# *Power*

## RATE OF ENERGY TRANSFER

The rate at which work is done is called **power.** More generally, power is the rate of energy transfer by any method. Like the concepts of energy and work, power has a specific meaning in science that differs from its everyday meaning.

Imagine you are producing a play and you need to raise and lower the curtain between scenes in a specific amount of time. You decide to use a motor that will pull on a rope connected to the top of the curtain rod. Your assistant finds three motors but doesn't know which one to use. One way to decide is to consider the power output of each motor.

If the work done on an object is $W$ in a time interval $\Delta t$, then the average power delivered to the object over this time interval is written as follows:

> **POWER**
>
> $$P = \frac{W}{\Delta t}$$
>
> **power = work ÷ time interval**

It is sometimes useful to rewrite this equation in an alternative form by substituting the definition of work into the definition of power.

$$W = Fd$$
$$P = \frac{W}{\Delta t} = F\frac{d}{\Delta t}$$

The distance moved per unit time is just the speed of the object.

**Why it Matters**

## Conceptual Challenge

**1. Mountain Roads** Many mountain roads are built so that they zigzag up the mountain rather than go straight up toward the peak. Discuss the advantages of such a design from the viewpoint of energy conservation and power.

**2. Light Bulbs** A light bulb is described as *having* 60 watts. What's wrong with this statement?