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Performance enhancing water skipping: successive free surface impacts of elastic spheres RANDY HURD, TADD TRUSCOTT, Brigham Young University, JESSE BELDEN, Naval Undersea Warfare Center — From naval gunners skipping cannonballs to children skipping stones, physicists have long been enamored with the repeated ricochet of objects on the water surface. Elastic spheres, such as the toy Waboba ball, make water skipping more accessible to the masses by expanding the range of impact parameters over which objects can be skipped. For example, it is not difficult to achieve more than twenty skips with such spheres, where skipping a stone twenty times is very difficult. In this talk we discuss the dynamics of water skipping elastic spheres over several successive skips. High-speed video captured using a unique experimental setup reveals how dynamics change with each skip as a result of lost kinetic energy. We place these observations in the context of previous work on single oblique impacts to identify material vibration modes that are excited during ricochet. The material modes excited with each successive impact are seen to decay from high-energy modes to low energy modes until water entry finally occurs. A model for estimating skipping outcome from initial conditions is proposed.

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