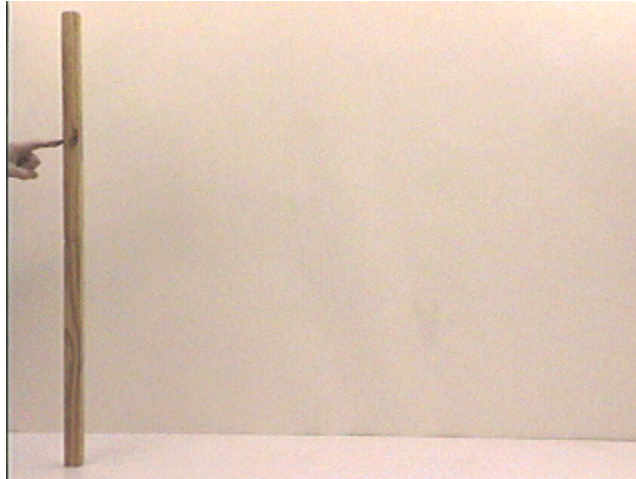# Answer #43

The answer is (a): the upper section will rotate more slowly and fall behind, as shown in (a) of the drawing and as seen in an mpeg video by clicking on the photograph below.

The angular acceleration *a* of each of the two sections is determined by the ratio of the torque on that section (around the contact point) to its moment of inertia. Simplifying the system by considering all of the mass and the torque acting at the center of each section: $a=(mgr \sin z)/(mr^{**}2)=(g/r) \sin z$, where *z* is the angle that the chimney makes with the vertical. Thus in this approximation the angular acceleration is less for the section farthest from the base, around which the chimney is rotating, so the outer section will fall behind.

Another famous experiment that illustrates this concept is the "hinged stick and ball" shown in the photograph below; click on the photograph to see a video of the action. Because the hinged stick rotates faster than the ball the ball falls into the cup.
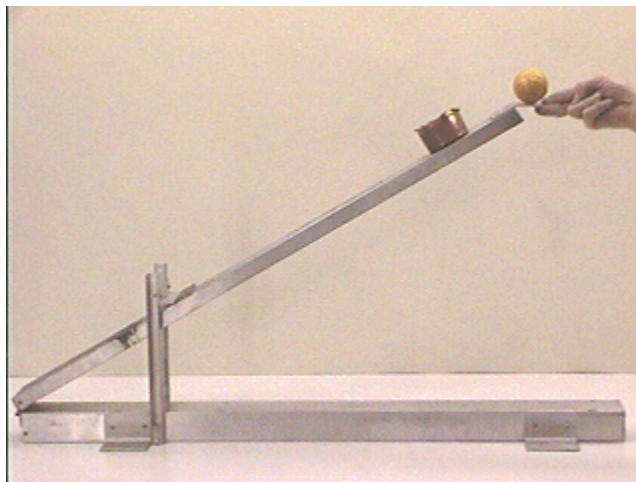
Archive 3

Question of the Week

For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address
given on the Lecture-Demonstration Home Page.