Will it hit an asteroid or other planet?

Why doesn’t it deteriorate like it would on earth?

Will it still send photos?

How is there no friction?

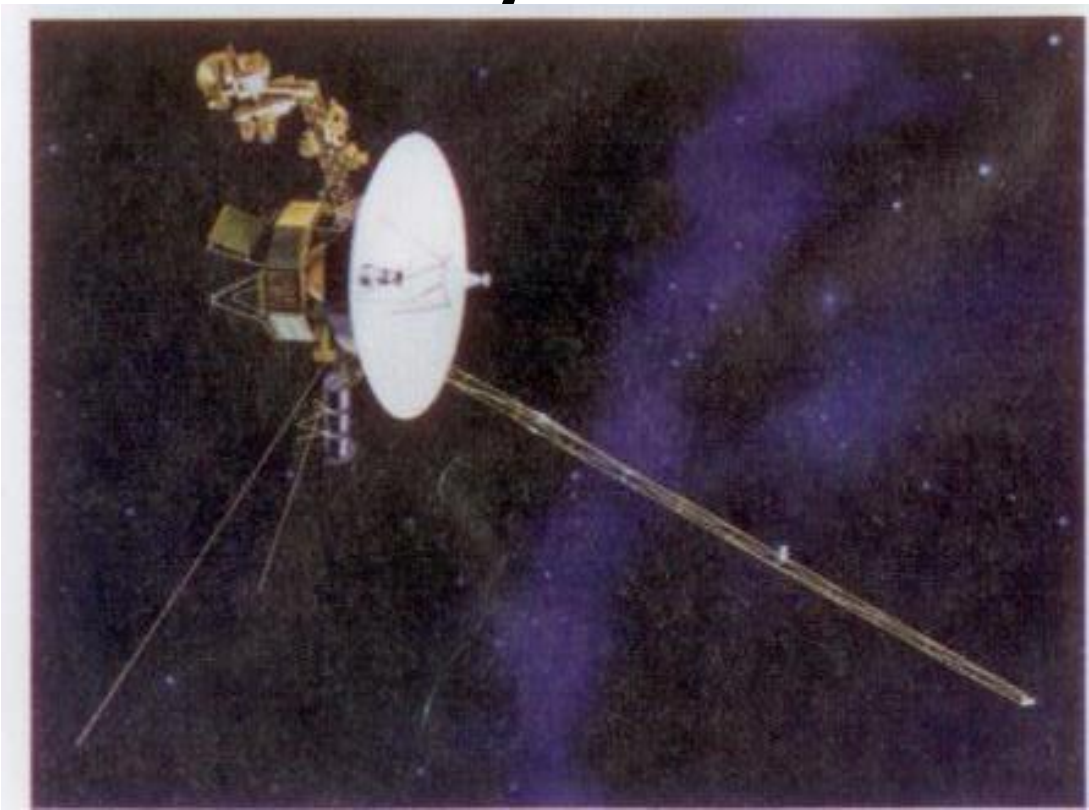
Will it hit an asteroid or other planet? **It could**

Why doesn't it deteriorate like it would on earth? **No oxygen or weather**

Will it still send photos? **Yes, still sending data. Nuclear power source – currently at 55%**

How is there no friction?

No air in space



A book is resting on your desk. Consider the following forces:

1. A downward force of gravity.
2. An upward force exerted by the surface.

Which of the above forces are acting on the book?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither

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A bowling ball is rolling across the floor, the main force(s) acting on the ball is (are)

A. A downward force of gravity
B. A downward force of gravity, and a force in the direction of motion.
C. A downward force of gravity, an upward force exerted by the surface, and a force in the direction of motion.
D. A downward force of gravity, an upward force exerted by the surface.

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D. **A downward force of gravity, an upward force exerted by the surface.**

A large box is pulled with a constant horizontal force. As a result, the box moves across a level floor at a constant speed.

The pull:

A. has the same magnitude as the weight of the box.
B. is greater than the weight of the box.
C. has the same magnitude as the total force which resists the motion of the box.
D. is greater than the total force which resists the motion of the box.
E. is greater than either the weight of the box or the total force which resists its motion.

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Natural motion so Zero net Force

If the pulling suddenly stops, then the box will:

A. Immediately come to a stop
B. Continue moving at a constant speed for awhile and then slow to a stop.
C. Immediately start slowing to a stop.
D. Continue at a constant speed.

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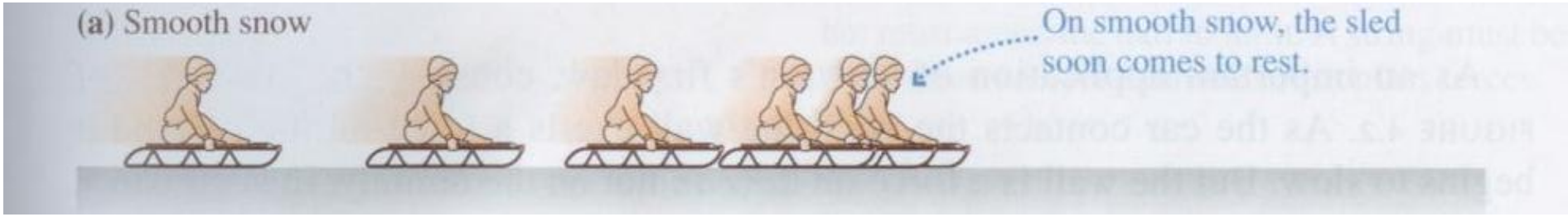


If, *instead,* the horizontal force pulling the box is doubled. The box's speed:

A. Continuously increases
B. Will be double the speed but still constant.
C. Is greater and constant, but not necessarily twice as great.
D. Is greater and constant for awhile and increases thereafter.
E. Increases for awhile and constant thereafter.

If, *instead,* the horizontal force pulling the box is doubled. The box's speed:

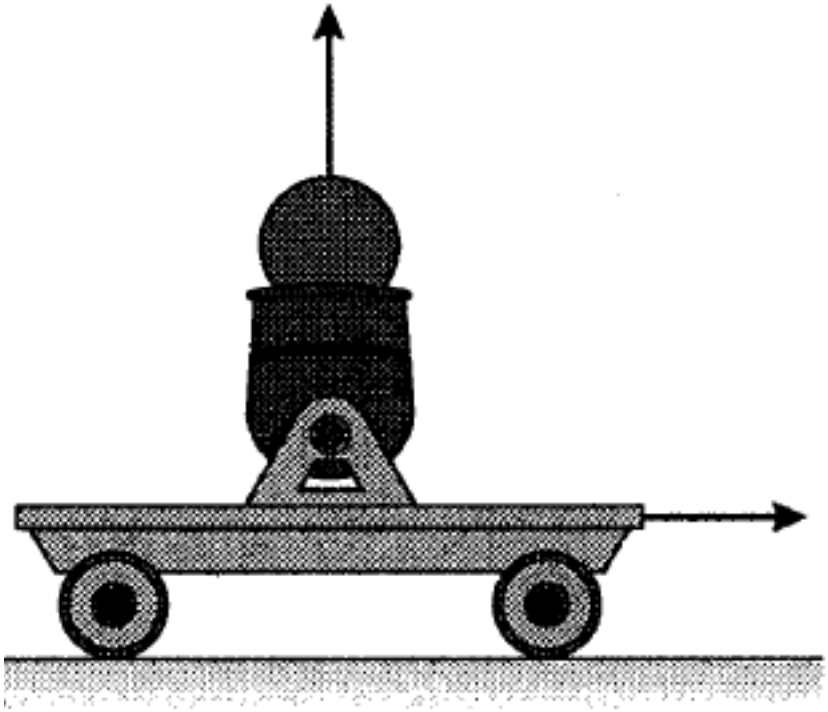
A. **Continuously increases**
B. Will be double the speed but still constant.
C. Is greater and constant, but not necessarily twice as great.
D. Is greater and constant for awhile and increases thereafter.
E. Increases for awhile and constant thereafter.

What will happen if the cart rolls at a constant velocity and then shoots a ball straight up?

A. The ball will land behind the cart.

B. The ball will land in the cart.

C. The ball will land in front of the cart.



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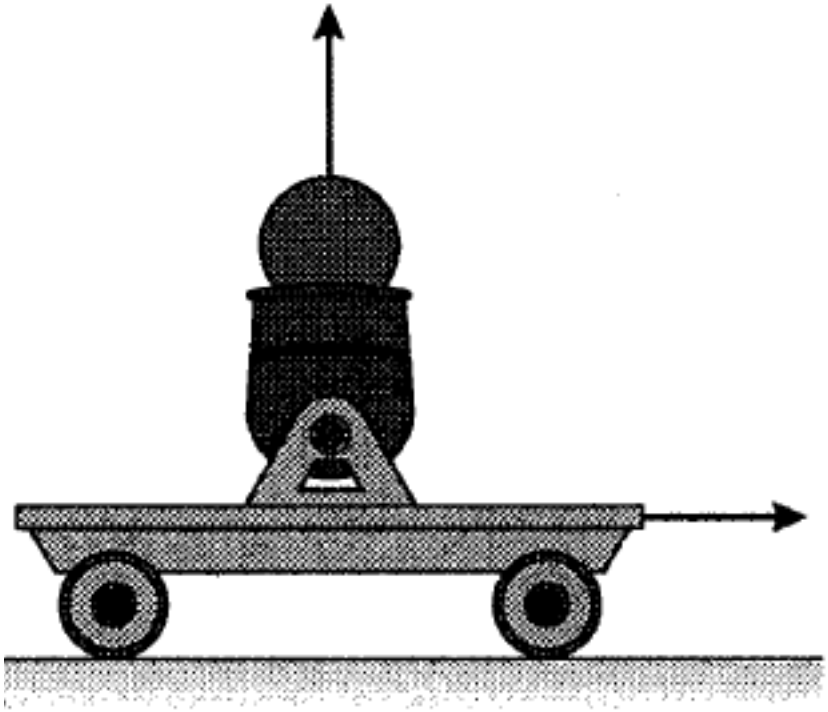


Newton's 3rd Law

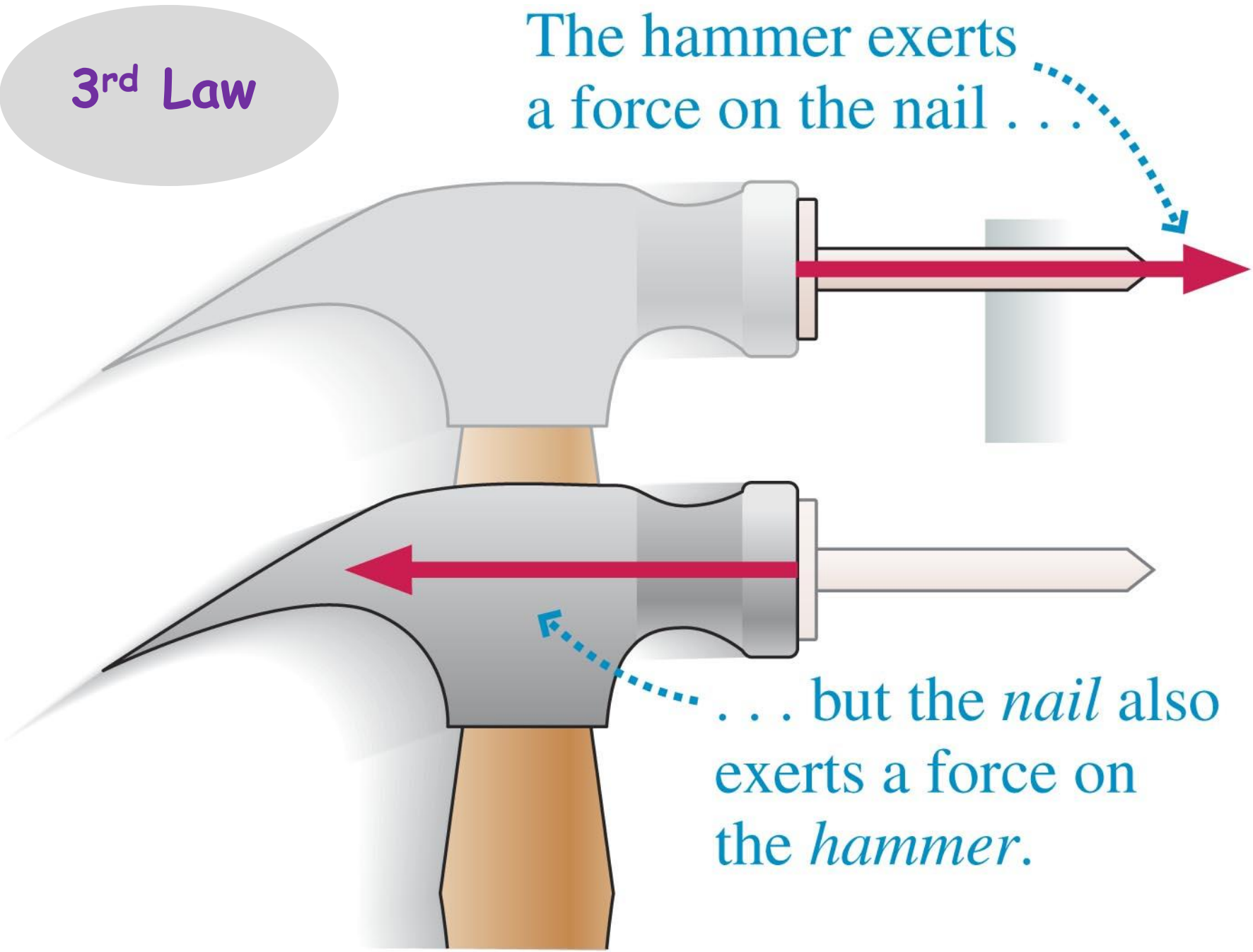
Every force has an equal and opposite force

You push on a Wall

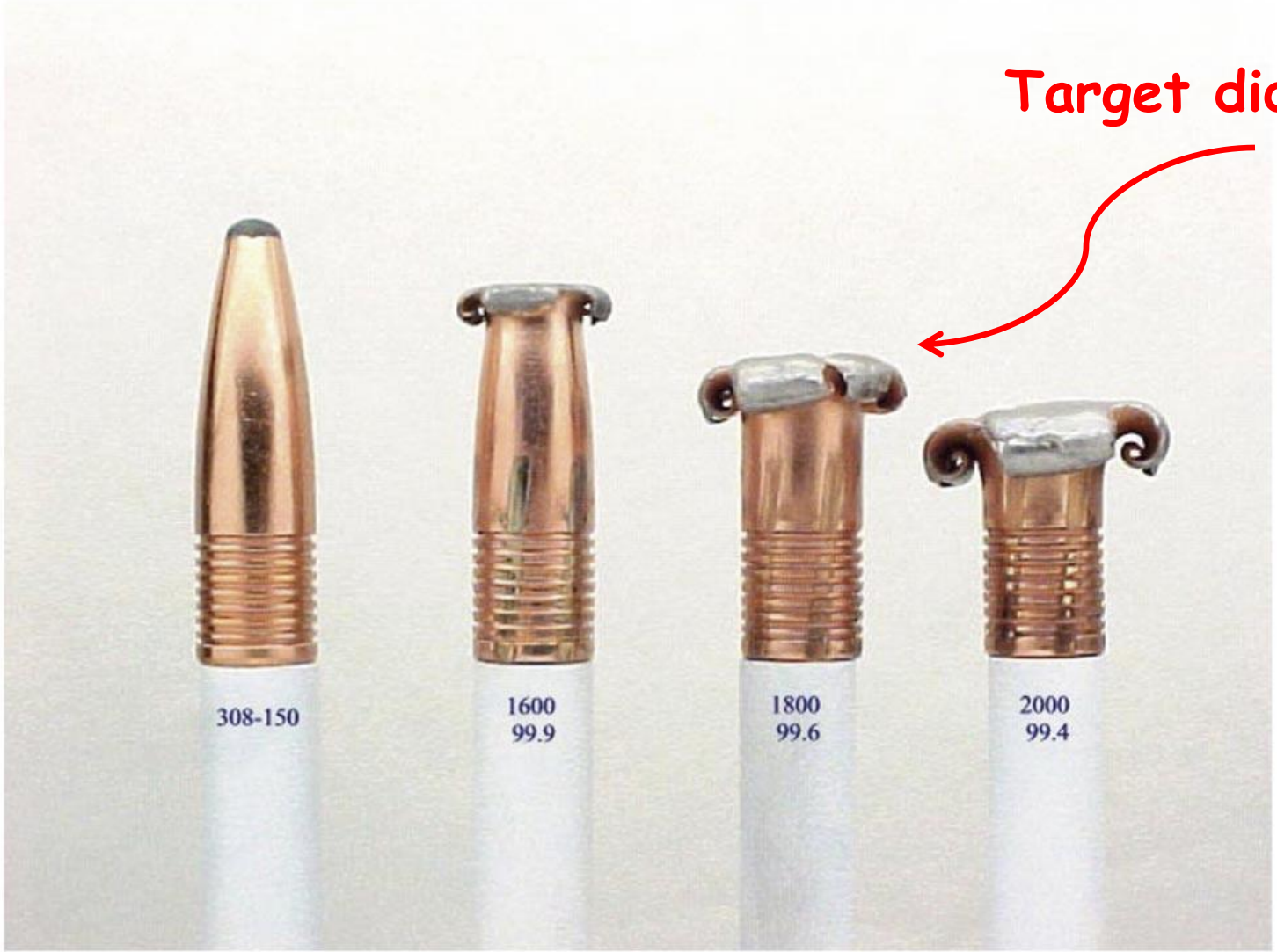
- don’t fall through

- Wall pushes on you

3rd Law



Bullet



Walking

The person pushes backward against the surface. The surface pushes forward on the person.

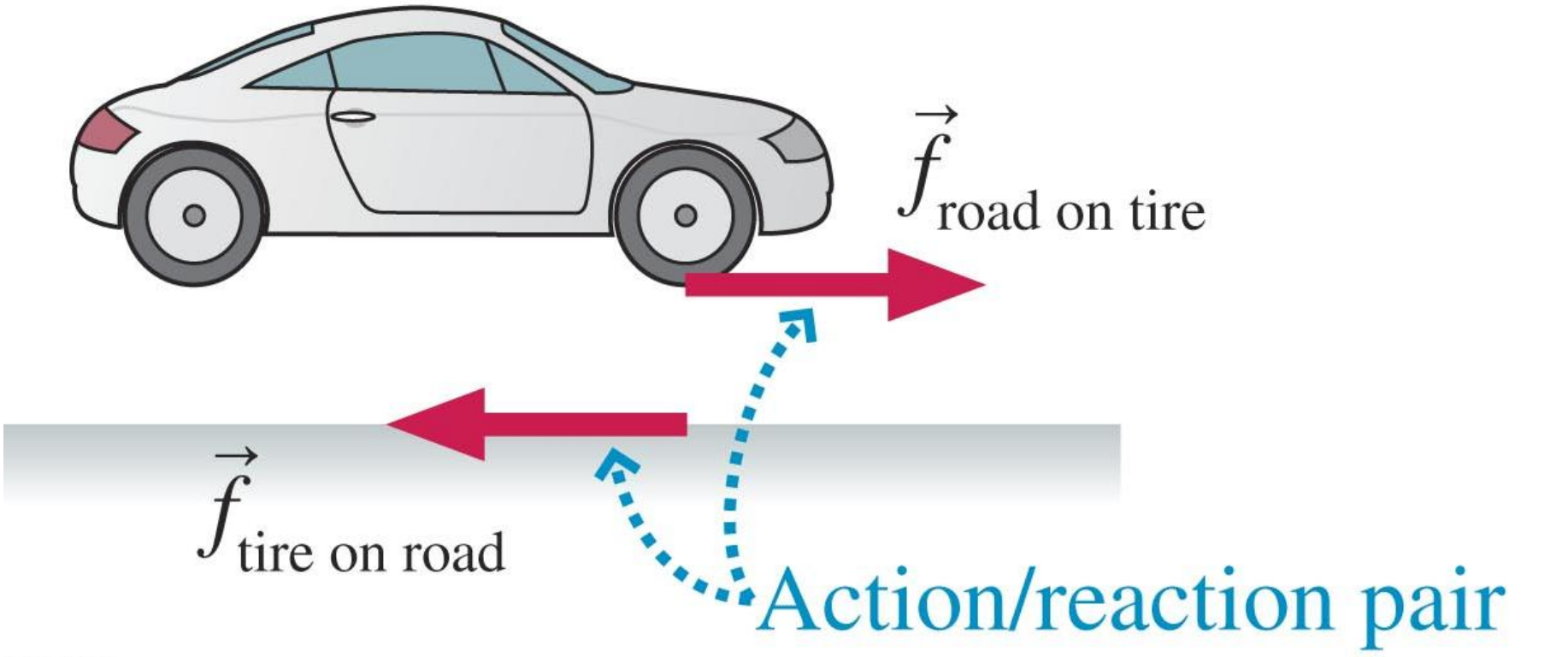
$\vec{f}_{\text{surface on person}}$

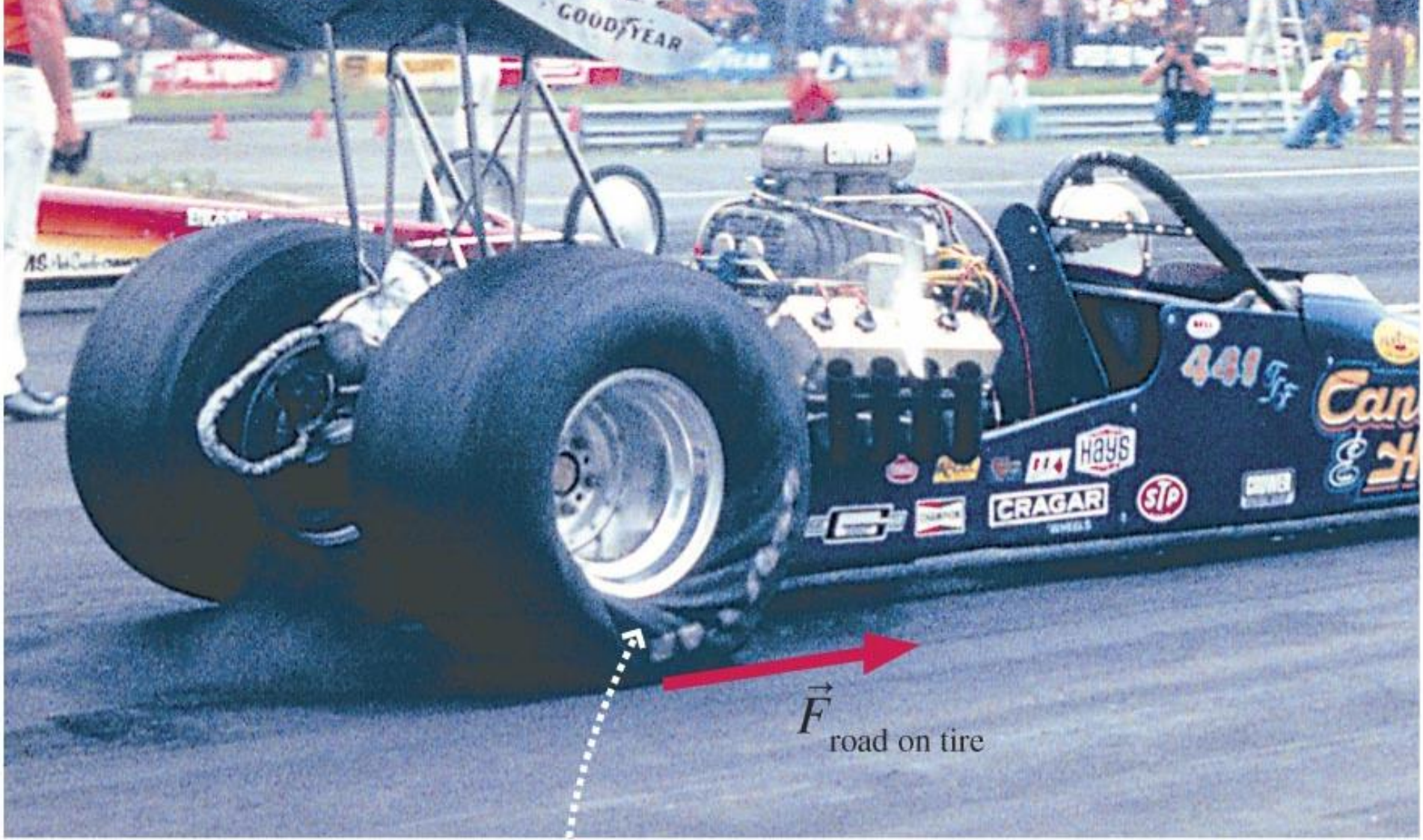
$\vec{f}_{\text{person on surface}}$

Force Pair

Propulsion

The tire pushes backward against the road. The road pushes forward on the tire.





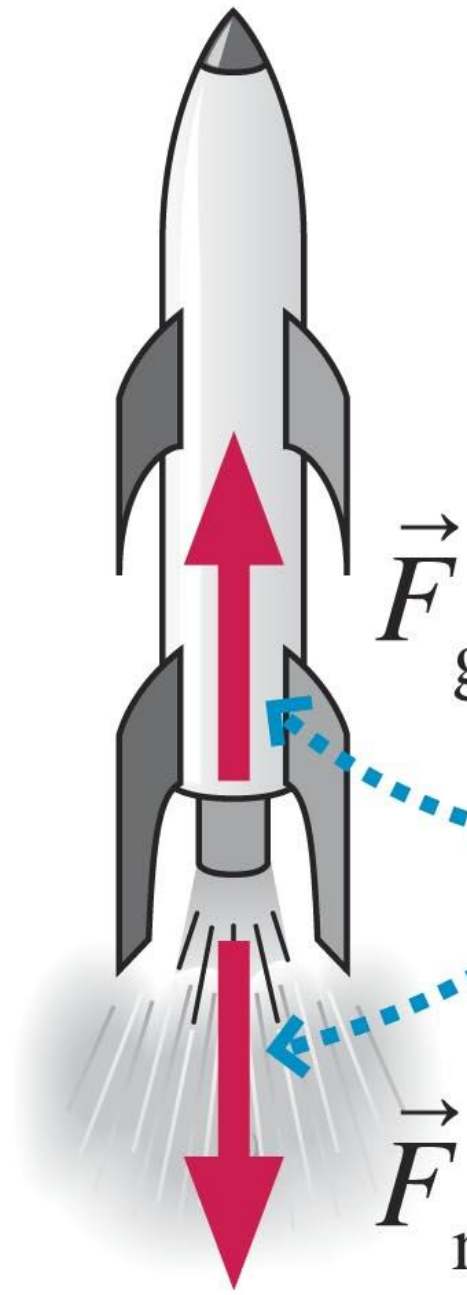
You can *see* that the force of the road on the tire points forward by the way it twists the rubber of the tire.

Rocket/Jet Engine

What pushes a rocket forward?

A. Engine shooting gas out
B. Surrounding air pushing back
C. Hot gasses pushing forward
D. Other

The rocket pushes the hot gases backward. The gases push the rocket forward.



$\vec{F}$ gases on rocket

Action/reaction pair

$\vec{F}$ rocket on gases

Rocket/Jet Engine

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A. Engine shooting gas out
B. Surrounding air pushing back
C. Hot gasses pushing forward
D. Other