The Power of Dimensional Analysis

In some cases of dimensional analysis, particularly when there is only *one* nondimensional Π parameter, you can predict the trend of one variable as a function of the other variables – often to within a single constant.

Example: For a soap bubble, ΔP = function(σ_s, R). Dimensional analysis yields

$$\Delta P = \text{constant}\frac{\sigma_s}{R}$$

We obtain this without knowing any physics of the problem; we need to know only the *dimensions* of the variables involved in the problem.

Compare this to the exact result,

$$\Delta P = 4\frac{\sigma_s}{R}$$

In other words, an exact analysis tells us that the constant is equal to 4. However, the relationship between ΔP, σ_s, and R is known to within a single constant by the process of dimensional analysis.

Dimensional analysis is very powerful indeed!