

THE SCIENTIFIC METHOD

Some Definitions:

- Data: empirical (observable, measurable), objective facts
- Hypothesis: a stated testable expectation
- Theory: a systematic explanation for observations (general definition for science)
****In archaeology the term theory is generally the overall framework in which an archaeologist operates (for example, processual approach). Thus, the findings (conclusion) of a study is not itself theory, but rather a model or explanation which is based on theory.**
- Model: a theoretical reconstruction of a set of interrelated phenomena, devised to describe and explain them better. It is case or phenomenon specific.
- Law: universal generalizations about classes of facts (rare in archaeology)

| STEP | AN EVERYDAY EXAMPLE |
|---------------|--|
| 1. data | Your car will not start! This is an <u>observable fact</u> . |
| 2. hypothesis | "Maybe my battery is dead?" This is a <u>hypothesis</u> (to explain the observed fact/data) which is <u>testable</u> . What are the <u>implications</u> of this hypothesis? In other words, how can it be tested? |
| 3. test | You check the battery for power. In doing so you <u>reject or confirm the hypothesis</u> (in fancier words, you <u>test the implications</u> [my battery may be dead] <u>against the observed phenomena</u> [my car won't start]). Such hypothesis tests are often framed as "if...then" statements. For example: "If my battery is dead then that explains the car not starting." |
| 4. re-test | Assuming the battery hypothesis is rejected, you form another/new hypothesis. "Perhaps I am out of gas?" Once again, this hypothesis is <u>testable</u> . How? You check your gas gauge. You find that it's empty. Therefore, you can <u>reject</u> your second hypothesis. |
| 5. re-test | Third hypothesis: "Maybe there is an electrical problem." Your mechanic <u>confirms</u> this hypothesis by testing the complete electrical system. |
| 6. conclusion | Interrelated hypothesis: "My car has an electrical problem which caused the battery to fail and therefore my car could not start, with or without gas." This is a <u>systematic explanation</u> of the observed problem. |
| 7. law | The above systematic explanation is also a <u>universal law</u> , since electrical current is necessary for a gas-powered engine to operate. |

Two other handy terms:

- inductive reasoning:* starts from specific observations and proceeds to a generalization.
- deductive reasoning:* starts from a generalization to specific implications.