Mechanics & Relativity

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Week 5

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Forces 2

This week's topics:

5.1 Friction & Drag

5.2 Springs

5.3 Problem Solving

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Friction

Frictional forces are responsive.

There are two kinds of frictional force: static and kinetic.

Kinetic friction only applies when there is sliding.

$F_{\mu_s} \leq \mu_s N$

$F_{\mu_k} = \mu_k N$

Often, friction problems come down to figuring out the normal force.

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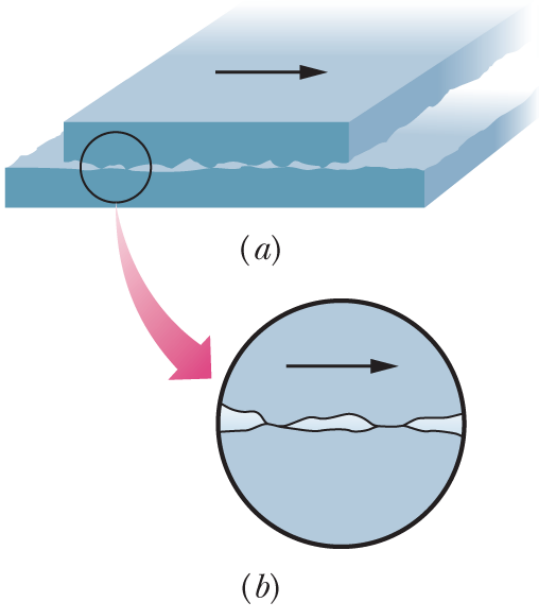
What has friction got to do with the normal force?



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Friction 1: Will it move?

A 1kg wooden crate is on a horizontal surface with $\mu_s = 0.3$. What is its acceleration if I apply a horizontal force of magnitude 10N?

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Friction 1: Will it move?

A wooden crate is on an inclined plane with $\mu_s = 0.4$. At what angle of incline will it begin to slide down the plane?

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Friction 1: Will it move?

The same wooden crate is now being pinned to a wall with $\mu_s = 0.5$ by a horizontal force of unknown magnitude. What is the minimum magnitude of this force to prevent the crate sliding down the wall?

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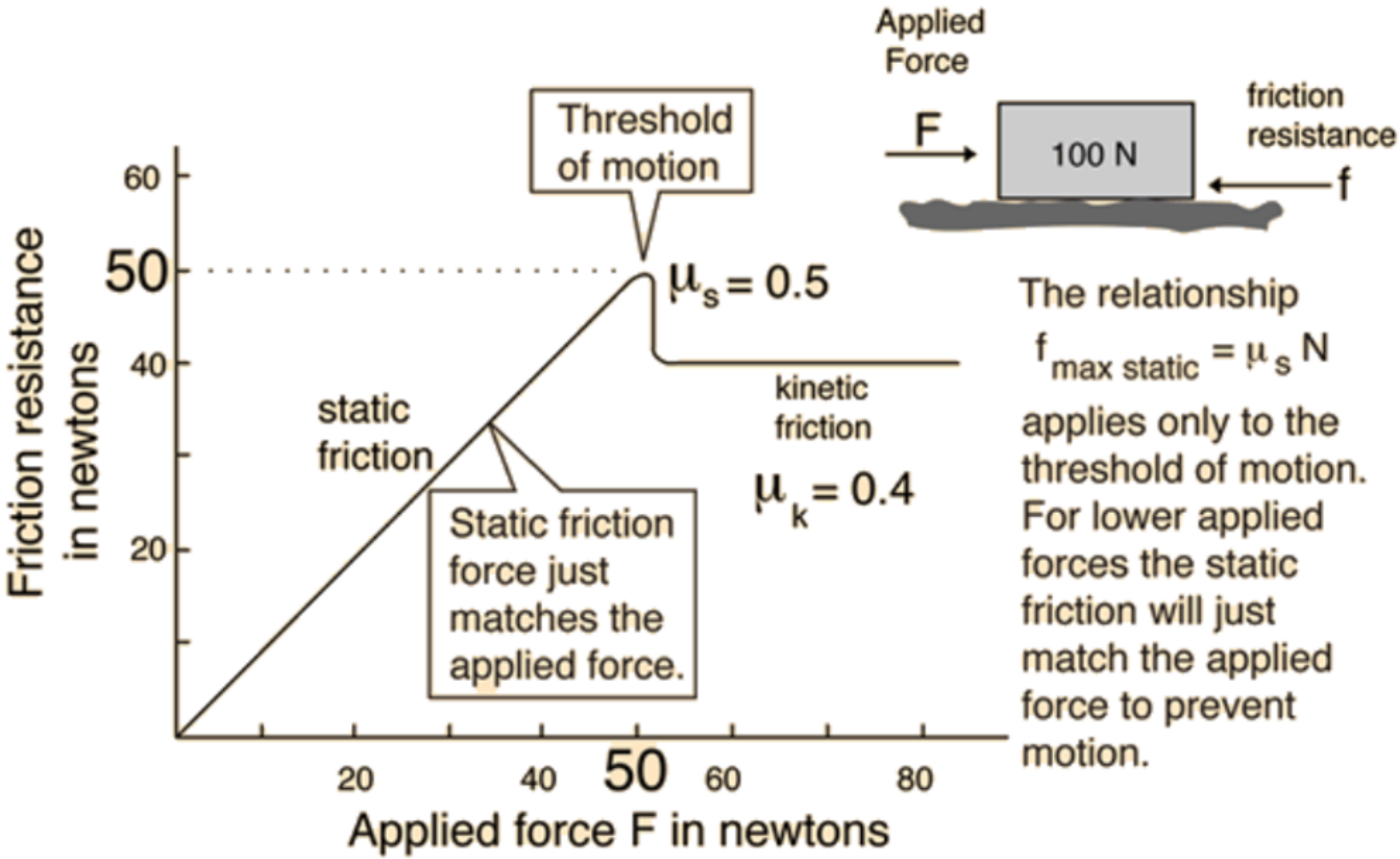
The two frictional forces



Friction 2: Sliding

A 200 kg car is driving along a wet road at 90 km/hr when it starts to slide out of control. If the car comes to a stop in 300m, what is μ_k? Is this possible?

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Drag

$$F_D = \frac{1}{2} C_D \rho A v^2$$

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Terminal Velocity

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