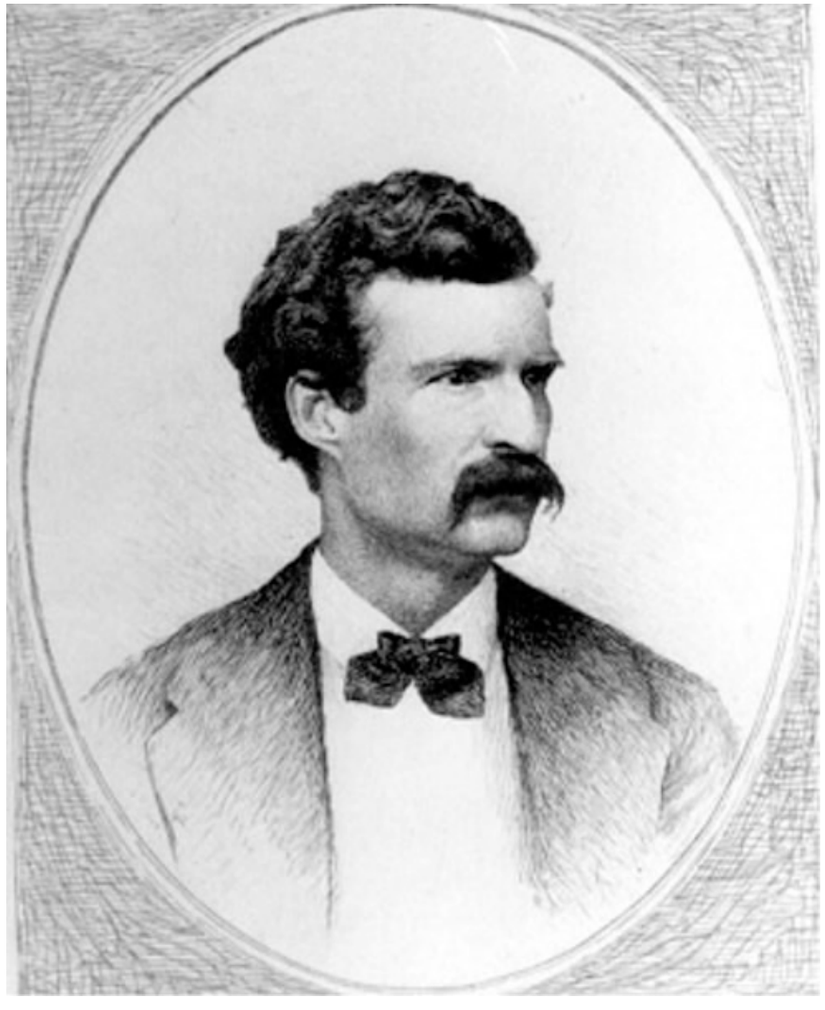
Scientists have odious manners, except when you prop up their theory; then you can borrow money off them.

Mark Twain



Arizona State University
SES 194

Energy in Everyday Life

Work-Energy

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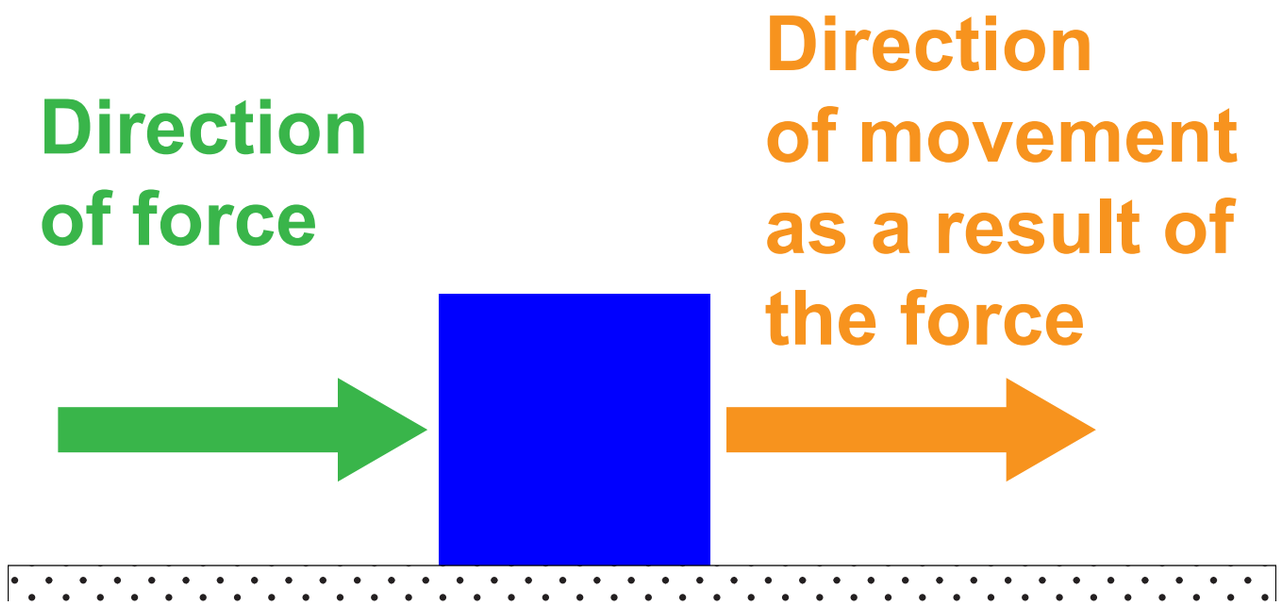
We can now define “work”.

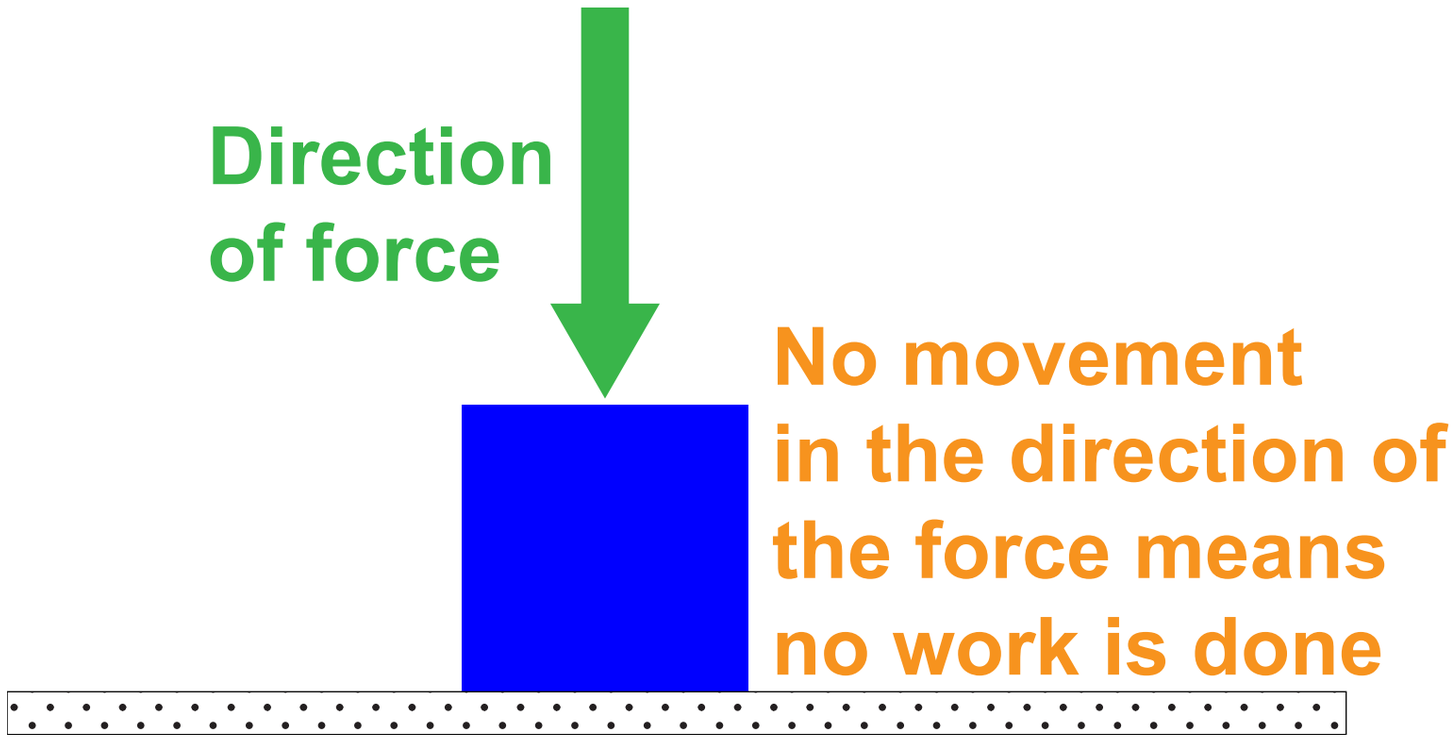
The work done by any force is the product of the force and the distance moved in the direction of the force.

If the force is exactly along the direction of motion, then the work done is

$$\text{work} = \text{force} \times \text{distance moved}$$



If the force is perpendicular to the direction of motion, there is no motion in the force's direction and thus no work is done by the force.



Work is the transfer of energy.

or as more commonly put

Energy is the ability to do work.

Work and Energy are measured in the same units.

For example

Golfer does work on club

Club does work on ball

Energy in the golfer → Energy in the club → Energy in the ball

Work is the transfer of energy.

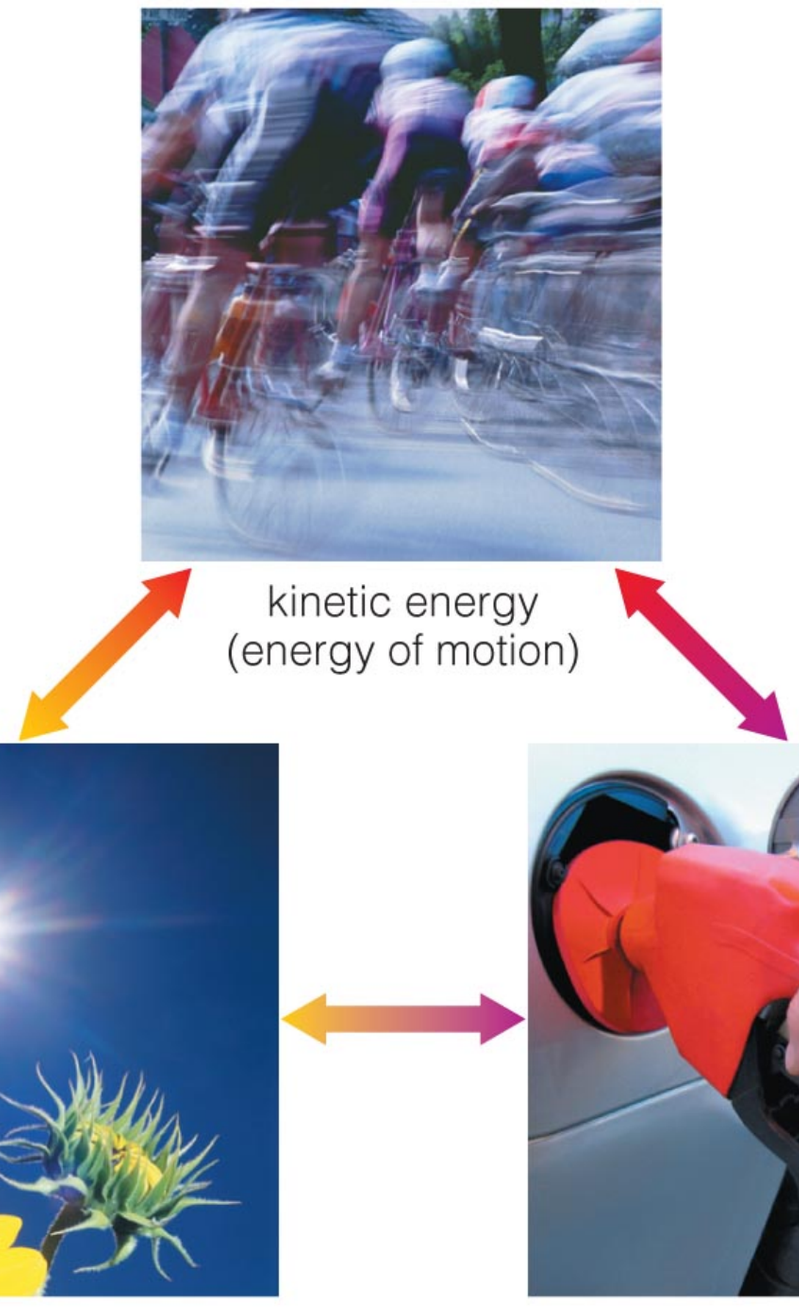
Energy is the ability to do work.

Energy can take many forms, including

Type	Description
Kinetic	motion of an object, KE = 1/2 × mass × speed^2
Potential	many forms on this list
Mechanical	material oscillations
Elastic	material deformations
Atomic	binding of electrons to nucleus
Chemical	binding of atoms to molecules
Nuclear	binding of protons and neutrons to nucleus
Thermal	microscopic form of kinetic energy
Electric	from electric charges
Magnetic	from moving electric charges
Radiative	from photons
Gravitational	from gravitational fields, PE = m × g × h
Mass	rest mass, E = m × c^2

Work is the transfer of energy.

Energy can be converted from one form to another.



Energy is the ability to do work.

Energy is a scalar physical quantity - just a number.

The joule is the International unit of measurement for energy. One joule is equal to the energy expended (or work done) in applying a force of one newton a distance of one meter.

Energy is also expressed in other units such as ergs, calories, kilocalories (food Calories), and British Thermal Units. There is always a conversion factor between these different units.