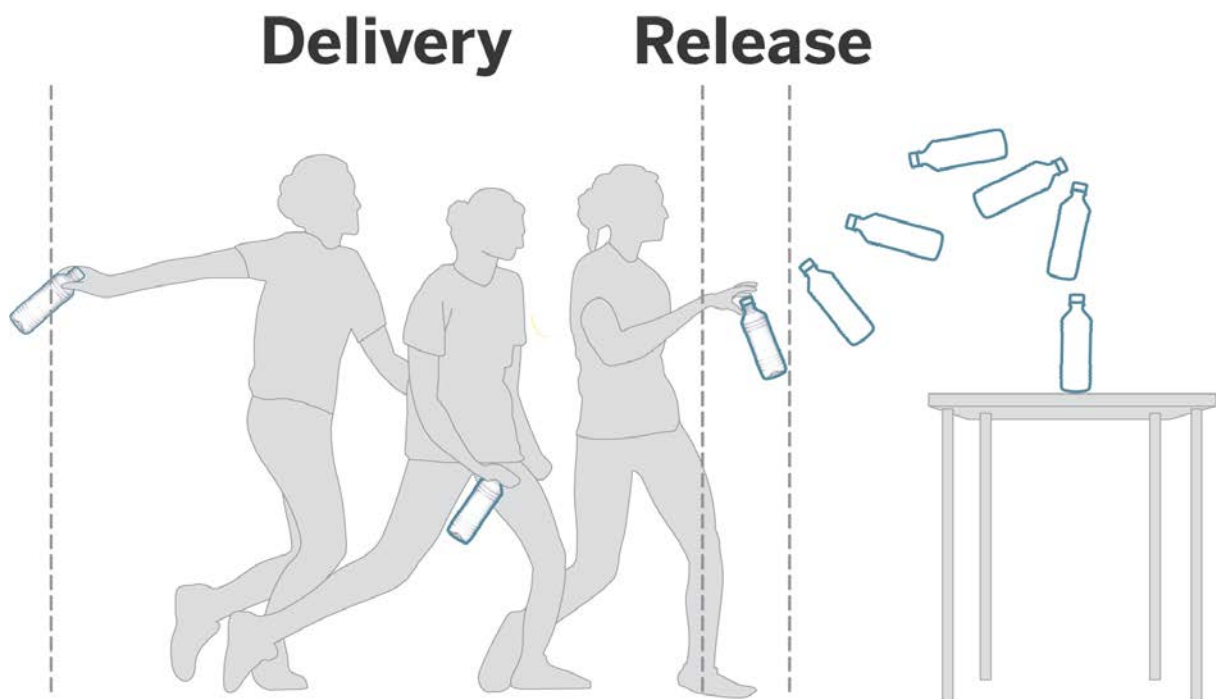


Breaking down the bottle toss

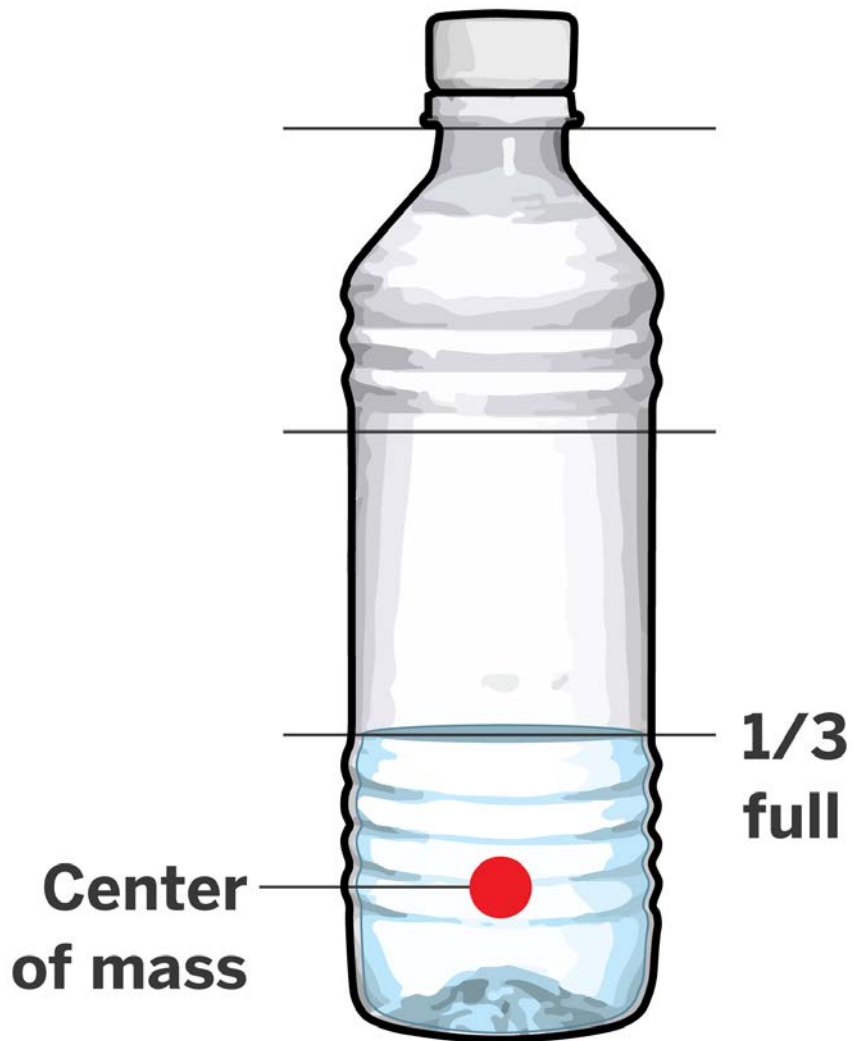
The act of flipping a water bottle through the air to achieve a perfect, upright landing on the table in front of you is part artform, part science.

ARTISTRY IN THE DELIVERY

The tosser can personalize how they serve the bottle during the “delivery,” right before the “release.”



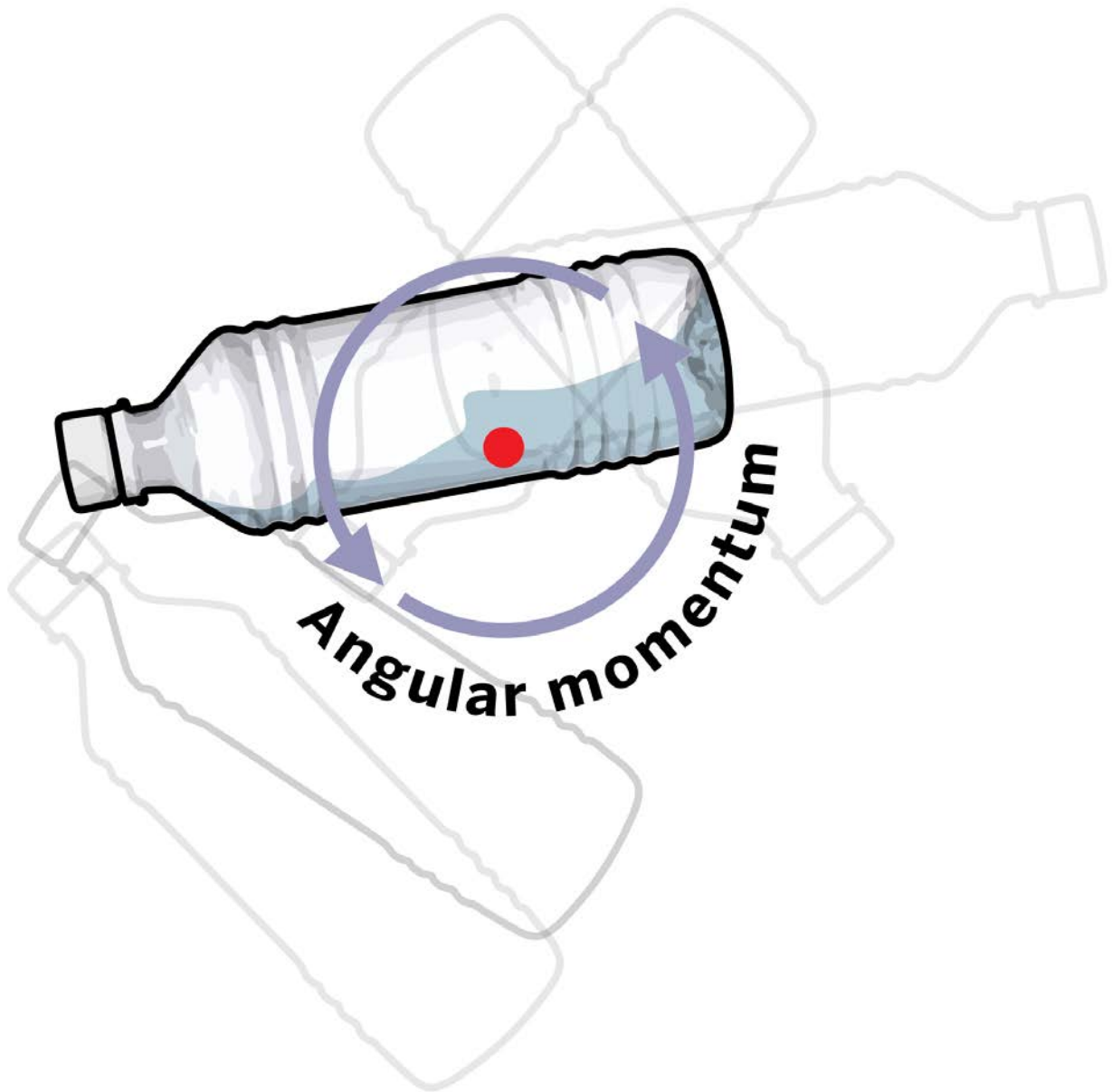
SCIENCE IN THE TOSS



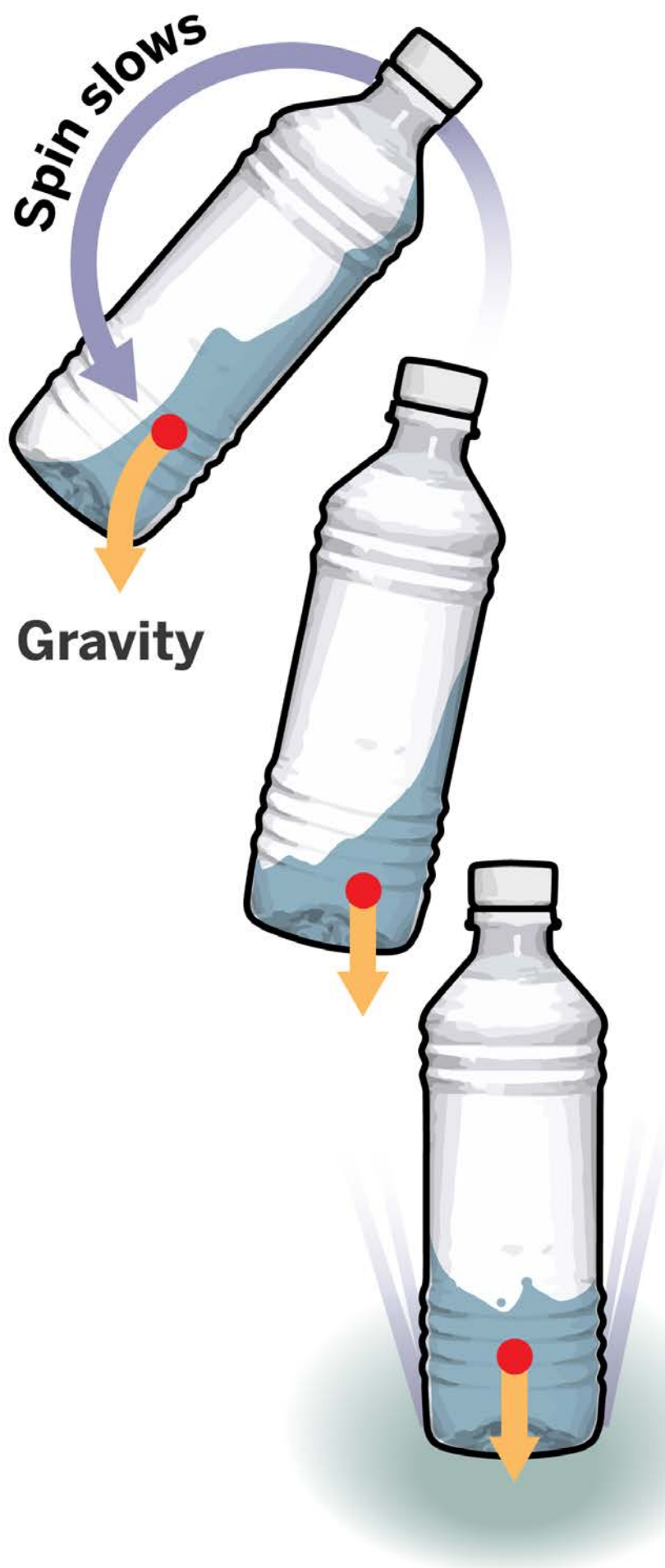
Begin by holding a plastic bottle, filled a third of the way up, from the top. At this point, the center of mass lies with the water at the bottom of the bottle.



Toss the bottle in a forward and upward motion. The bottle rotates, but most of the water doesn't because it is free to move around within the bottle instead.



As the bottle continues on its downward path, the spin of it is reduced and transferred to the heavier, contained water. The “spin” refers to a concept known as “angular momentum.”



The bottle soon reaches a point at which it is barely spinning at all, and it falls straight to the surface because of gravity. The weight of the water, as well as the flat bottom of the bottle, contribute to the bottle landing upright.

SOURCES: James Bird, assistant professor fluid dynamics, Boston University; Iain Stewart, physics professor, MIT

SONIA RAO, JAMES ABUNDIS / GLOBE STAFF