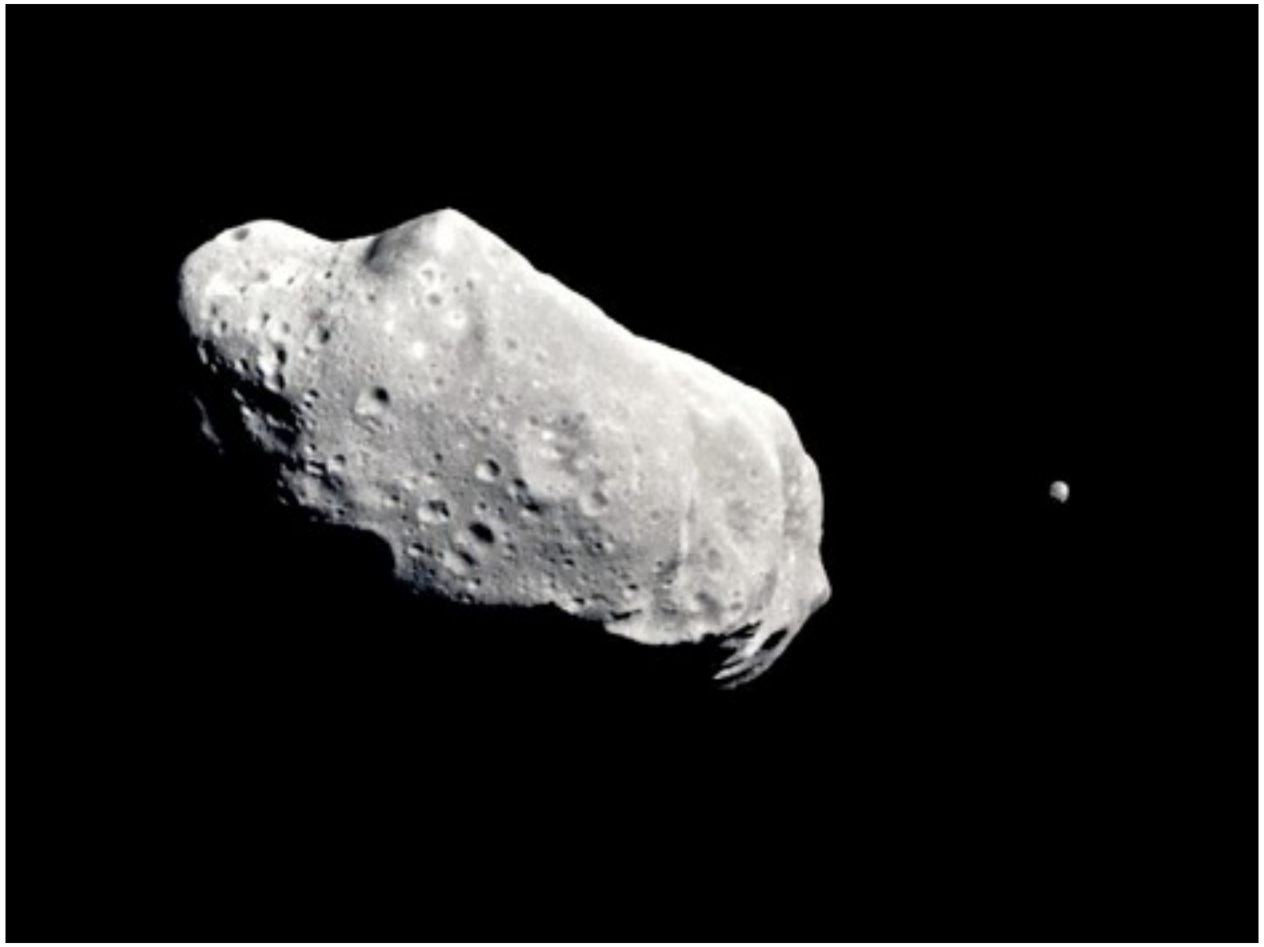
# Work



# Clicker Question

An instructor pushes a table covered in Science One students across a carpeted floor.

The table is at rest before and after the push. We can say that

A) Mechanical energy of the table/students is not conserved but total energy of the table/students is conserved

B) Total energy of the table/students is not conserved, but total energy of the floor/table/students is conserved

C) Energy conservation does not apply in this situation.

D) None of the above statements are true.

*Extra: describe all ways in which one form of energy is transformed to another form in this process*

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C) Energy conservation does not apply in this situation.

D) None of the above statements are true.

*Energy from the instructor is transferred to kinetic energy of the students/table, but this energy goes into heating up the wheels and the floor via friction.*

# Work

The **work done** on a system is equal to the **change in energy** of the system:

$$W = \Delta E_{\text{sys}} = \Delta K + \Delta U + \Delta E_{\text{therm}}$$

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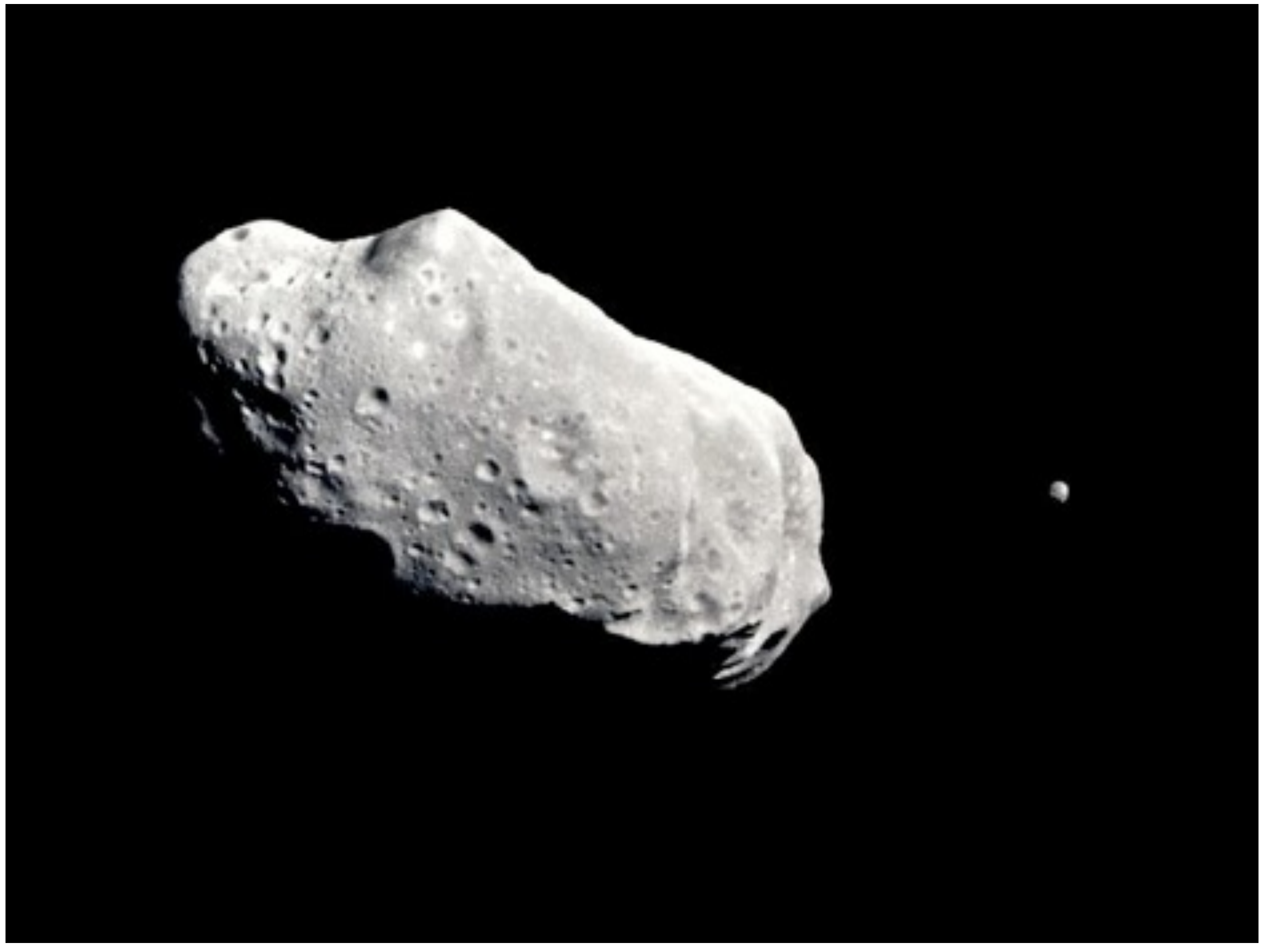
*The mechanical energy of the system isn't changing. My hands might transfer a bit of thermal energy. I'm exerting a lot of effort, but not doing much work.*

# Work

In the pre-reading you came up with a **concrete expression** for work.

Simplest situation: a rock (possibly a space salmon) in empty space.



If I push the rock, what is the work done equal to?

# Work

The **most common expression** for work we'll use is

$$W = \vec{F} \cdot \Delta\vec{r}$$

1) **time** it takes to push is **not relevant** ($F\Delta t$ is change in momentum!)

2) gives the **energy transferred** to the rock for **any situation**, even though we derived it for an isolated object in space. why?

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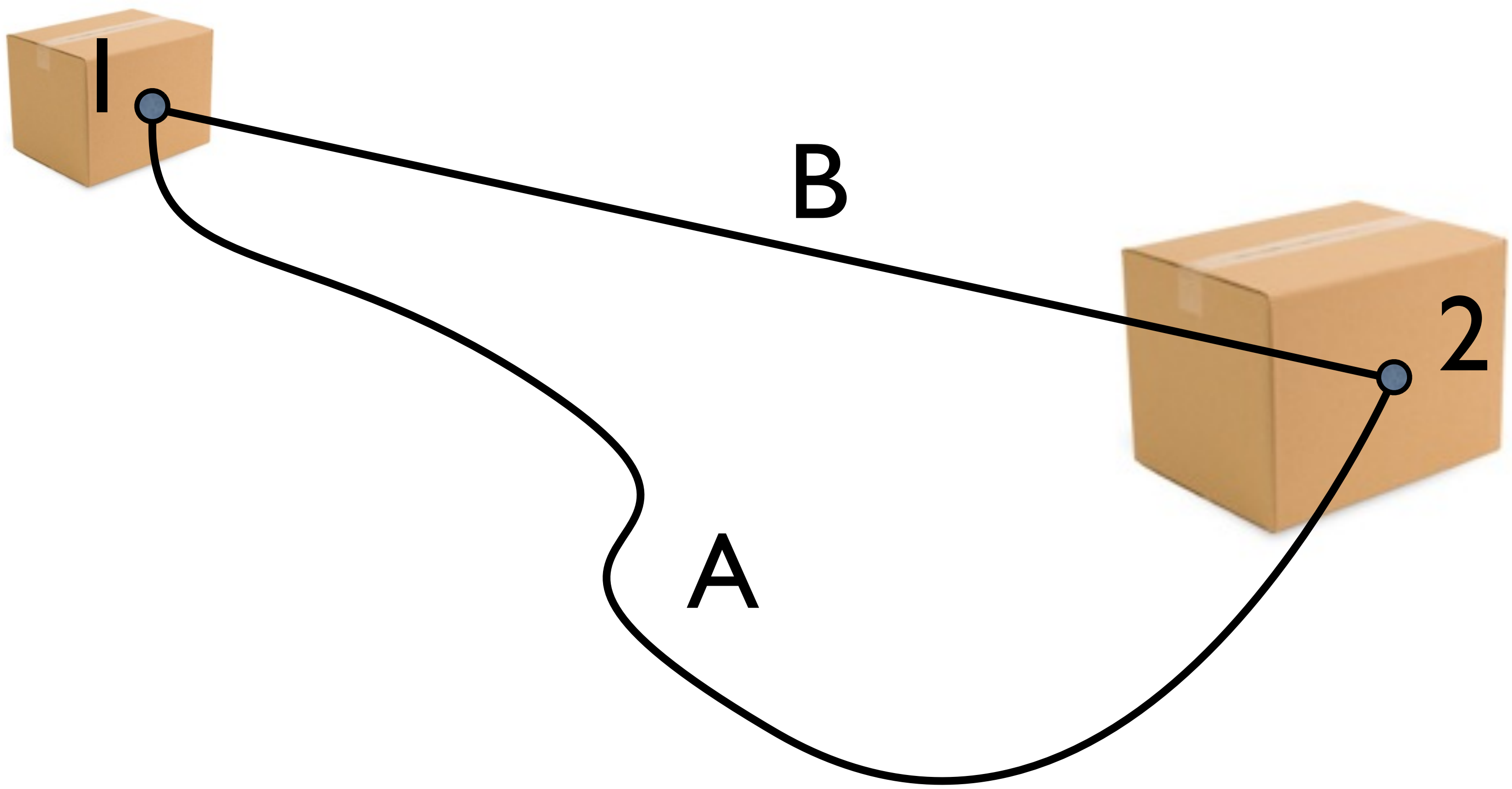
*- for the same strength of push over the same distance, the energy leaving us is the same, so the energy going into the block is the same whether is goes into kinetic energy or thermal energy or potential energy.*

# Work

You have to slide a box on the floor between points 1 and 2. Which path requires you to do the least work. Explain!

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B) B

C) same

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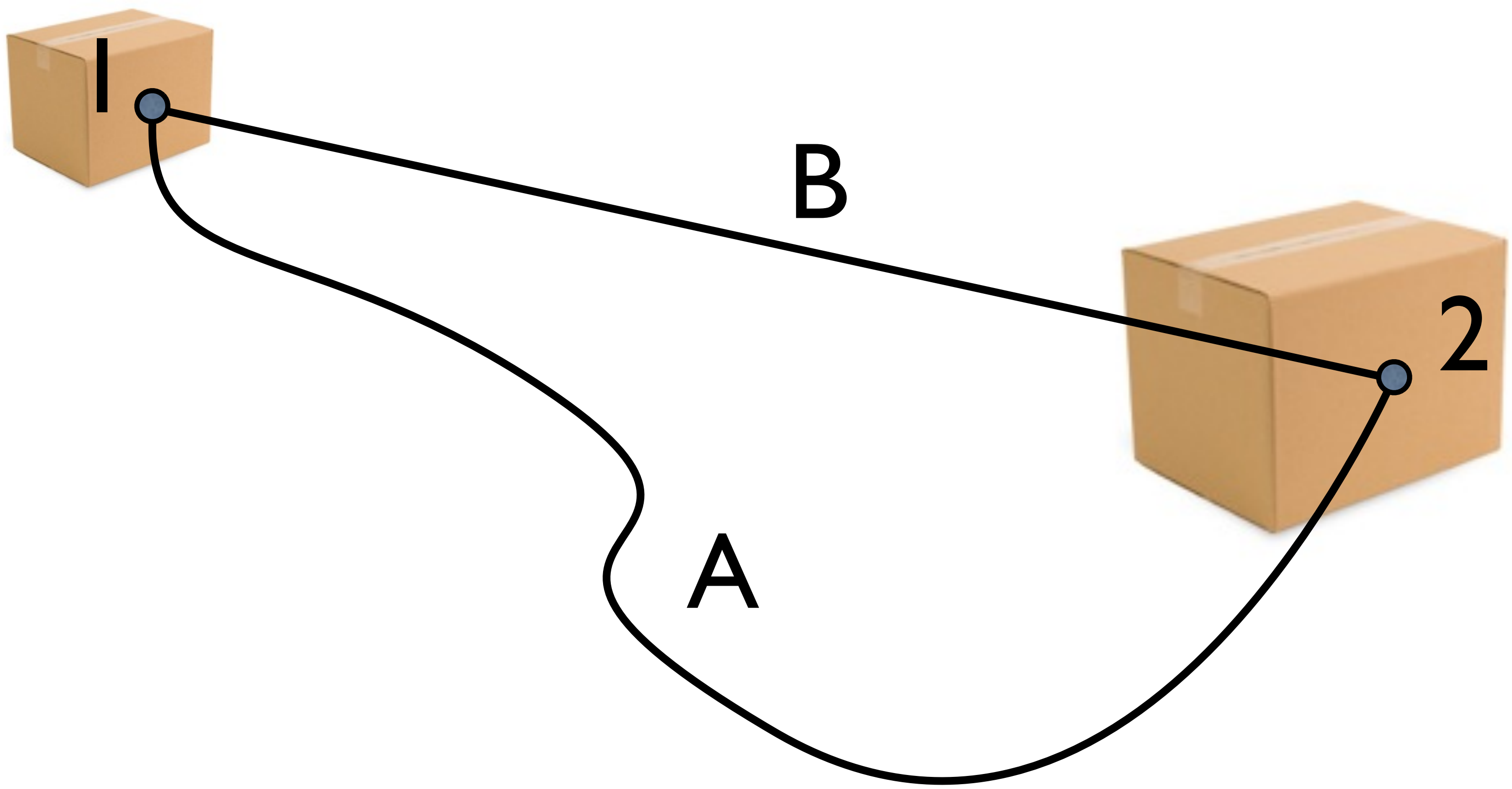


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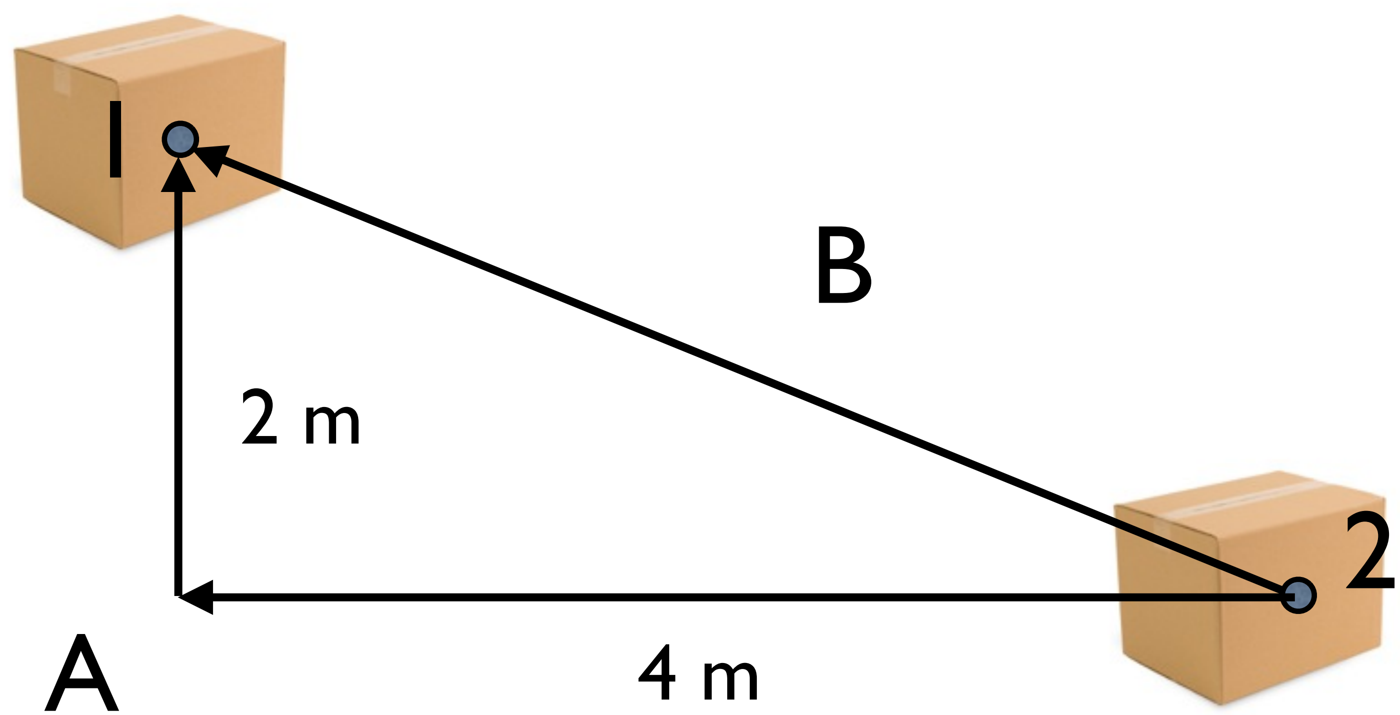
# Work

A gravitational field is pointing downwards. You have to move a box from point 1 to point 2. Which path requires you to do the least work. Explain!

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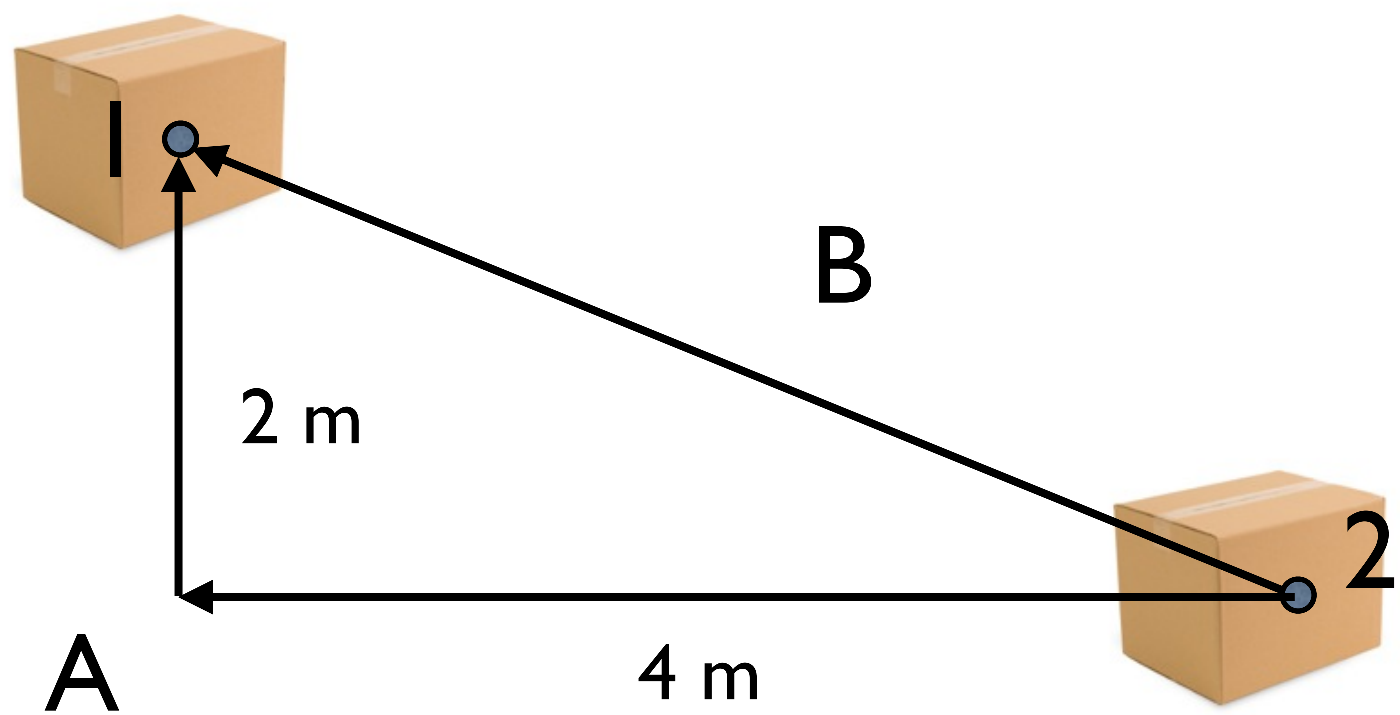


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When the work doesn't depend on the path, it's called path independence. We say the force is conservative.