

Simulated Artesian Well

If the layer of ground above the water table is permeable, water can soak upward to form a spring or lake. When the water table happens to have an impermeable layer, such as clay, above it, the water has nowhere to go. The water here is trapped and under lots of pressure from the weight of the water above and on either side of it.

Objective

Build a simple model of a water table under pressure and let the water out through a simulated “artesian well.”

Materials

- a pitcher of water
- two funnels
- a large nail
- a toothpick
- some putty
- two cups
- some clay
- a section of clear plastic tubing about 60 centimeters long
- two cork or rubber stoppers that will fit in the end of the plastic tubing

Safety Notice: All applicable laboratory safety rules must be followed. Students should not perform any experimental activity without the teacher’s supervision and express permission. Students must follow safety guidelines and wear appropriate protective gear.

Procedure

1. Use the nail to poke a hole in the center of the tubing. Be sure your hole only goes through one side of the tubing. Work the nail around so that the hole will stay open.
2. Plug the hole with putty so no water can leak out.
3. Insert a stopper tightly into one end of your tubing. Then, lift your tubing vertically and place one funnel in the open top end.
4. Add water through the funnel into the tubing. Pour very slowly and let the air inside the tubing get out as the water goes in. You might have to lift the funnel slightly to let the air out.
5. When the tubing is nearly full of water, even if there’s a little air space near the funnel, remove the funnel and insert the other stopper tightly in the open end of the tubing. Be sure your putty is still plugging the nail hole.
6. Lay your tubing down flat. Be sure your putty-filled hole is on the high side. Imagine that this clay mold represents impermeable layers of rock. The tubing represents a level water table trapped between the layers of rock.

7. What do you think would happen if you used the toothpick to make a “well” by digging out the putty and unplugging the hole? Write down your guess and then make the well with the toothpick.

8. Lift the open ends of the tubing high and bring them toward each other, so that the center of the tubing sags very low in a steep U-shape. The tube will now represent a water table that slopes downward.

9. Trickle water through the two funnels. This represents the constant flow of surface water, such as rain and runoff, soaking down into your water table. What do you think will happen to the water flow now?

Conclusions

- What was the difference in pressure between the two “wells”? How did that affect the flow of water?
