

# The Fork and Spoon Act

**The Action** The students will see a fork and spoon locked together balancing on a matchstick off the rim of a glass. If desired you may light the match at both ends (the end protruding beyond the fork and spoon and the end inside the glass). The match will stop burning at the glass rim and at the fork and spoon so the system will continue to balance.

**Grade Level**  
Grade 7 – Forces and Motion  
Grade 7 – Temperature and Heat  
Grade 9 – Risks and Limits  
Science 10 – Science Challenge  
Physics 20 - Heat  
Physics 30 – Kinematics and Dynamics

**Materials**  
Fork  
Spoon  
Toothpick or Wooden Match  
Matches (Optional)  
Drinking Glass

**Instructions** Attach the spoon to the fork by pushing it between the teeth (the two inside prongs should be on the backside of the spoon). Place a toothpick or wooden match between two of the fork's teeth and let the system balance from the toothpick/match resting on the rim of a drinking glass. Once the spoon and fork are in balance on the glass rim, dramatize by burning the ends of the toothpick/match.

**Safety** If lighting the toothpick/match be careful not to knock the system over or touch the system until it has cooled.

**Hints** Practice balancing the toothpick/match and fork and spoon on the glass prior to presenting it. It can be a little tricky.

**Science Principle** This system (fork, spoon, match/toothpick, glass) is in equilibrium. This means there are no net forces or net torques acting on it, thus it is balancing. Since the spoon and fork are some distance  $r$  away from the pivot point the force they

are applying to the toothpick/match actually results in a torque. In the free body diagram below the forces  $F_1$ ,  $F_2$  and  $W$  are in equilibrium. That is  $F_1 = F_2 + W$ . Now the burning of the toothpick/match stops exactly at the glass rim because the glass suddenly absorbs the heat of the flame and the temperature drops below the woods kindling point. The flame at the fork will be extinguished for the same reasons. This transfer of heat occurs because the silverware and the glass are at room temperature, which is obviously much cooler than the burning match. This difference in temperature encourages the transfer of heat. Wood is an insulator. This means it has a low thermal conductivity, much lower than any metal and a bit lower than glass. Thus the glass and metal conduct heat to a greater capacity. This as well contributes to the heat transfer.

