2 The rules of friction

The amount of friction changes with the force holding two objects together, but not with the amount of area in contact.

When we think about friction, we think about stickiness, or grip. So what does the amount of grip depend on? Here are two simple experiments that help you to decide the rules (laws) of friction. To do the experiments you need to be able to make a fair test.

Measuring force

To move a wooden block across a table, it must be pushed or pulled. This push or pull is called a **FORCE**.

The force needed to move the block has to be enough to overcome the grip between the surfaces. This is because friction is also a force, but one that works against movement.

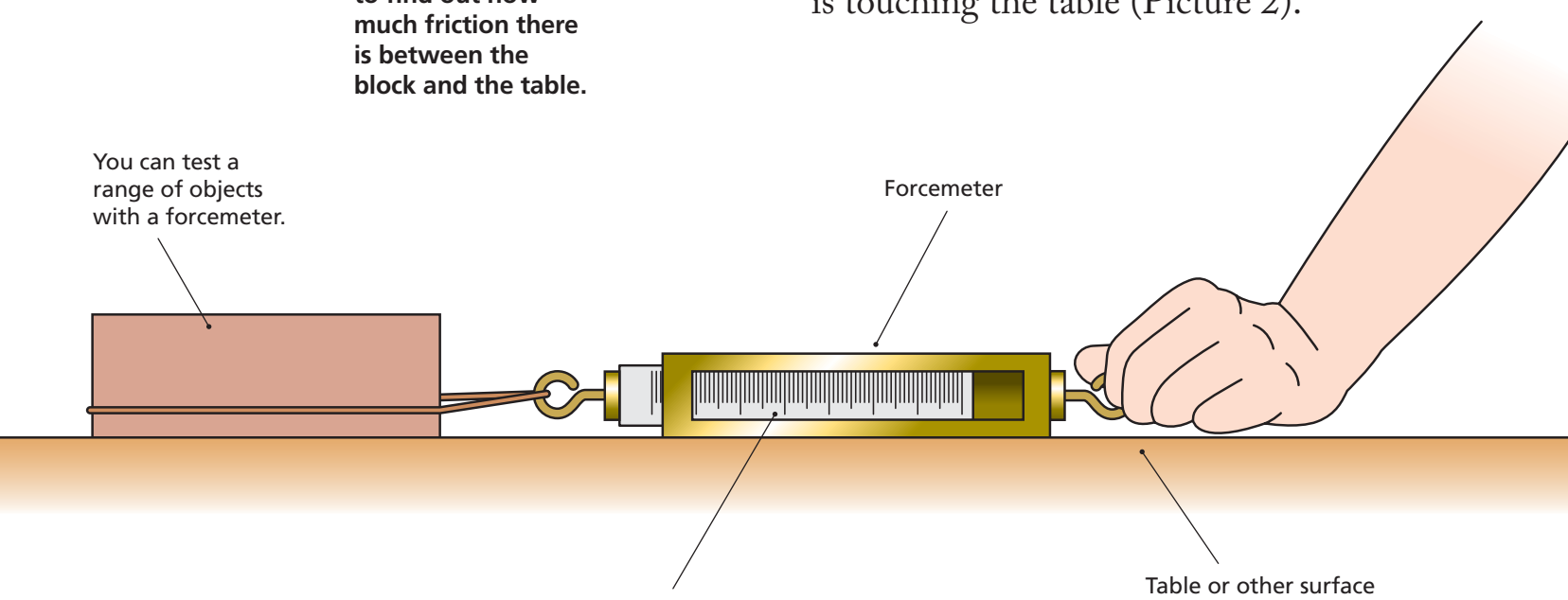
Force can be measured by an instrument called a **FORCEMETER** (Picture 1).

Force is measured in a unit called **NEWTONS**. The unit is named after the famous English mathematician, Sir Isaac Newton.

Friction and area

Using a forcemeter you can find out if friction increases as more of the block is touching the table (Picture 2).

▼ (Picture 1) You can use a forcemeter to find out how much friction there is between the block and the table.



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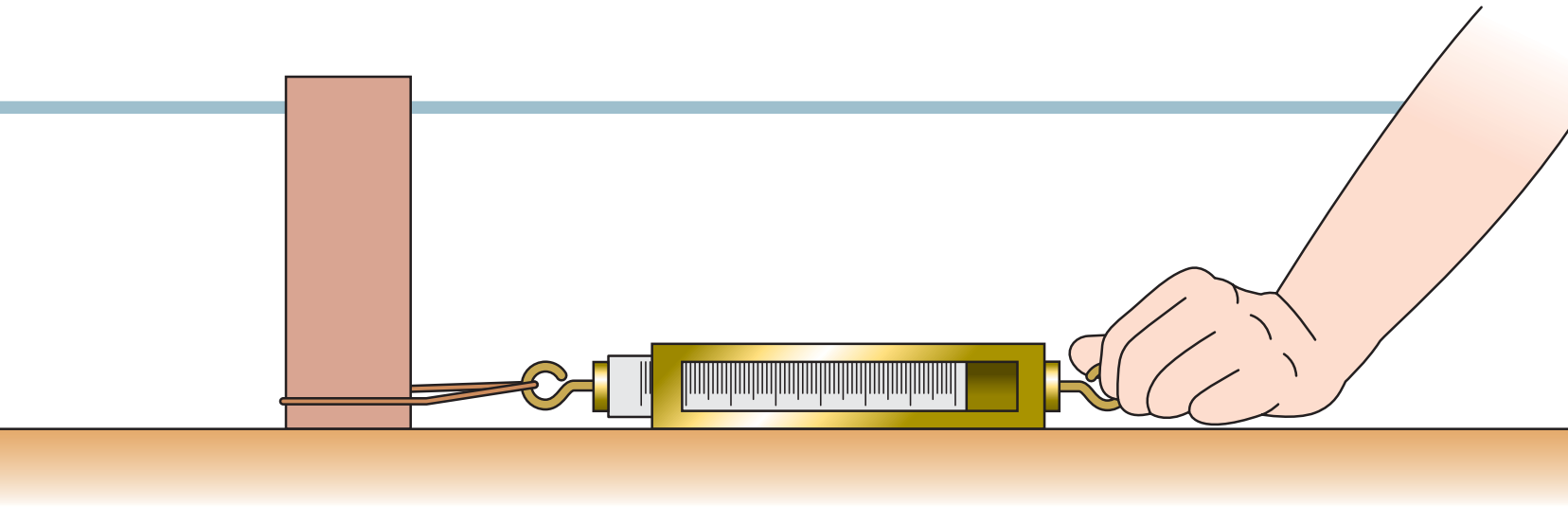
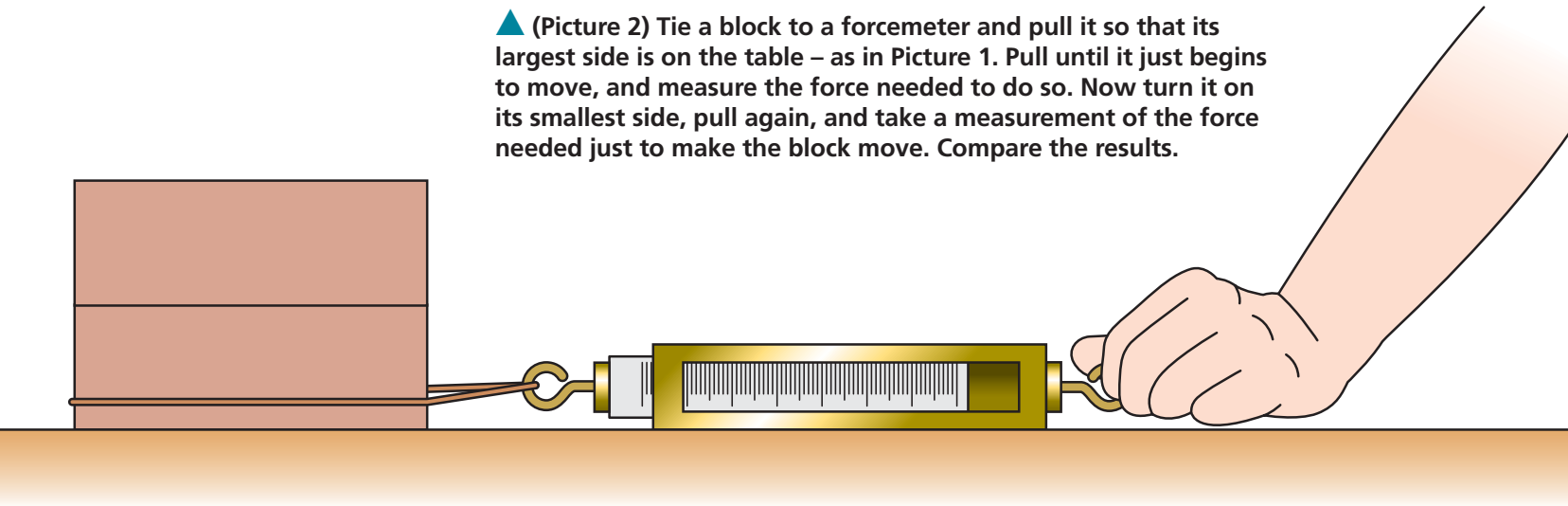


▲ (Picture 2) Tie a block to a forcemeter and pull it so that its largest side is on the table – as in Picture 1. Pull until it just begins to move, and measure the force needed to do so. Now turn it on its smallest side, pull again, and take a measurement of the force needed just to make the block move. Compare the results.



▲ (Picture 3) You can use a forcemeter to find out if the force is different when more blocks are added.

You should find that the force needed is the same in both cases. The amount of friction does not depend on how much of the block touches the table. If this result seems surprising, test it again.

Force on the surface

Try a second test to see what happens when you press, or force, the block down harder on the table. To do this, pile two blocks on top of one another and pull the bottom block with the forcemeter (Picture 3). You should find that the force needed to begin to move both blocks is twice as great as that needed to pull one block.

Add one more block and try again. You should find that the force needed to begin to pull this pile is now three times as great as that needed to pull one block.

From this we can tell that friction becomes greater as greater force presses the surfaces together.

Summary

- **Friction is a force that pushes or pulls against movement.**
- **Friction does not depend on the amount of area in contact.**
- **Friction varies with the weight pressing one surface down on the other.**