Title: **Bat Attack!**

Objective: To demonstrate to students that there is a special point on the bat, its center of percussion, at which you can hit the ball without causing the bat's handle to accelerate.


Materials: a baseball bat; a rubber mallet; a swing support; string; and putty.

Procedure: Attach the string to the bat's handle and hang the bat from the support. With the bat hanging motionless below the support, strike the bat firmly at various points on its business end. Only when you strike the bat on its center of percussion will the handle remain in place (although the bat's body will accelerate away from the impact and the bat will begin to rotate). If you hit the bat almost at its end, the handle will jerk toward the mallet. If you hit the bat near its middle, the handle will jerk away from the mallet. You can show this jerking motion by sticking the putty to the bat's handle. The bat will fling the putty in the direction of its jerk. When you hit the bat exactly at its center of percussion, the putty may still come off the bat because of vibrations, but it will drop more or less straight down.

Student Questions for Inquiry:
1. Where does the energy that causes the bat to move come from?
2. Is that energy transferred, transformed, or conserved?
3. When hit in the “sweet spot” or center of percussion, is energy transferred, transformed, or conserved?
4. Why does it “sting” sometimes when we bat a ball?

Science Behind It: When you hit the bat, the bat's center of mass will accelerate away from the mallet but the bat will also begin to rotate about that center of mass. If you hit the bat at its center of percussion, these two motions will cancel at the handle and the handle itself won't accelerate.