

## **Cheesy Experiments to Understand Fundamentals of Fractures**

This is like a mini-lab. Do these experiments and discuss the results with your group — I'll ask various groups to present their results and conclusion/inferences/questions to the whole group at the end of class.

1. Make a simple, small cut in the cheese food, perpendicular to the direction of tension. Then apply tension and watch the crack grow. Does the pulling get easier as the crack lengthens? Does the crack accelerate if you try to apply a constant tensional force? What can you infer about the relationship between crack length and the magnitude of the stress concentration at the crack tip?
2. Make a simple cut, about a cm long and then use a hole-making device to install a small, circular hole at one tip of the cut. Then apply tension and see what happens. What can you infer about the radius of curvature at the crack tip and the magnitude of stress concentration at the crack tip?
3. Do a series of experiments in which you alter the initial orientation of the cut. How important is the initial orientation of the cut? Try an experiment where you start out with two cuts of equal length where one is perpendicular to the tension direction and the other is at a  $45^\circ$  angle.
4. Make two cuts that do not intersect, where one is perpendicular to the tension direction and the other is parallel. Apply tension and see what happens when the cuts grow and interact with each other. Is it possible to get two intersecting joints?

5. Here, we're interested in the interaction between two parallel but offset cuts, both of which are perpendicular to the tension direction. Apply tension and see what happens to the paths of crack growth. Try varying the offset distance between the cracks to see if their interaction is a function of offset distance.
  
6. Try to make a Mode II shear fracture propagate. Make an initial cut parallel to the shear direction, then apply a shear and see what happens. This should simulate the formation of faults. How does it work out?
  
7. Now try a Mode III fracture — this is tougher with a thin slice of cheese food. You basically have to apply the right kind of shear and then examine the surface of the fracture very carefully in 3-D. You might even need a hand lens.