Putting Your Finger On Atmospheric Pressure

Simulate the pressure caused by our atmosphere on your fingertip!

Introduction:

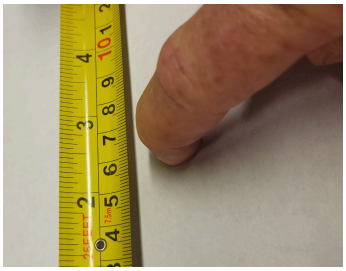
Balance a water bottle on the tip of your finger to simulate an additional atmosphere of pressure. Feel the equivalent of 101325 pascals (14.7psi) on the end of your digits.

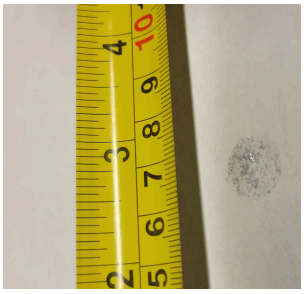
Materials:

- 1 or 2-liter empty plastic bottle
- Piece of paper
- Water
- Metric ruler

To do and notice:

1. Place some water on your index finger. Shake off any excess.
2. Place and push the tip of your wetted index finger on the paper.
   Note: use the tip of your finger only





3. Measure the diameter of the wetted area of the spot left behind by your wet finger.
4. The tip of your finger should leave behind a circular wet spot. Calculate the area of this circle. Use the formula of a circle:

   $$\text{Area} = \Pi r^2$$

5. Fill your 1-liter bottle with water (or fill your 2-liter bottle ½ full with water).
6. Cap your bottle and invert it onto your fingertip.
7. Try supporting as much weight of the bottle as possible with your one finger.
   You can use your other finger to help balance your device.
   Remember: use the tip of your finger only.

8. How does it feel?

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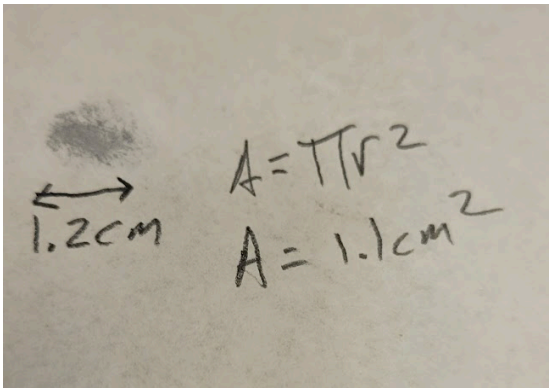
Orginal idea from “Portable Potable Pressure” 2004

What's going on?:

This is the pressure of one atmosphere, but on your fingertip.



Most people's fingertips pressed against a flat surface, have a surface area of about 1 cm^2. Hopefully, you confirmed this when you pressed your finger onto the paper. The calculation shown was slightly more than 1 cm^2 (based on the tip of the author's fingertip), your's might be slightly smaller or slightly larger, but they should be in the neighborhood of 1 cm^2

Your filled one-liter bottle of water contains 1000 ml of water. 1000 milliliters has a mass of 1000 grams or 1 kilogram.

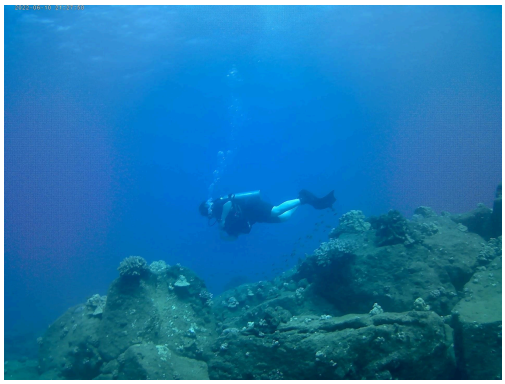
The unit of pressure in metric units is the Pascal or **1Newtons/meter^2**
Standard atmospheric pressure is 101,325 pascals.
This is equivalent to 1.01 kilogram/cm^2
That's pretty close to the pressure of a 1-liter bottle resting on your fingertip.

Right now, every surface of your body is being pressed on by the air around you…that's atmospheric pressure. Luckily, your body pushes back. You don't notice this because you are used to this evenly distributed pressure. However, placing the 1-liter bottle on your fingertip adds one more atmosphere to that little spot. At that spot, you have two atmospheres of pressure.

Going further:

If you were able to reshape the contents of your 1-liter bottle, into a very, very tall column of water with a cross-section of only 1 cm2, the column would stretch a little over 10 meters (actually 10.13 meters).

Every 10 meters under water is an additional atmosphere! This means that if you dive 10 meters or about 33 feet underwater, you have the equivalent of 2 atmospheres of pressure on your entire body.



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