# Boyle's Law

If n and T are constant, then

$$PV = k$$

This means, for example, that
Pressure *goes up* as Volume *goes down*.

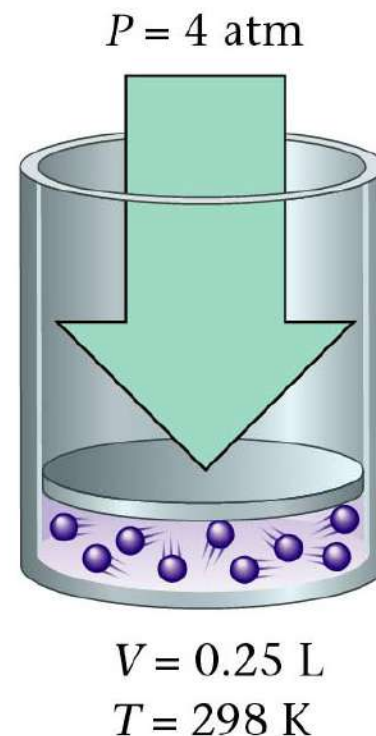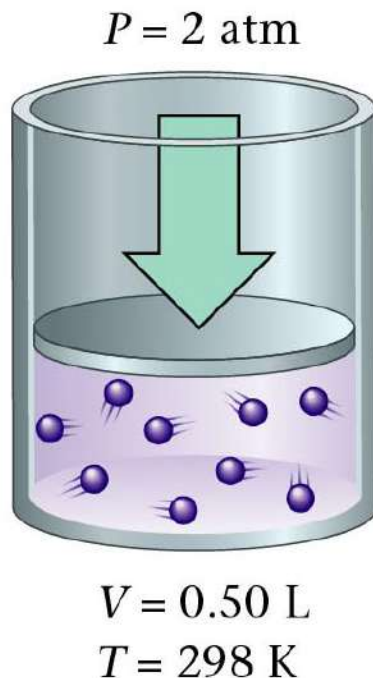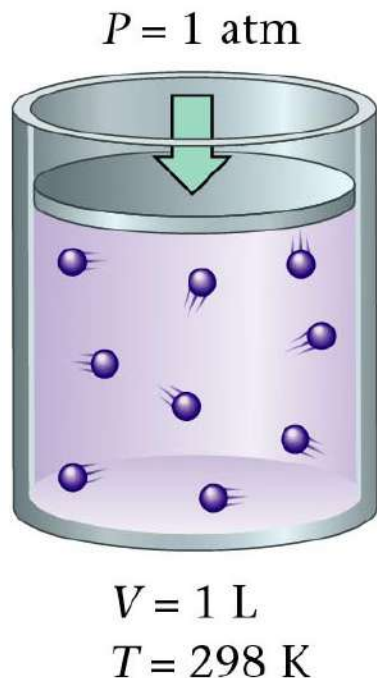A bicycle pump is a good example of Boyle's law.

As the volume of the air trapped in the pump is reduced, its pressure goes up, and air is forced into the tire.

**Robert Boyle**
(1627 - 1691)

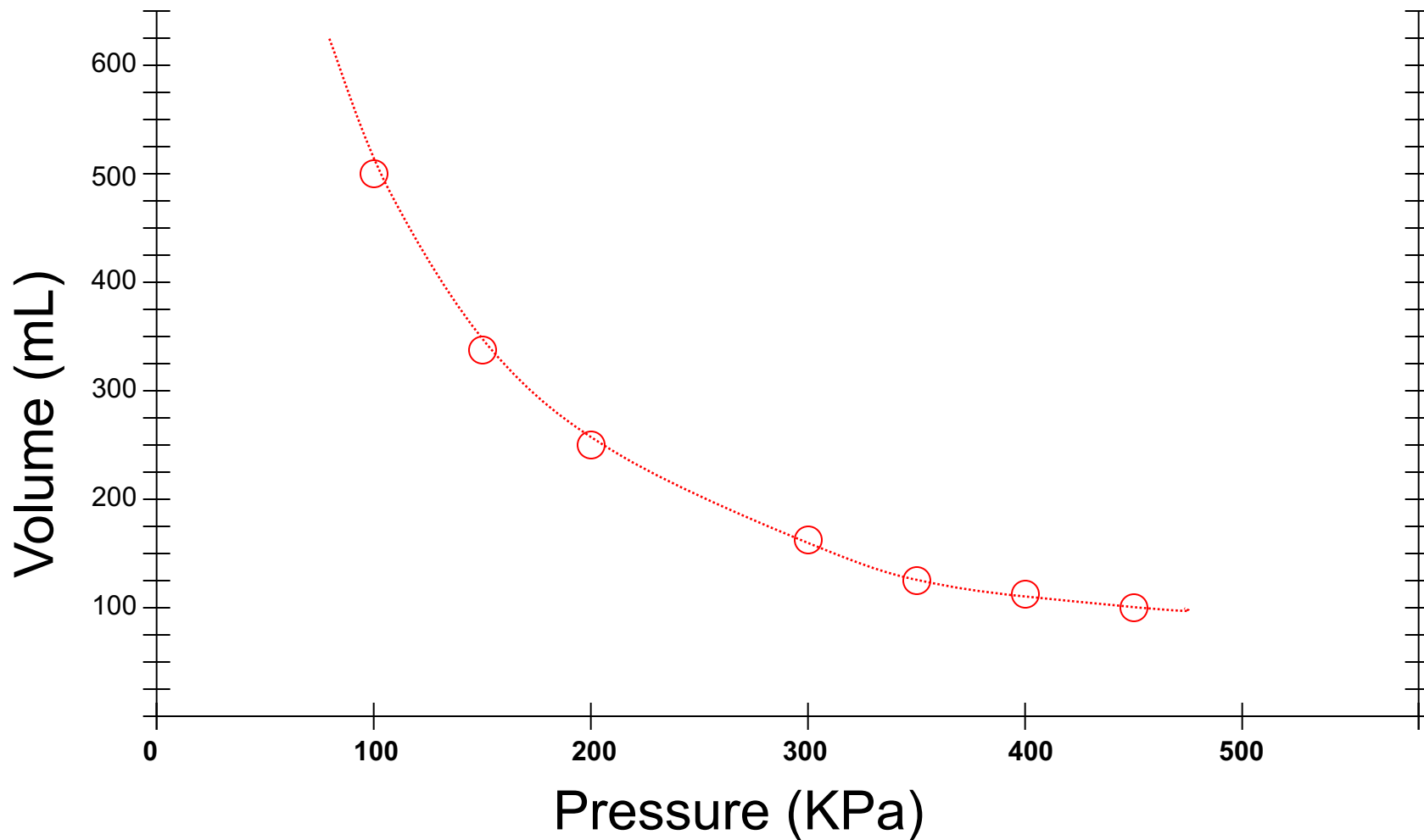Son of Earl of Cork, Ireland.

# Boyle's Law Illustrated

$P = 1$ atm

$P = 2$ atm

$P = 4$ atm

$V = 1$ L
$T = 298$ K

$V = 0.50$ L
$T = 298$ K
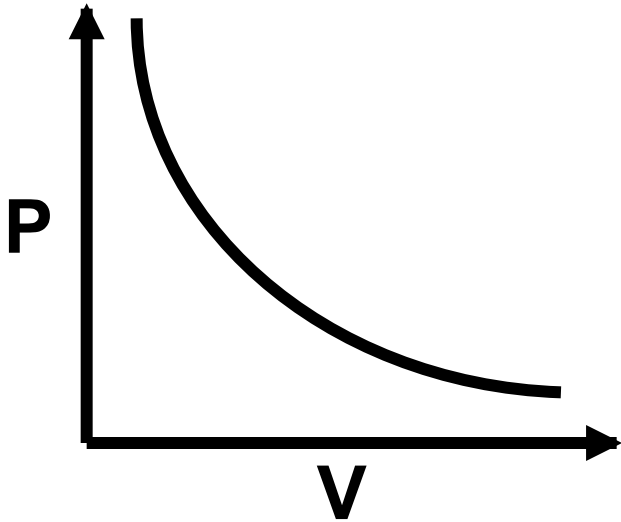
$V = 0.25$ L
$T = 298$ K

Pressure vs. Volume
for a Fixed Amount of Gas
(Constant Temperature)

# Boyle's Law

The pressure and volume of a gas are inversely related at a constant temperature.

$$P_1 V_1 = P_2 V_2$$

P

V

# Pressure and Volume of a Gas
## Boyle's Law

A quantity of gas under a pressure of 106.6 kPa has a volume of 385 L.  What is the volume of the gas at standard pressure(1 atm), if the temperature is held constant?

$P_1$ x $V_1$  =  $P_2$ x $V_2$

(106.6 kPa) x (385 L)  =  (101.3 kPa) x ($V_2$)

$V_2$  =  405.14 L = 405L

# Boyle's Law

A quantity of gas has a volume of 120 L when confined under a pressure of 93.3 kPa. At what pressure will the volume of the gas be 30.0 L?

$P_1 \times V_1 = P_2 \times V_2$

$(93.3 \text{ kPa}) \times (120 \text{ L}) = (P_2) \times (30.0 \text{L})$

$P_2 = 373.2 \text{ kPa} = 370 \text{ kPa}$