

Poroelastic Pressure

Activity

This activity links to [Axel](#)'s research into cartilage and aims to give you a way to understand poroelasticity and the large fluid pressures that can build within poroelastic materials – such as how cartilage acts in your body.

You need a few items that are likely to be available around your home and you can experiment with how to make water stiff. Do watch the video instructions to show you in detail how to do this experiment!

Materials

- Coffee Press/French Press/Cafetiere
- Ground coffee – cafetiere grind
- Tap water – room temperature
- Scoop to measure out coffee
- Long spoon to mix ground coffee and water
- Weights
- Stopwatch/timer
- Ruler

Method

1. Fill the cafetiere with $\frac{1}{3}$ tap water
2. Rapidly force the plunger down (make note of the resistance)
3. Add 1 scoop of coffee and mix with a long spoon
4. Rapidly force the plunger down (make note of the resistance)
5. Repeat steps 3 and 4 until it becomes nearly impossible to drive the plunger down

Extended method

1. Fill the cafetiere with $\frac{1}{3}$ tap water
2. Place a known amount of weight on the plunger and use the stopwatch to record the time for the plunger to pass through the coffee slurry. *Also record the distance the plunger travels using a ruler
3. Add one scoop of coffee and mix with a long spoon
4. Place a known amount of weight on the plunger and use the stopwatch to record the time for the plunger to pass through the coffee slurry.
5. Repeat steps 3 and 4 until it becomes nearly impossible to drive the plunger down

Comments

Caution: If your cafetiere is made from glass be careful how much force is applied, or the container may shatter

Caution: if you apply too much force or create a moment on the plunger you may bend the plunger and render the coffee press unusable in the future.

Poroelasticity is a really complex topic, and uses advanced maths, so don't worry if the equations seem difficult. This demonstration is to give you an understanding of the theory and why we care about it.