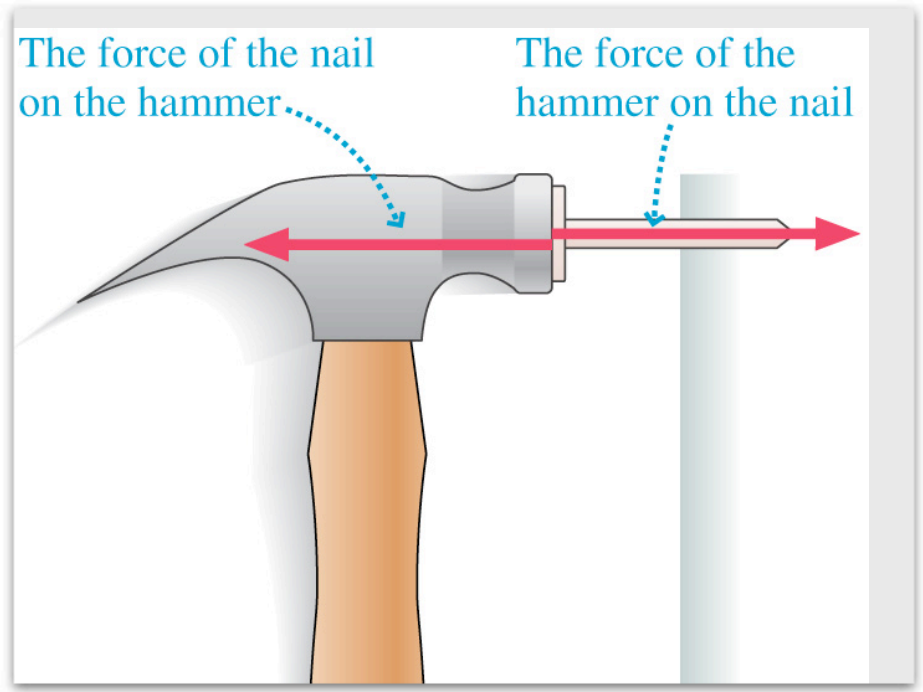
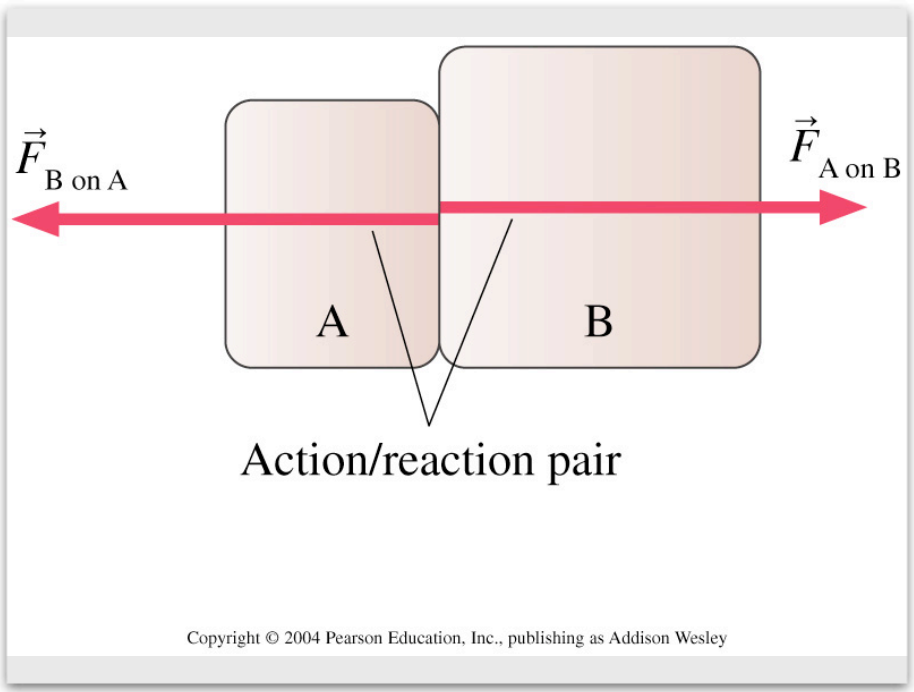
Newton's 3rd Law

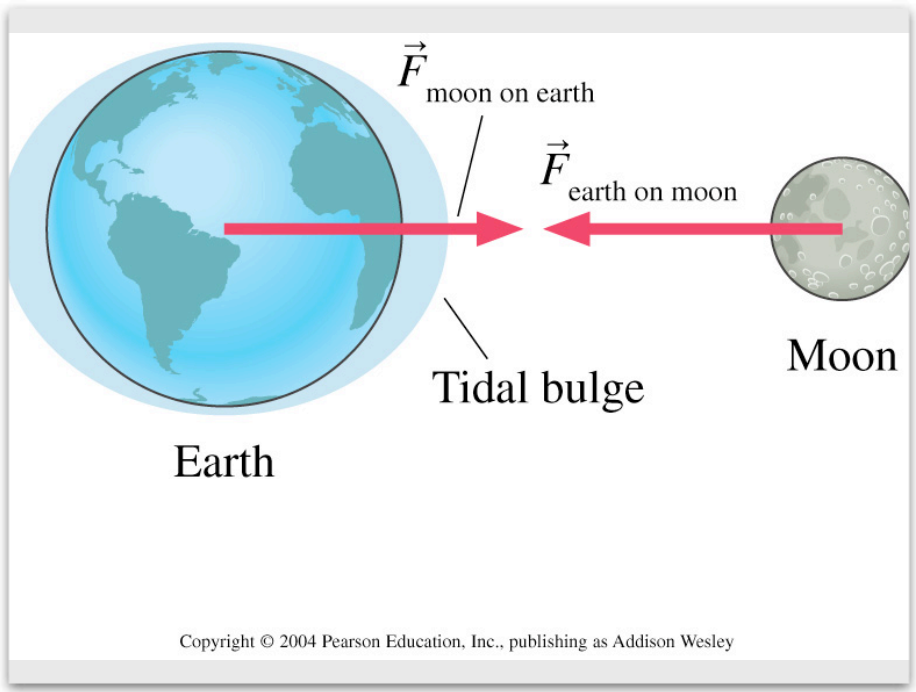
"For every action, there is a equal and opposite reaction"


The force of the nail
on the hammer
The force of the
hammer on the nail

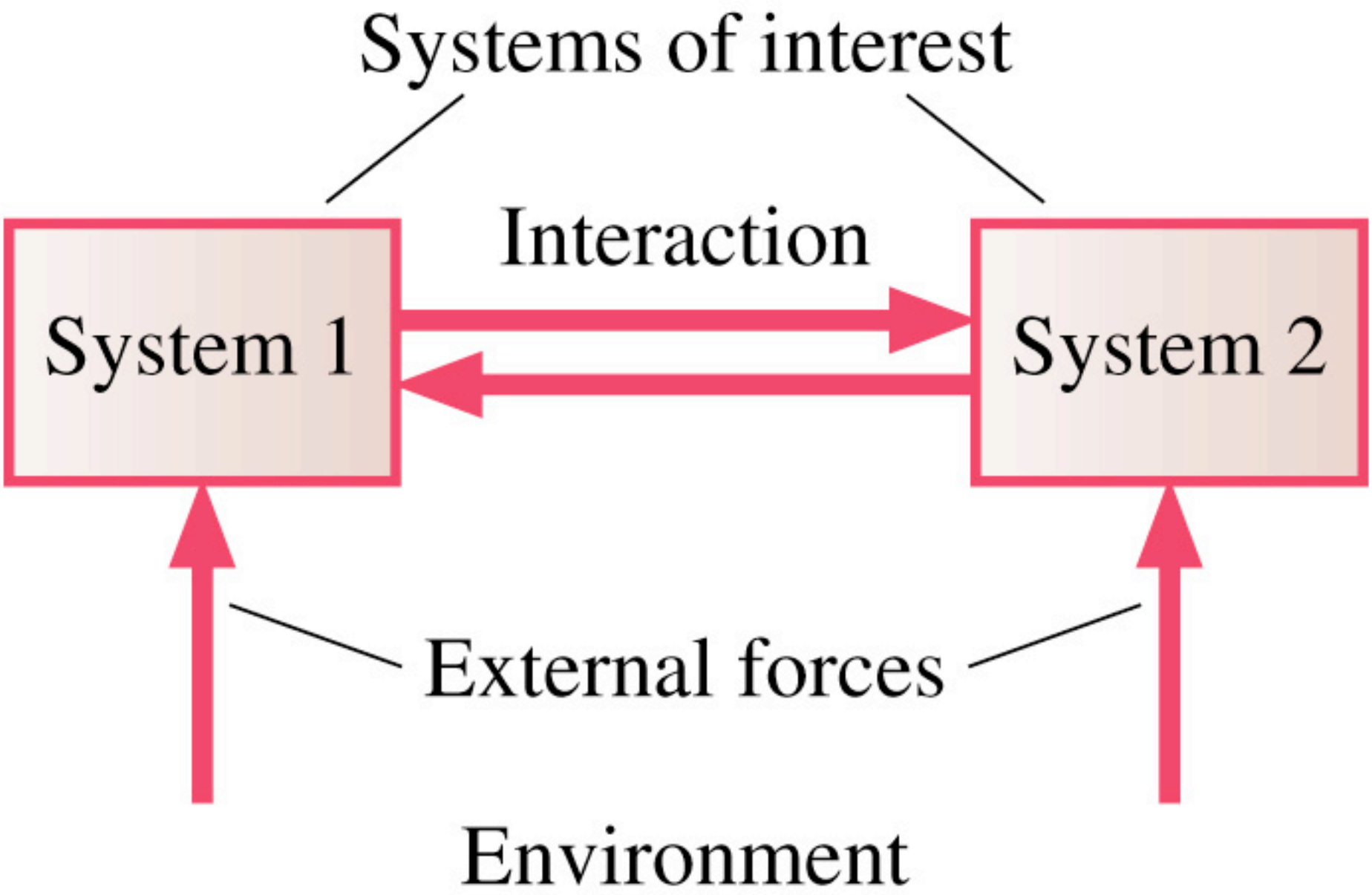
Hammer & Nail

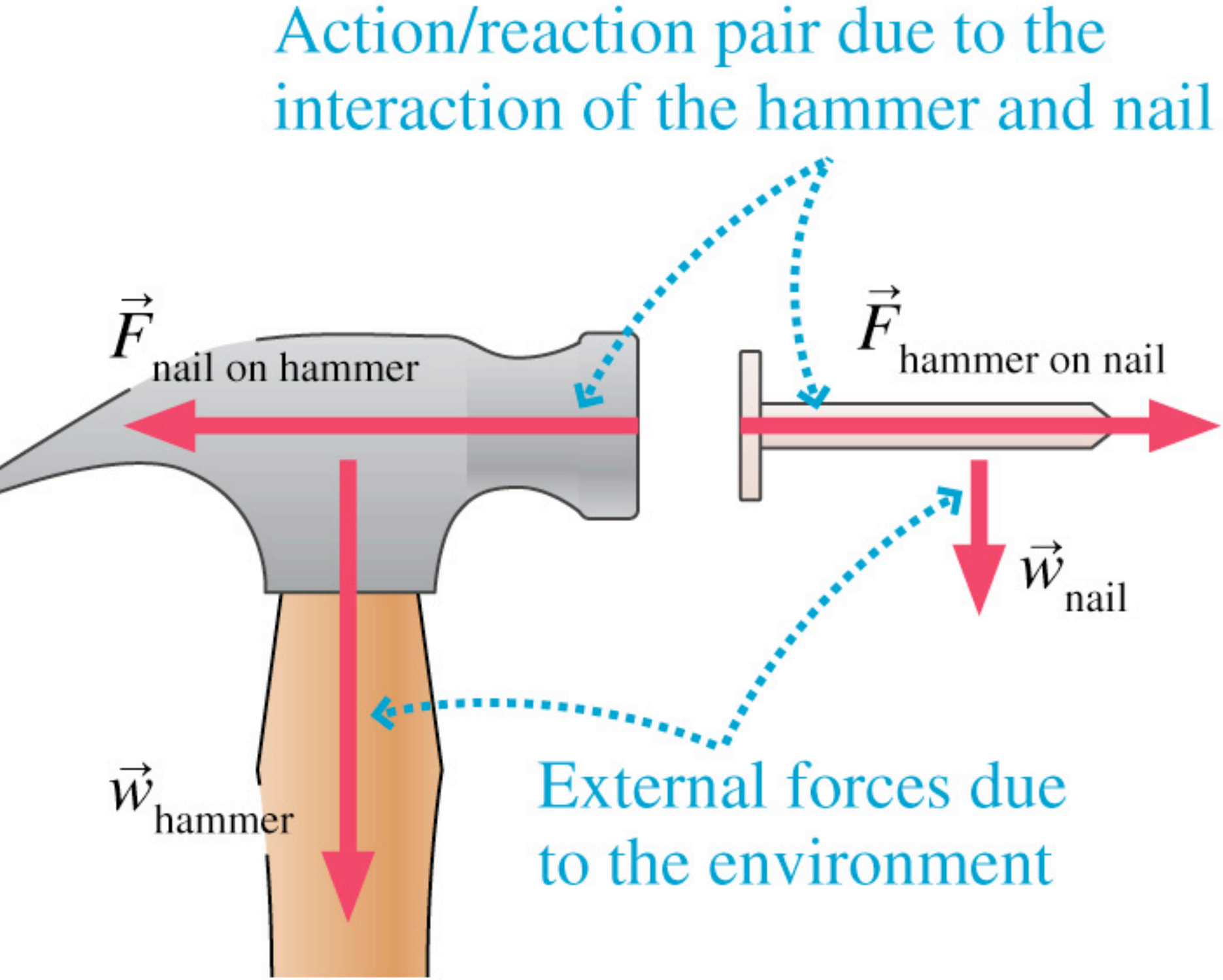


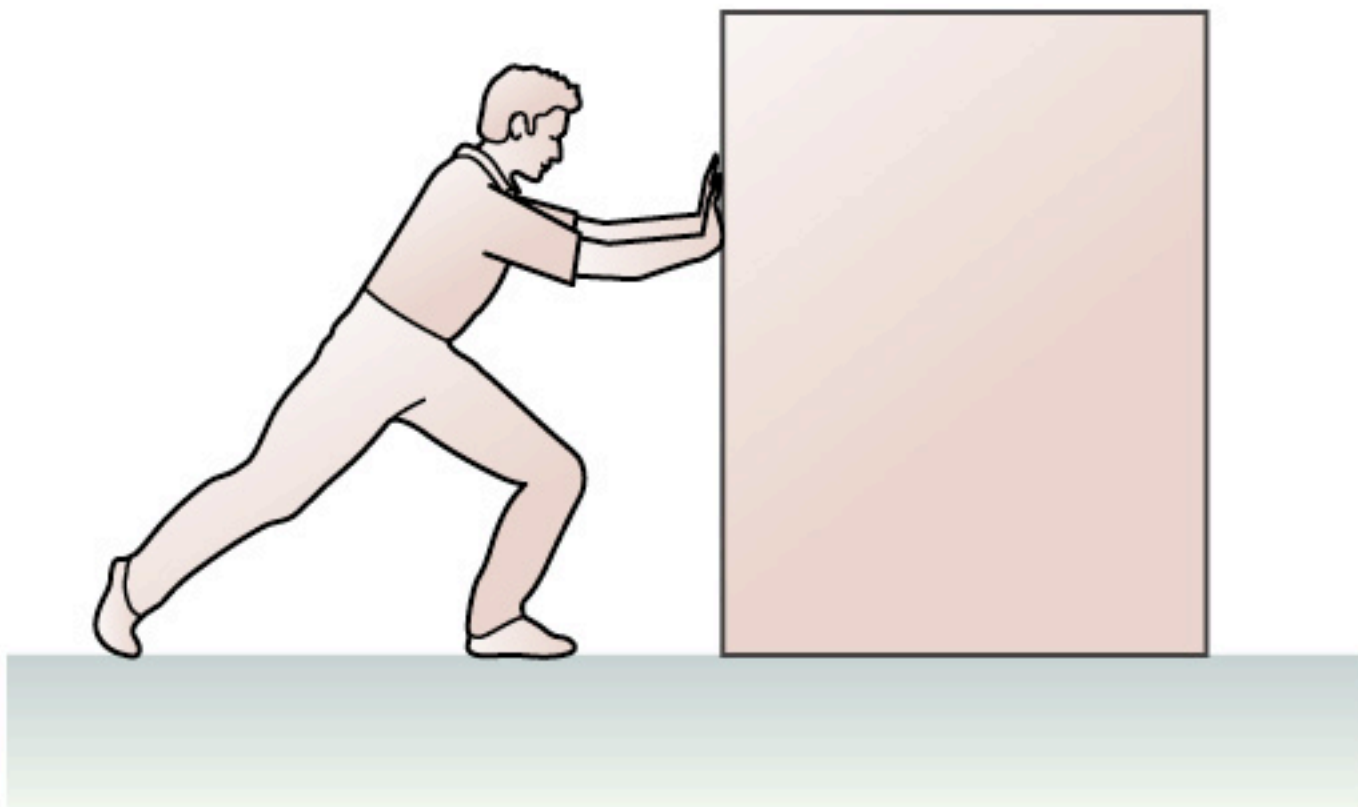
Force of B on A is matched by a Force of A on B
Magnitudes equal, Directions opposite



Gravitational forces of the earth and moon


Systems of interest
Interaction
System 1
System 2
External forces
Environment


Action/reaction pair due to the interaction of the hammer and nail
$\vec{F}_{\text{nail on hammer}}$
$\vec{F}_{\text{hammer on nail}}$
$\vec{w}_{\text{nail}}$
$\vec{w}_{\text{hammer}}$
External forces due to the environment



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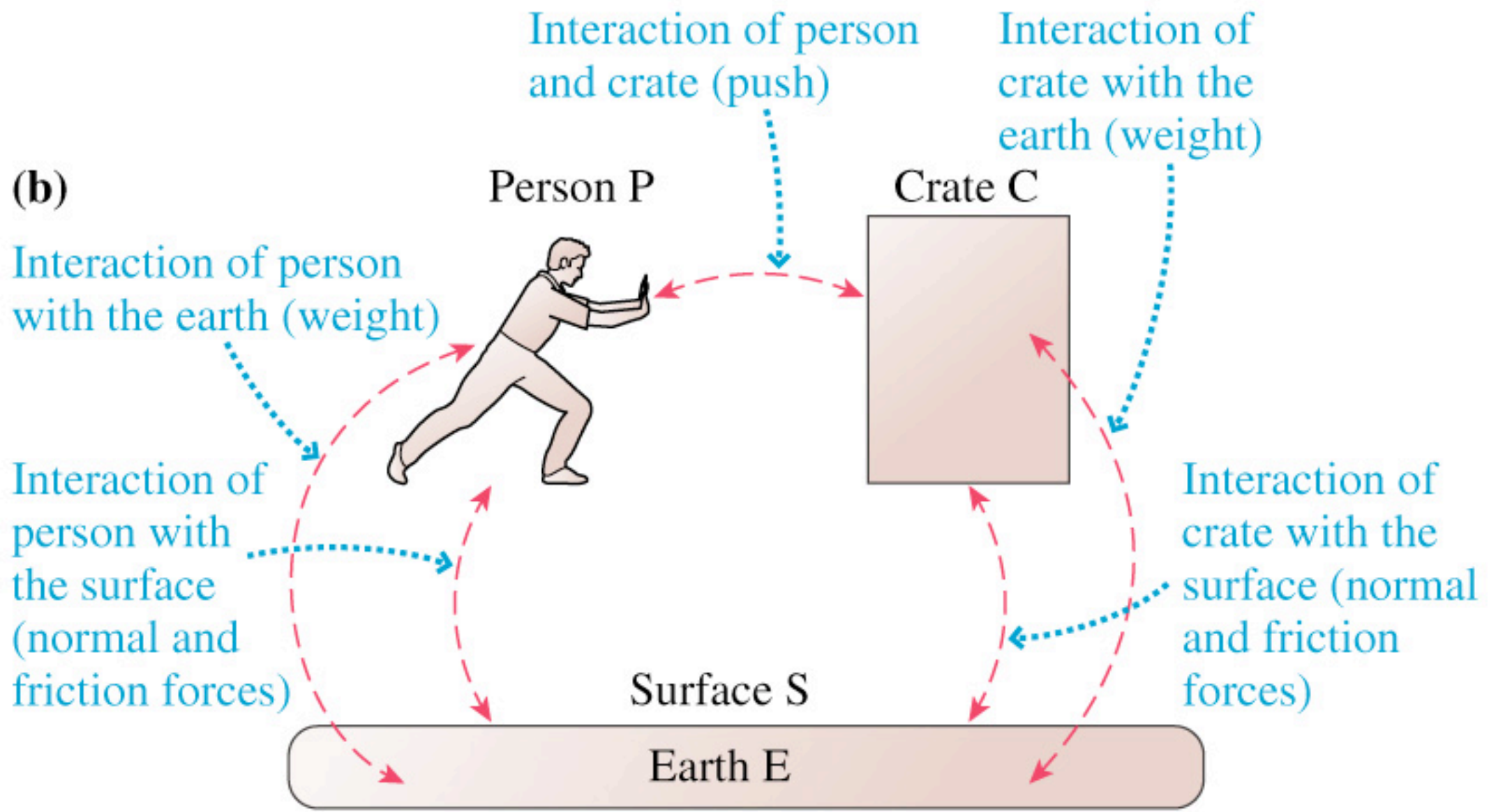

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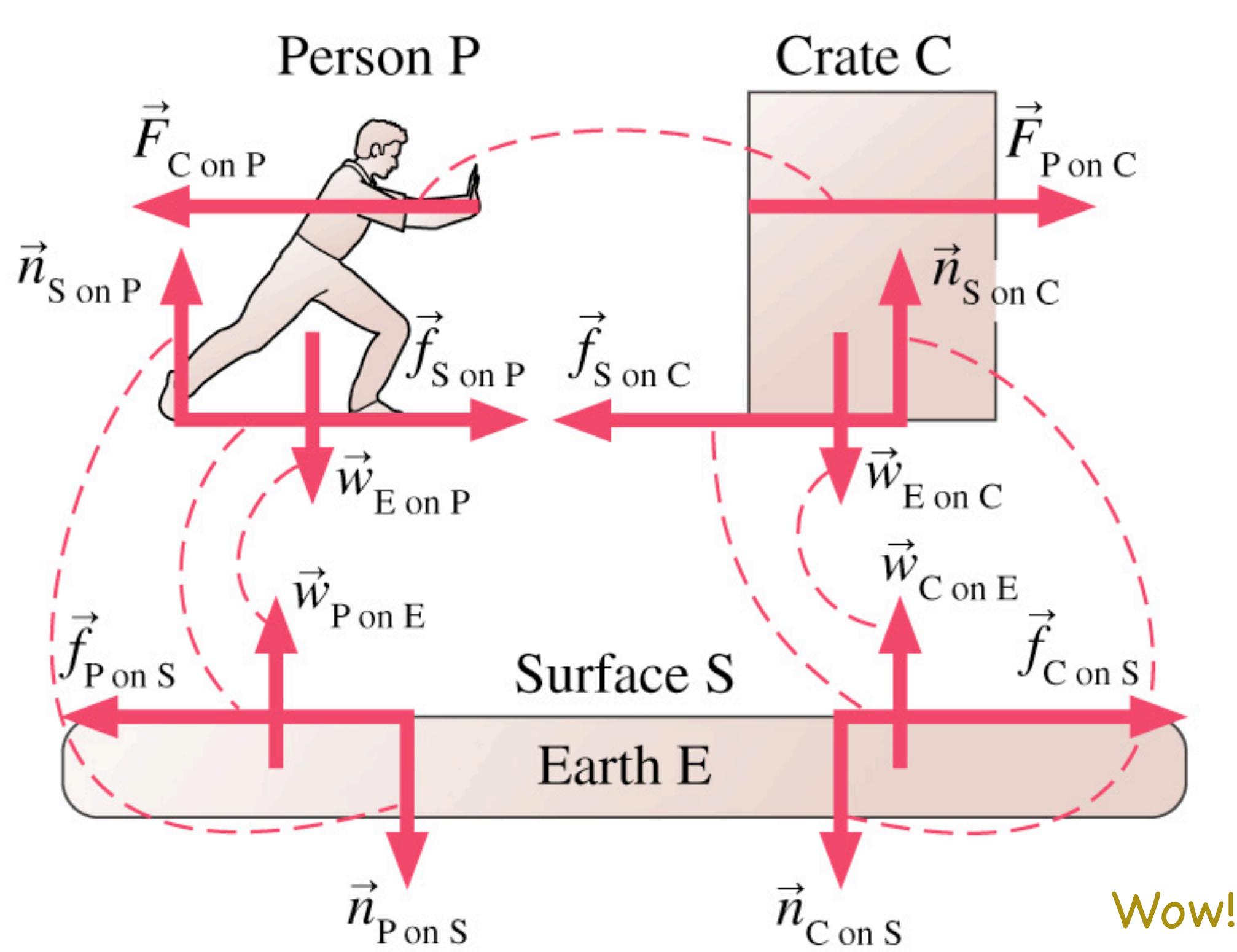
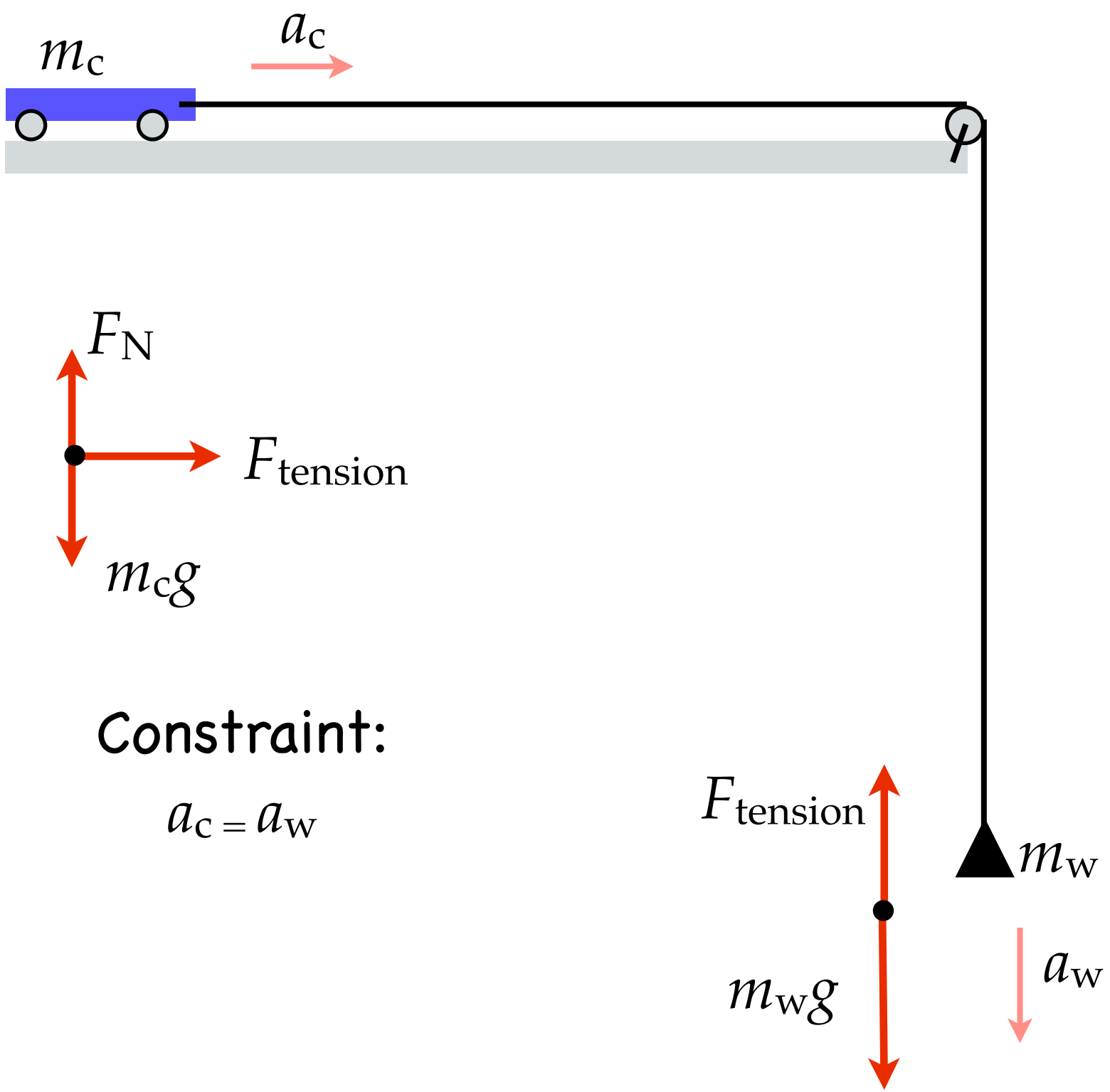
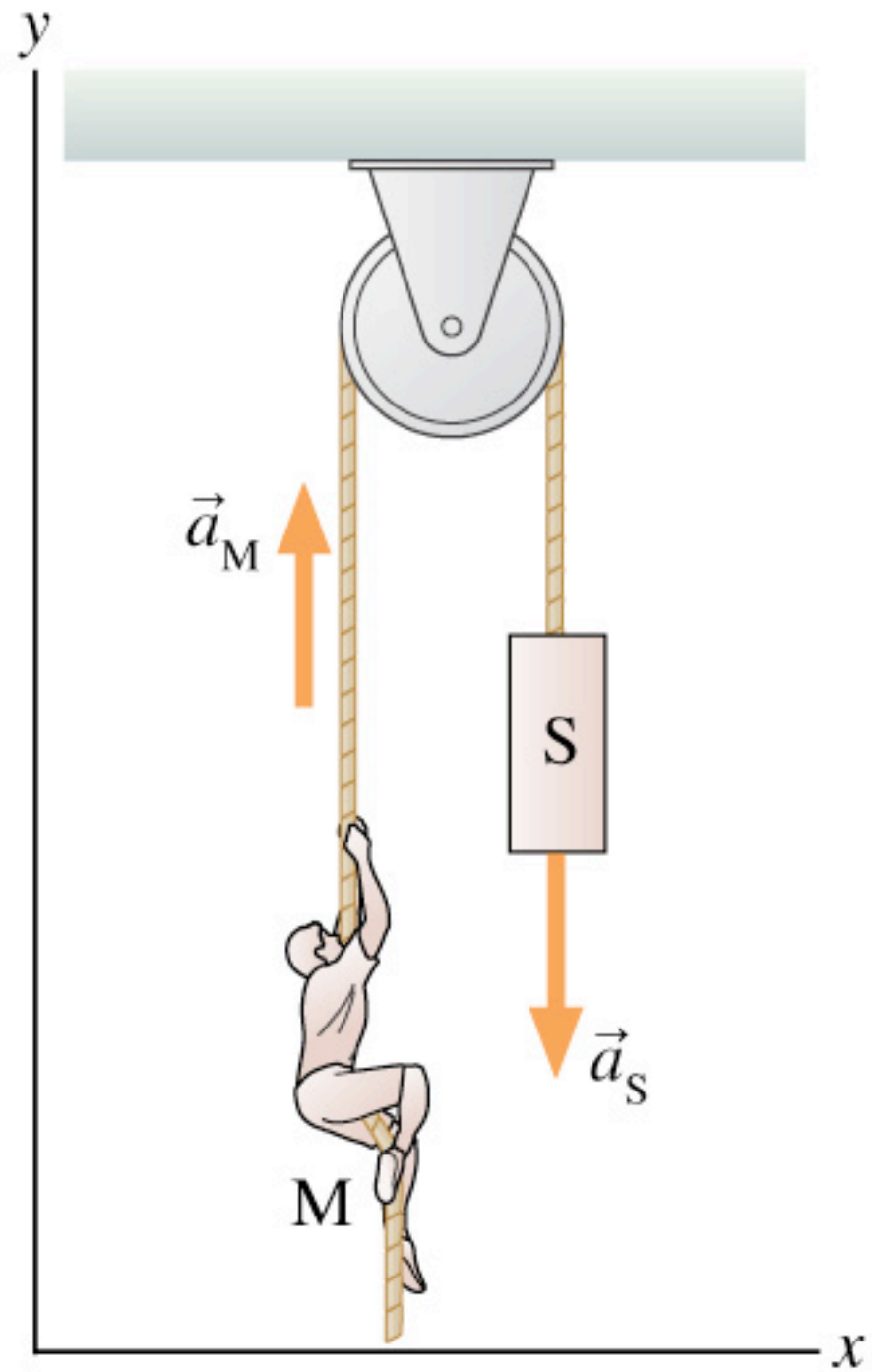

Person P
Crate C
$\vec{F}_{\text{C on P}}$
$\vec{F}_{\text{P on C}}$
$\vec{n}_{\text{S on P}}$
$\vec{n}_{\text{S on C}}$
$\vec{f}_{\text{S on P}}$
$\vec{f}_{\text{S on C}}$
$\vec{w}_{\text{E on P}}$
$\vec{w}_{\text{E on C}}$
$\vec{w}_{\text{P on E}}$
$\vec{w}_{\text{C on E}}$
$\vec{f}_{\text{P on S}}$
$\vec{f}_{\text{C on S}}$
Surface S
Earth E
$\vec{n}_{\text{P on S}}$
$\vec{n}_{\text{C on S}}$

Wow!


m_c
a_c
F_N
$F_{tension}$
$m_c g$
Constraint:
$a_c = a_w$
$F_{tension}$
m_w
a_w
$m_w g$

"Atwood's Machine"

Pictorial representation



Known

$m_M = 100\ \text{kg} \quad m_S = 200\ \text{kg}$

Acceleration constraint

$a_{Sy} = -a_{My}$

Find

a_{My}