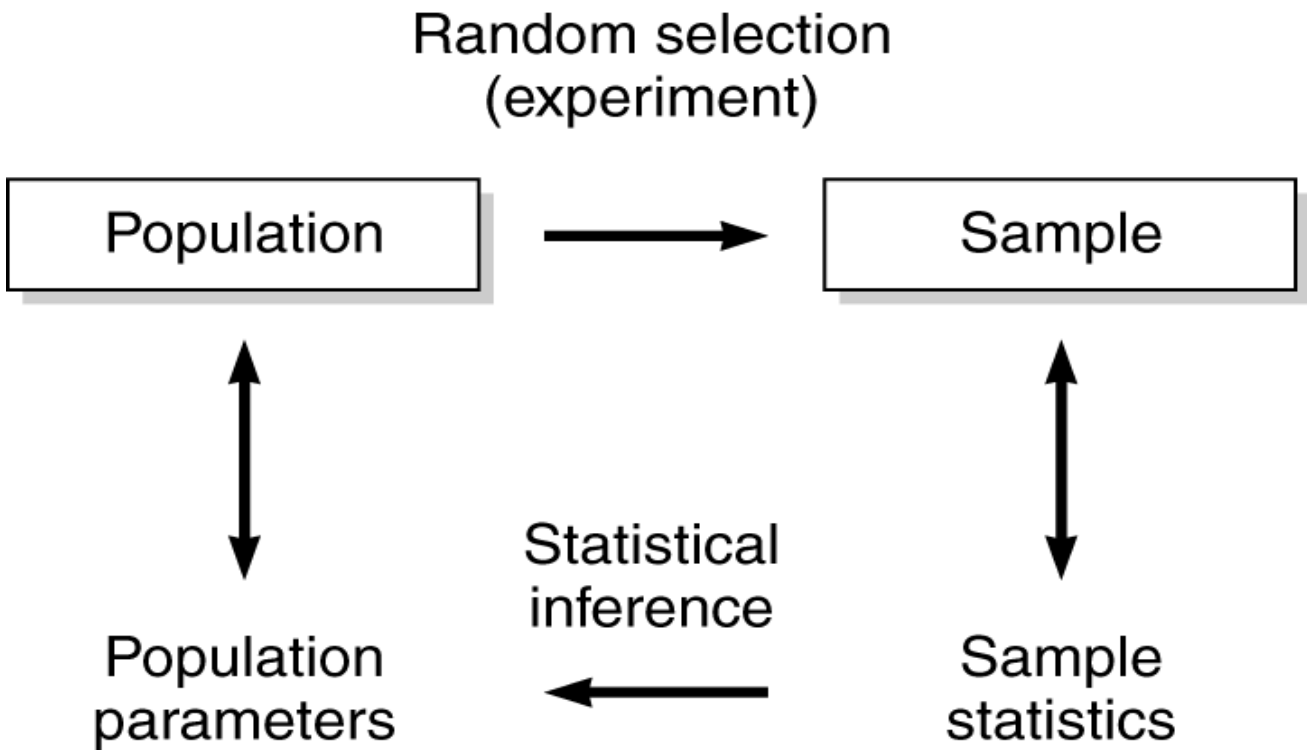
Sample vs Population



Populations Parameters and Sample Statistics

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$S_x^2 = \frac{1}{N-1}\sum_{i=1}^{N} (x_i - \bar{x})^2$$

Populations Parameters and Sample Statistics

$$x' = \lim_{N \to \infty} \frac{1}{N} \sum_{i=1}^{N} x_i$$

$$\sigma^2 = \lim_{N \to \infty} \frac{1}{N} \sum_{i=1}^{N} (x_i - \bar{x})^2$$

Comparing Theory and Measurement

- Agreement between theory and experiment does NOT imply correctness.

- Counter-examples include:

Proper Graphical Comparison with Uncertainty

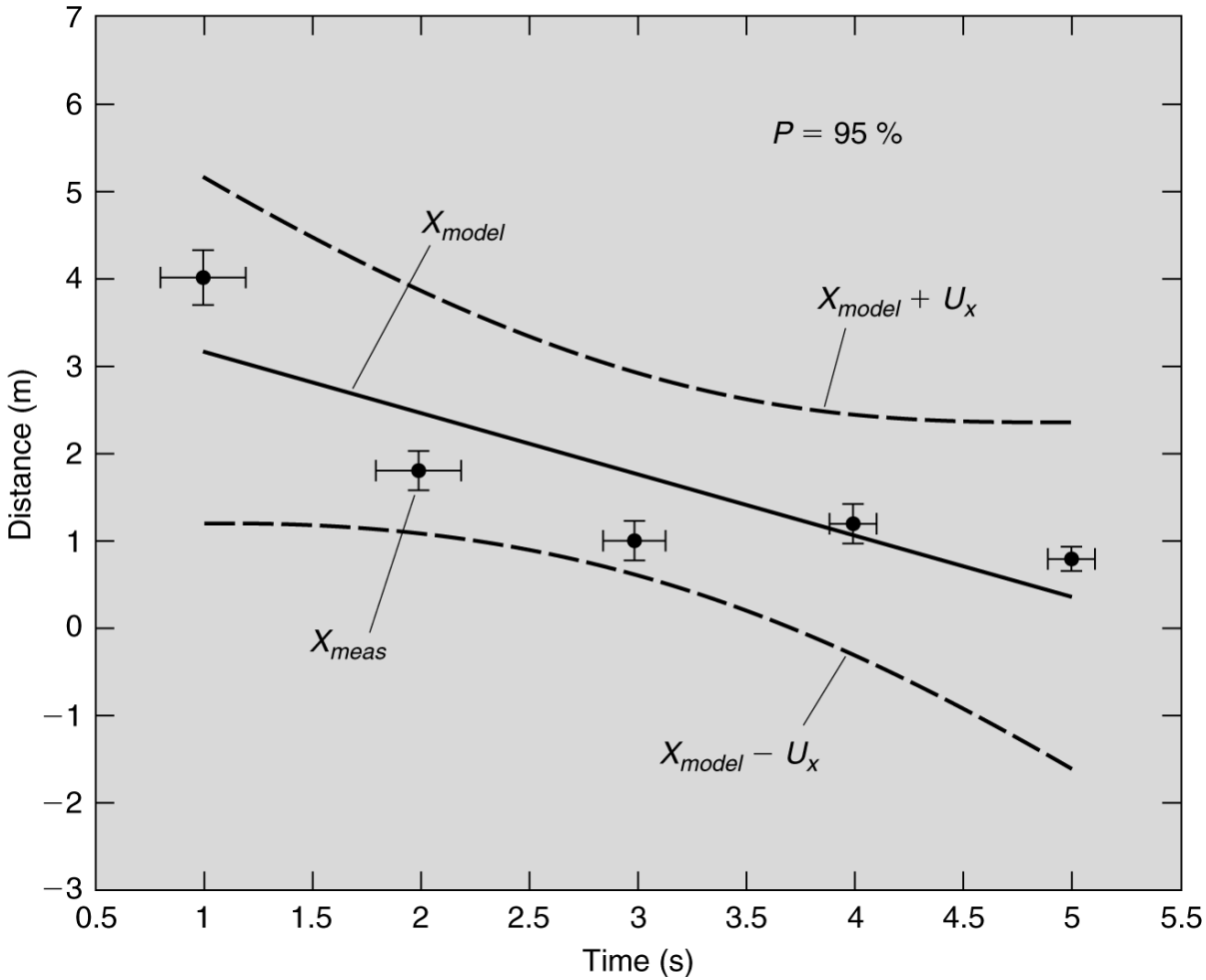


Figure 9.1

How Sure Are We ?

- When a physical process is quantified, uncertainties associated with describing the process occur.

- Uncertainties result from

  Experiments Modeling

Systematic and Random Uncertainties

- An *error* is the difference between the measured and the true value.
- An *uncertainty* is an estimate of the error.

Systematic and Random Uncertainties

- Systematic, B_i:

- Random, P_i:

Systematic and Random Uncertainties

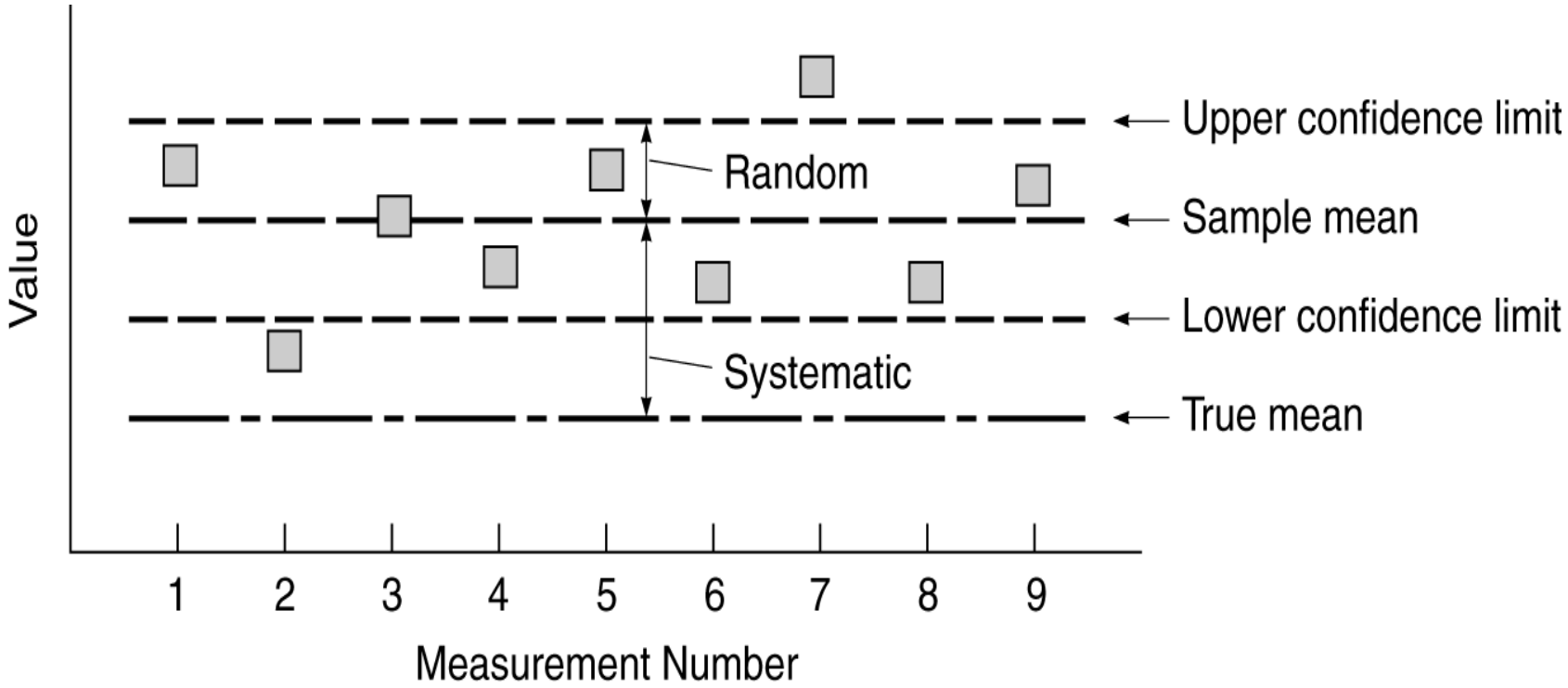
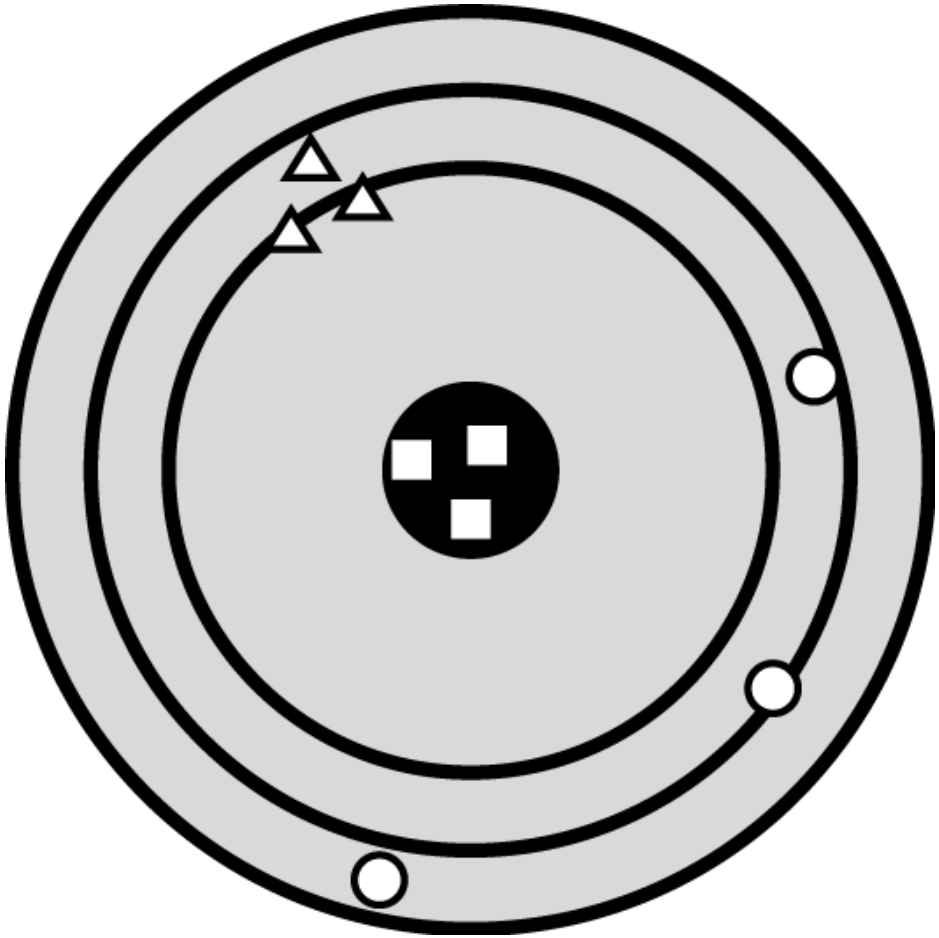


Figure 9.2

Precision and Accuracy



Precision	Accuracy
good	poor
good	good
poor	poor