

On the highway of life, are you the bug or the windshield?

Bug hits windshield



Bug hits windshield



The force on each is...

The same- Newtons third law  
You can only exert back as much force is exerted on you



The time of impact is...

The same- it would be impossible for the bug to hit the windshield for 2 seconds while the windshield hits the bug for 3 seconds



The change of velocity on each is...

Very Different - The car, hardly noticeable. The bug very noticeable. The bug slows down, stops and reverses direction



The momentum before and after...

The same - momentum is conserved in a collision



• What about a BIGGER BUG?


The force on each is...

The same- Newtons third law  
You can only exert back as much force is exerted on you




The time of impact is

The same - It would be impossible for the bug to hit the windshield for 2 seconds while the windshield hits the bug for 3 seconds



The change of velocity on is...


Slightly Different - The car slows down noticeably, The bug slows down stops and reverses direction



- So Why Does the bug go splat, but a windshield doesn't


It's only a Small force when a bug hits the windshield

It only takes a small force to kill a bug. That same size force won't hurt the windshield




The difference, the size of the force impulse and momentum,


the small bug, the less force, impulse, change in momentum, the bigger the bug the more of each



What if the bug is the same mass and same speed as a car?



They stop



- What are some approximate numbers
- Car mass 1500 kg
- Car speed 60 mph 33m/s
- Bug mass 1 g = .001 kg
- Bug speed 10 mph 7 m/s

- $1500 \cdot 33 + .001 \cdot 7 = (1500 + .001)v$
- $49500 + -.007 = 1500.001 \cdot v$
- $49499.993 = 1500.01 \cdot v$
- $32.99 = v$
- So the car's velocity changes from 33 to 32.99, while the bug changes from -1 to 32.99