

Ch. 1 – The Nature of Science

- ✦ Defining Science
- ✦ Problem–Solving
- ✦ Scientific Method
- ✦ Experimental Design

A. Defining Science

- ▶ Pure Science
 - research that adds to the body of scientific knowledge
 - has no practical use
- ▶ Applied Science (Technology)
 - the practical application of scientific knowledge
 - **Advances in pure science create opportunities for applied science**

A. Defining Science

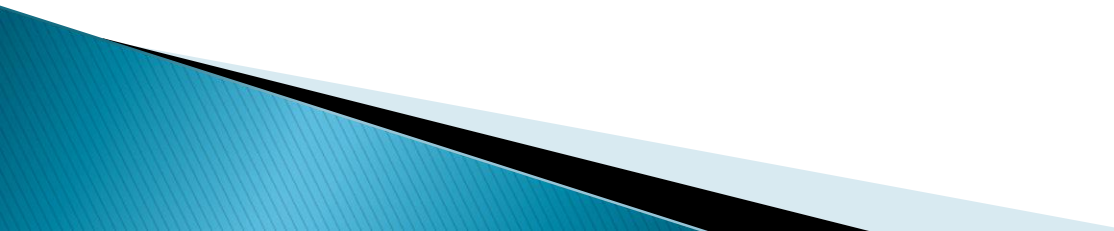
PURE

- ▶ human genetics
- ▶ polymer science
- ▶ atomic theory
- ▶ study of the human ear

APPLIED

- ▶ DNA fingerprinting
- ▶ Lycra[®] spandex
- ▶ nuclear weapons
- ▶ hearing aids

A. Defining Science

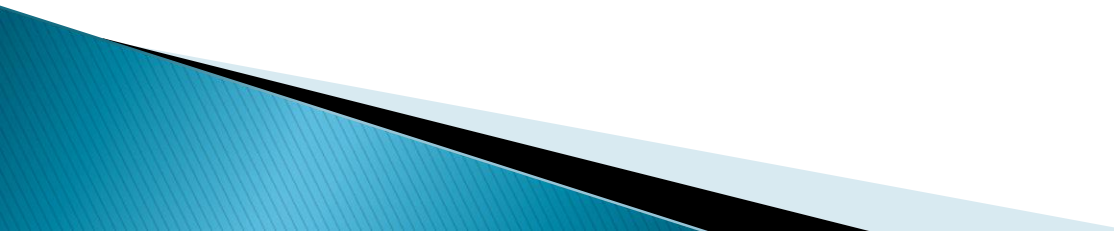
- ▶ Life Science
 - the study of living organisms
 - ▶ Earth Science
 - the study of Earth and space
 - ▶ Physical Science
 - the study of matter and energy
 - chemistry & physics
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B. Problem-Solving

1. Identify the problem.

- What do you know?
- What do you need to know?

2. Plan a strategy.

- Look for patterns.
 - Break the problem into smaller steps.
 - Develop a model.
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B. Problem-Solving

3. Execute your plan.

4. Evaluate your results.

- Did you solve the problem?
- Is your answer reasonable?

Identify – Plan – Execute – Evaluate



C. Scientific Method

- ▶ Hypothesis – testable prediction
- ▶ Theory – explanation of “why”
 - based on many observations & experimental results
- ▶ Scientific Law – prediction of “what”
 - describes a pattern in nature

C. Scientific Method

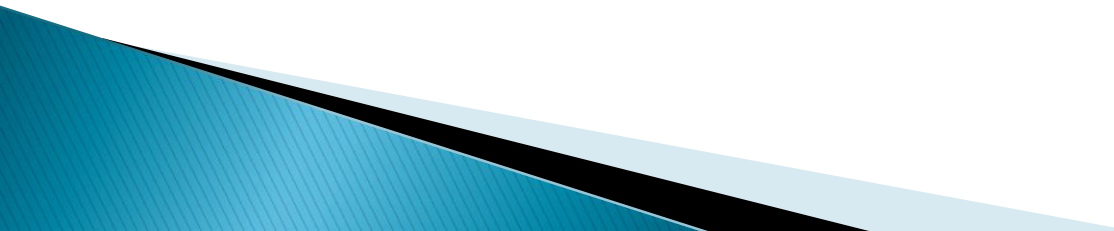
Theories and laws are well-accepted by scientists, but...

THEY ARE NOT SET IN STONE!

They are revised when new information is discovered.



C. Scientific Method

1. Determine the problem.
 2. Make a hypothesis.
 3. Test your hypothesis.
 4. Analyze the results.
 5. Draw conclusions.
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C. Scientific Method

1. Determine the problem.

When the Titanic sank, what happened to the water level on shore?

2. Make a hypothesis.

The water level rose.

The water level dropped.

The water level stayed the same.



C. Scientific Method

3. Test your hypothesis.

How could we test our hypothesis?

4. Analyze the results.

What happened during our test?

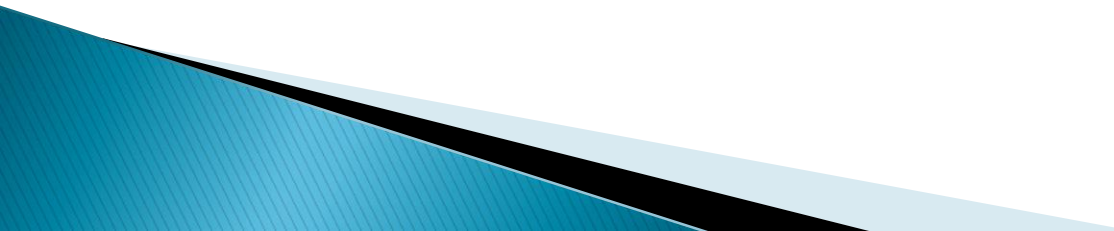
5. Draw conclusions.

Was our hypothesis correct?

Is further testing necessary?



D. Experimental Design

- ▶ Experiment – organized procedure for testing a hypothesis
 - ▶ Key Components:
 - **Control** – standard for comparison
 - **Single variable** – keep other factors constant
 - **Repeated trials** – for reliability
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D. Experimental Design

▶ Types of Variables

◦ Independent Variable

- adjusted by the experimenter
- what you vary

◦ Dependent Variable

- changes in response to the indep. variable
- what you measure