

A Classroom Demonstration for *The Life of a Leaf*

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Surface Tension in Droplet Formation (Page 163):

A particularly impressive demonstration of surface tension in droplet formation can be arranged if one has access to a stroboscopic flasher whose frequency can be varied. As in the diagram below, one squirts water through a pipette so it takes a short, arcing trajectory and watches the formation of droplets with the stroboscope. Normally, droplet formation is a bit irregular; vibrating the pipette with a barely audible hum at around 80 Hz from a small loudspeaker ensures sufficient regularity. If the strobe frequency is slightly lower than droplet-formation frequency (or slightly lower than half that frequency—our Strobotac makes much brighter flashes at 40 Hz), droplets will appear to form in very slow motion. If the frequency is a little higher then, disconcertingly, the droplets will appear to ascend and enter the pipette.

Laplace's law comes into play as well—any reduction in radius of the cylinder of water will increase the inward pressure caused by surface tension. So radius reduction leads to further radius reduction and droplet formation. The phenomenon has some direct biological relevance—the reader can guess where.

An alternative to an exposed loudspeaker is one of the little spherical speakers supplied with older I-Mac computers. For that matter, a computer can provide both oscillator and amplifier if equipped with software that makes it generate audio-frequency sine waves. I've used a share-ware program for a Macintosh called "Audio Toolbox," and I'm informed that many analogous programs exist for PC's.

