



Phis's World

Episode 5: Newton's 3rd Law- No Pain No Gain



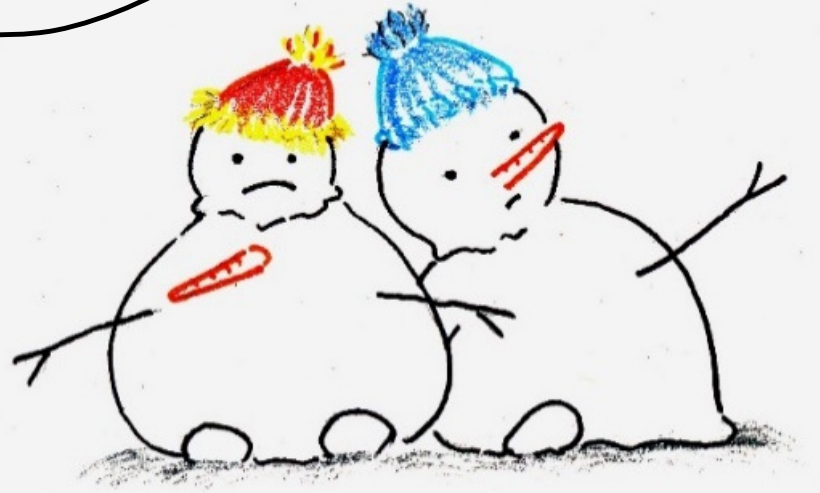
Illustration: Xia Hong

Script: Xia Hong

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Phis, it's sunny out!



Shall we go sledding one more time? The snow will melt soon...

Eh, but it's still chilly outside... and icy...



Come on! You've been slower than last year so far...

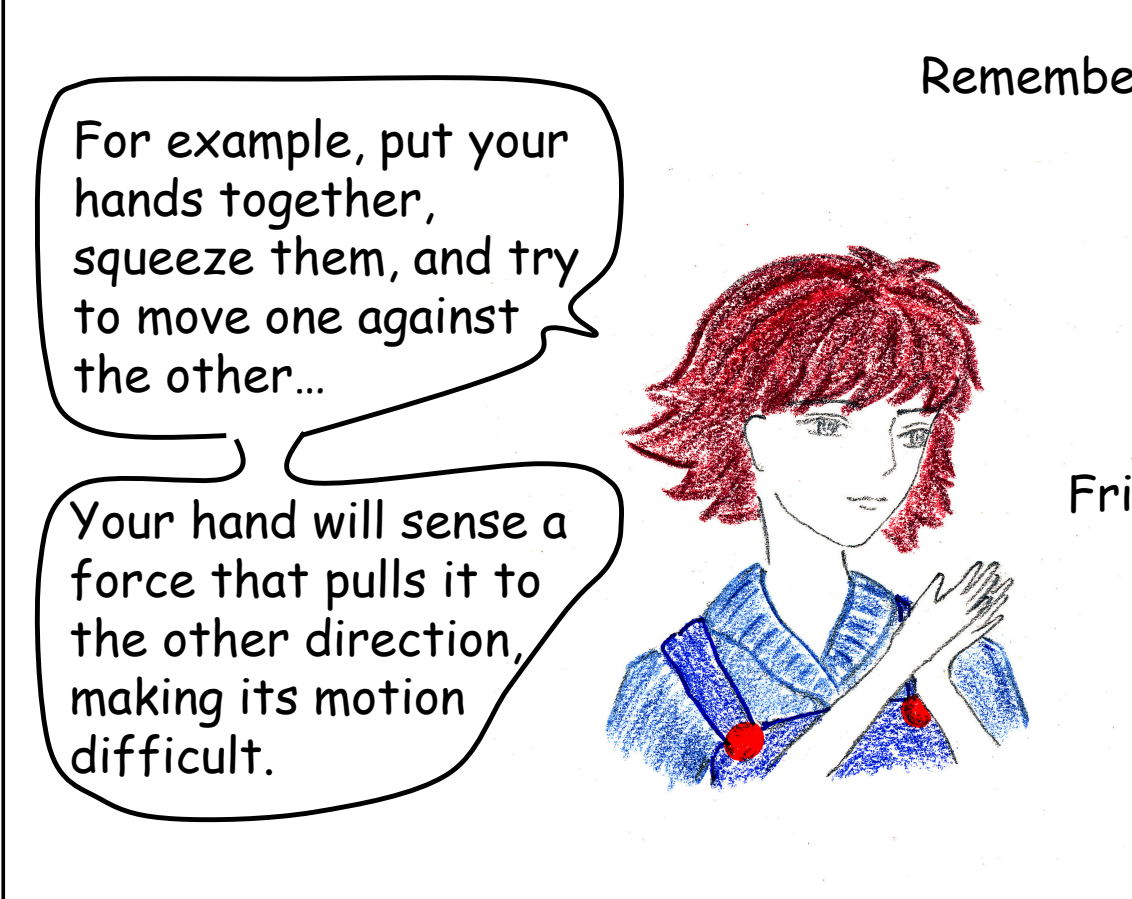
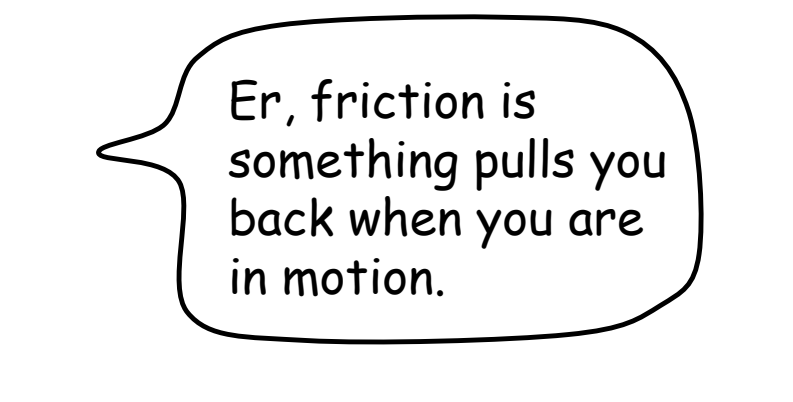
Wanna beat your personal best? Don't let the weather stop you!

Just think what mom is gonna say...

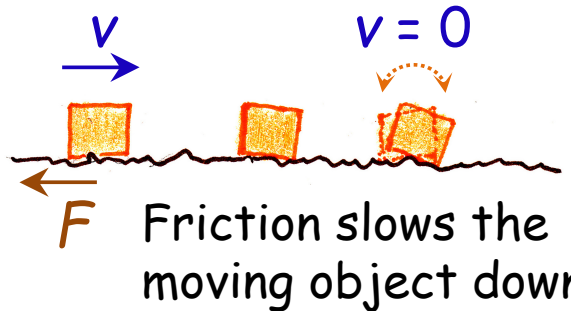
No Pain, No Gain!



Alright, that's annoying enough!
I'll do it!!
Let's go sledding!!!



Remember Newton's 2nd Law: $F = ma$

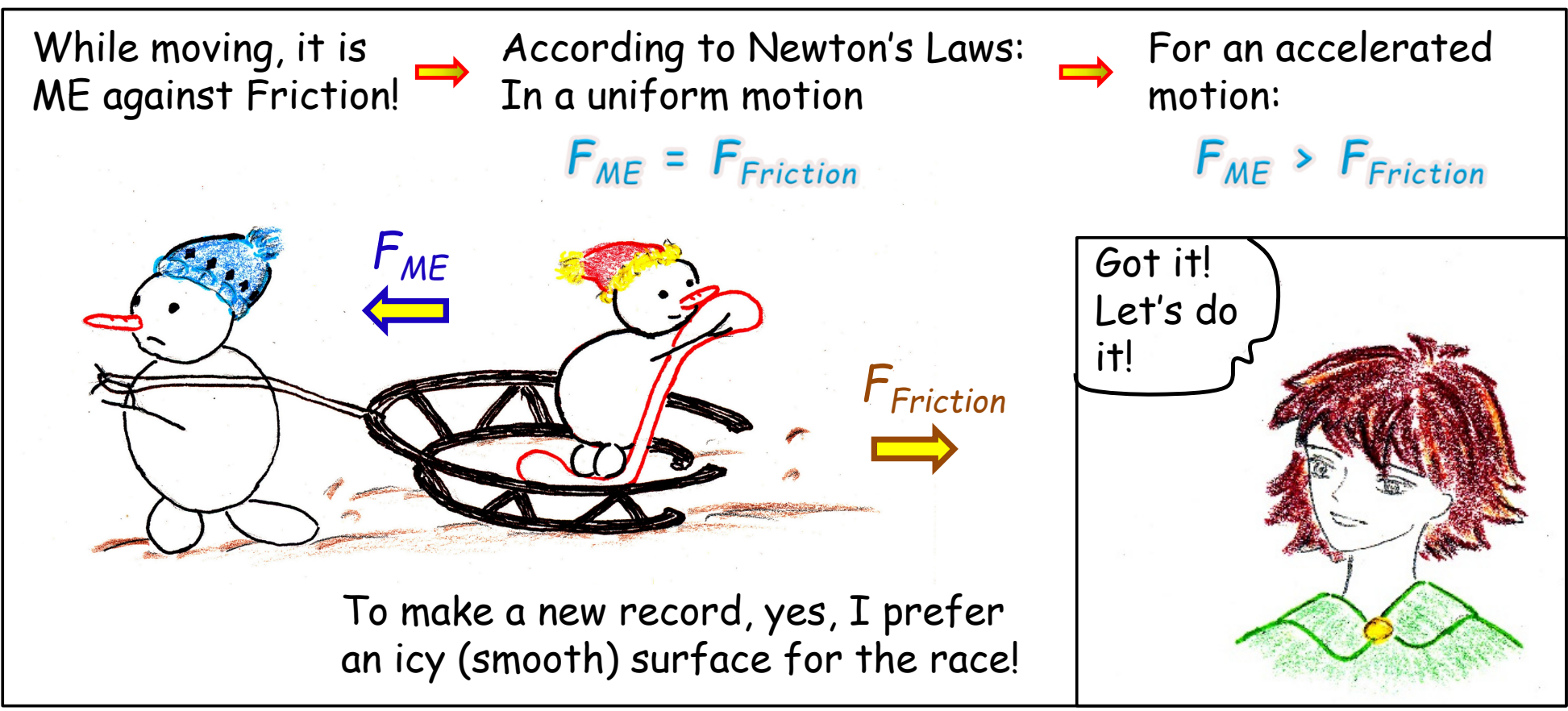


Friction slows the moving object down.

Friction is large on a rough surface...



and small on a smooth surface, where you can travel a long way without another push...



To make a new record, yes, I prefer an icy (smooth) surface for the race!

Er, it's indeed icy!



Aha, this is fun!



Watch out!

Ouch!



Positioning on the starting line...



Chemi, are you ready?

Sure, Phis. How about you?

Me? Cannot be more ready...
All I need to do is to start a push...
And...
Er... Hold on... Wait...
Wait!!!

No...





Phis, should we go inside and report the result to mom?

Chemi, let me stay here for a minute... and reflect on it...

You know, Chemi, what happened just proves Newton's 3rd law:

When two bodies (e.g., sled and I) interact, they exert forces to one another that are equal in magnitude and opposite in direction.

Okey, Phis. Good you figured that out.

I think it also prove what Mom said:

**No Pain
No Gain**

To read more about the stories of Phis, please visit us at www.physics.unl.edu/~xhong/hong/Phis/PhisHome.html.



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