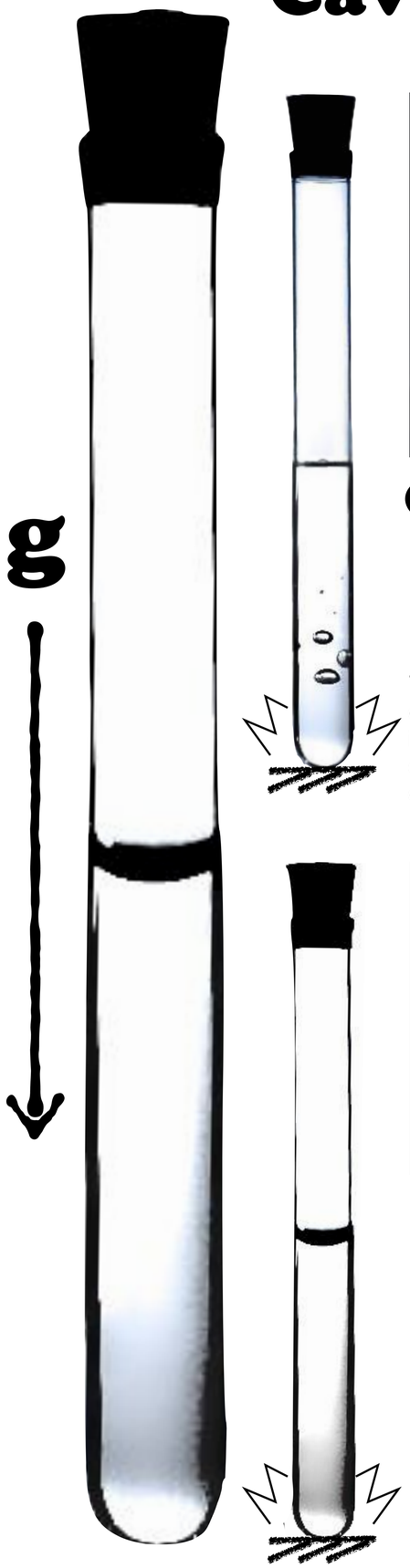
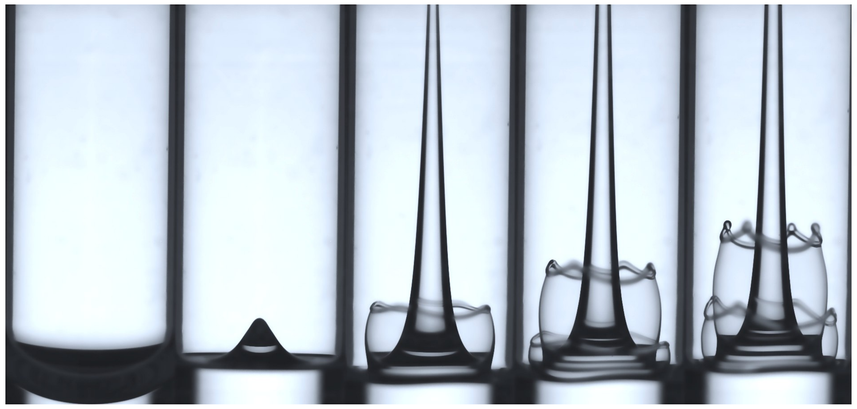
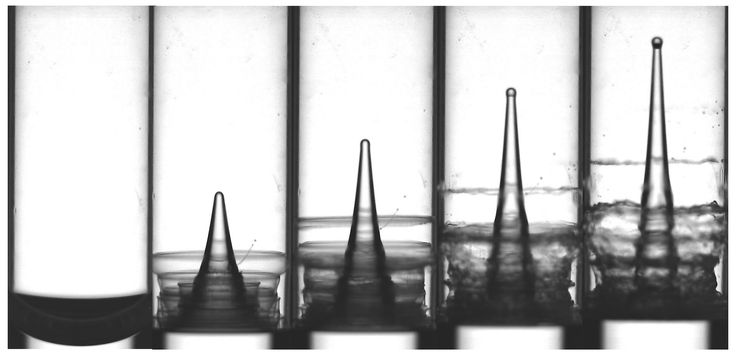




Cavitation leads to “crown”

A test tube filled with a liquid freely falls from 125 mm above a rigid floor. At some point, the tube impacts on the floor, which accelerates the liquids.

The existence of cavitation nuclei in the liquid leads to cavitation occurrence just after the impact. Here pressure waves induced by the impact are severely attenuated. The secondary shock waves due to cavitation bubble collapses trigger beautiful “crowns” around an elongated jet emerged at the center of the tube.



No bubble leads to “splash”

The test tube falls and impacts on a floor in the same experimental conditions except that there is no cavitation nucleus in the liquid. In contrast to the “crown” case, without cavitation bubbles, pressure waves induced by the impact survive for a relatively long time and continuously reflect between an air-water interface and the tube bottom with sound speed. The reflecting pressure wave violently vibrates the interface, resulting in the generation of many liquid sheets around an elongated jet. The perturbed liquid sheet eventually disintegrates into droplets, i.e. “splash”.

References: Antkowiak, et al., 2007, Kiyama, et al., 2014, Vogel, and Lauterborn, 2013.,
Acknowledgement: M. Kameda, K. Ando, Y. Watanabe, M. Maeshima, and K. Hirose