Moving Metronomes

Lesson Plan

Subject	Grade Level	Time
Physics/Energy	**3-4th (Adjustable 2-12)**	**30 minutes**

Overview

This experiment demonstrates both the conservation and transfer of energy as moving metronomes on a moveable surface will sync up due the force exerted by the moving pendulums on the surface and back again.

Standards

Next Generation Science Standards

3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Materials

- 2 or more metronomes (Try these ones!)
- 2 Soda cans, pieces of PVC pipe, or other sturdy smooth tubes
- 1 Lightweight Board

Lesson Body

1. Build your platform by laying both soda cans on their sides and using them to support your board to build a moveable platform.
2. Place your metronome on the board and set it in motion.
    a. Observe that the movement of the metronome causes the platform to move.
3. Now place a second metronome set to the same tick mark on the board. The two metronomes will be out of sync at first and slowly they will come into sync.
4. Why is this happening? As the pendulum changed direction with each swing, it exerts a small amount of force on the platform below, which in turn exerts its own force in the opposite direction affecting all the metronomes. When any two arms hit one side the forces exerted will either add or cancel each other. As the forces are transferred back and forth the metronomes will come into sync with each other as the force exerted on them grows.
5. Try reducing fiction by emptying the soda cans, finding a lighter platform and seeing how this affects the forces exerted. Add more Metronomes, track your variables and see how long each sync takes.