Phis's World

Episode 4: Newton's 2nd Law Revisited–

Push Harder or Eat Less

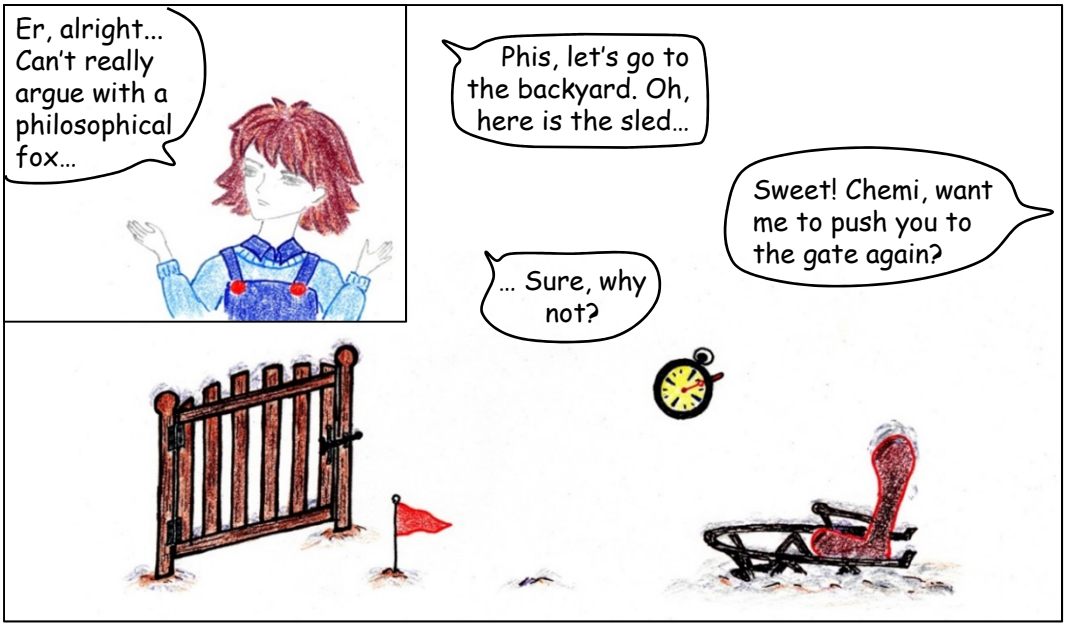
Illustration: Xia Hong

Script: Xia Hong

08/2017


The first snow this year!
It's time to continue our family tradition.
Chemi: 4
Phis: 8
Chemi: 2
Phis: 6
The sled series again? Oh, NO!
Aren't Chemi and I too old for that?
Well, you may be too old. I'm definitely not!
I think having a tradition is pretty cool.


"It's the fact that one day is different from the other days, one hour from the other hours." – fox
Antoine de Saint-Exupéry*
That's called a rite- says the fox in The Little Prince.
Xia 08-17-17


Er, alright... Can't really argue with a philosophical fox...
Phis, let's go to the backyard. Oh, here is the sled...
Sweet! Chemi, want me to push you to the gate again?
... Sure, why not?


Let me start with some warm up exercises!
Er, for what? Aren't you just sitting there?


To keep me warm! It took you quite a while to reach the gate last year!
Aha... No worries! I'm much stronger now! It will be very fast this time!

That would be nice…

?

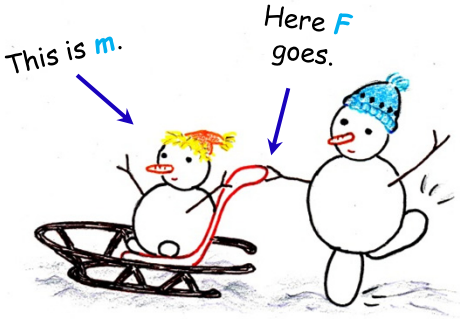
But how?

Oh, easy to explain. Remember the question you asked last time?

Newton's 2nd Law

$$F = ma$$

F : Force
m : mass
a : acceleration



The key factor here is **a**, or the acceleration. It is the speed (**v**) change within a certain amount of time (**t**).

$$a = \frac{\Delta v}{\Delta t}$$

A large **a** means we can reach a very high speed very quickly. It describes the state of moving faster and faster.

To increase **a**, all I need to do is to increase **F**, or how hard I push the sled…

which is not a problem at all…

Just look at how much stronger I am now compared to last year!

Quite convincing, right?
Wait, Chemi, you look puzzled?

All that sounds quite authoritative…

Er, just a minor question. What happens to **m** ?

What about **m** ?
That is mass, how much you weigh.

That is exactly my question: I also weigh more compared to last year, isn't it? Does it matter?

Sure…

Oops… 😐?!

You know, Chemi. According to Newton, there's a solution to this problem —

$F = ma$

$F \Uparrow$

You mean you will do more exercises?

Okey, apparently there's more than one solution…

$m \Downarrow$

I'm actually thinking, er, maybe you can start a diet and lose some weight…

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

This project is supported by National Science Foundation Grant CAREER No. DMR-1148783.**

* Image created based on "*The Little Prince*" (Antoine de Saint-Exupéry).

** Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.