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Stable and unstable rotational dynamics of a smartphone CHAD GIBBONS, MATTHEW LOTH, SAMI BELAITER, JAMES CLARAGE, University of St Thomas — One of the canonical, and memorable, classroom demonstrations from an upper division Mechanics course is to toss a rigid body with three distinct principal moments of inertia into the air, giving it a spin along one of its three principal axes. A student's Mechanics textbook itself works great for the body, secured rigidly shut with a rubber band. The book will spin stably about its longest and shortest dimensions, just like a top or gyroscope. What is surprising is that any attempt to spin the book about its intermediate axis (the axis parallel to the book's lines of text) will result in a wildly unstable and chaotic tumbling, which most students find curious enough to warrant staying awake for a subsequent derivation of Euler's equations. However, now that most students read text "books" off a tablet or phone, this demonstration may seem outdated. Or is it? Like a textbook, a phone or tablet also has three distinct principal moments. Better still, not only do these solid state devices require no rubber band, but these bodies can collect detailed data on their dynamical state, turning a demonstration into an actual experiment. This article reports the results of this modern version of the classical "book toss" demonstration using a cell phone tossed off a five story building.

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