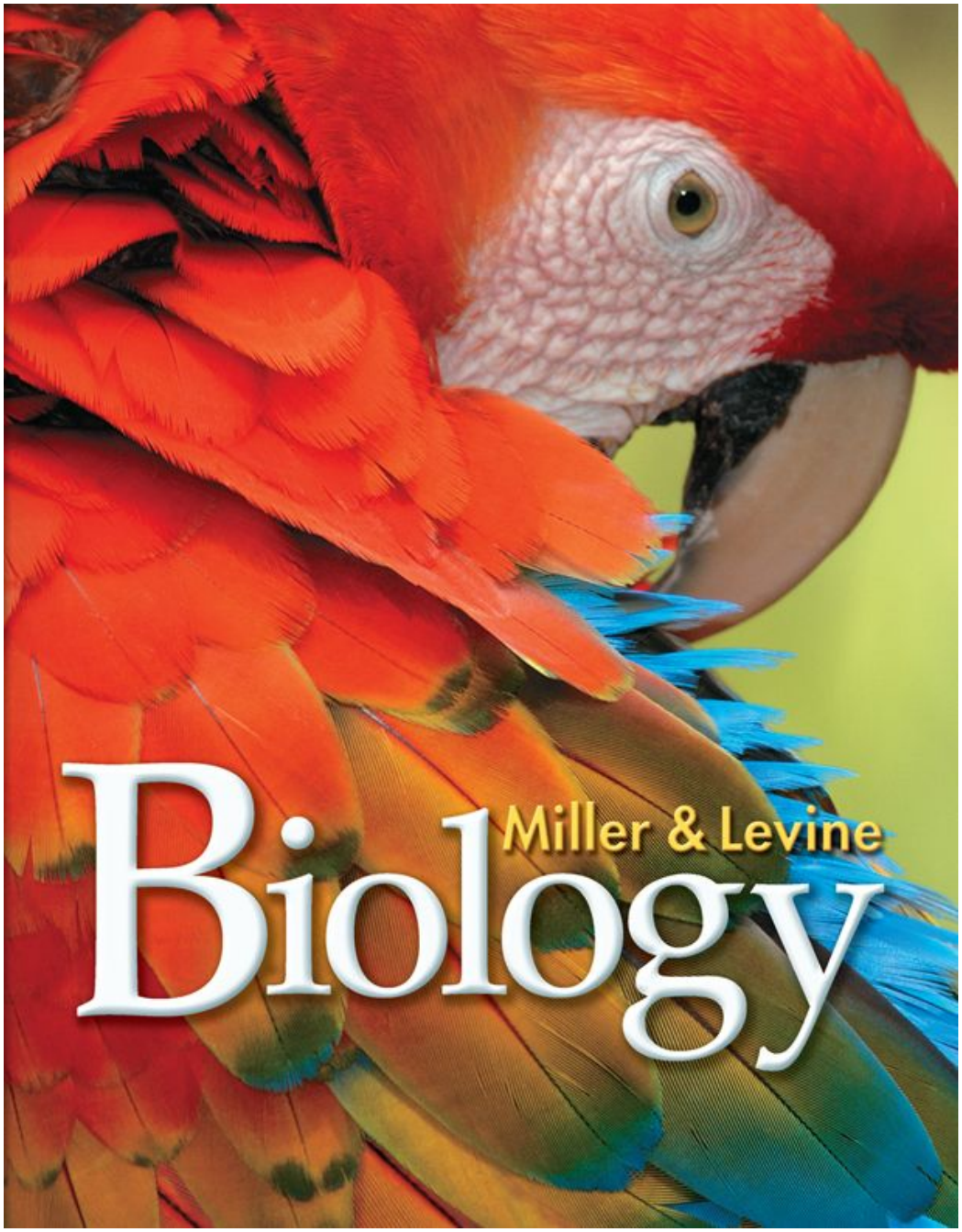


1.1 Scientific Method

II. Scientific Methodology: The Heart of Science

- The scientific method involves observing and asking questions, conducting research, forming hypotheses, designing controlled experiments, collecting and analyzing data, and drawing conclusions.

A. Observing and Asking Questions

- Scientific investigations begin with a **question** about something observed.
- An **observation** is the act of noticing and describing events or processes in a careful, orderly way.
- The question asked should be **testable**.

B. Conducting Research

- After posing questions, scientists conduct research by gathering as much information as possible from **reliable sources**.
- Reliable sources are science publications and educational websites.
- Unreliable sources are open source websites, such as Wikipedia, blogs, and movies.

C. Forming a Hypothesis

- Next scientists form a **hypothesis**, a proposed scientific explanation for a set of observations.
- A good hypothesis is **testable** and is usually an “if/then” statement.
- Avoid using best or better in a hypothesis as it is too vague.

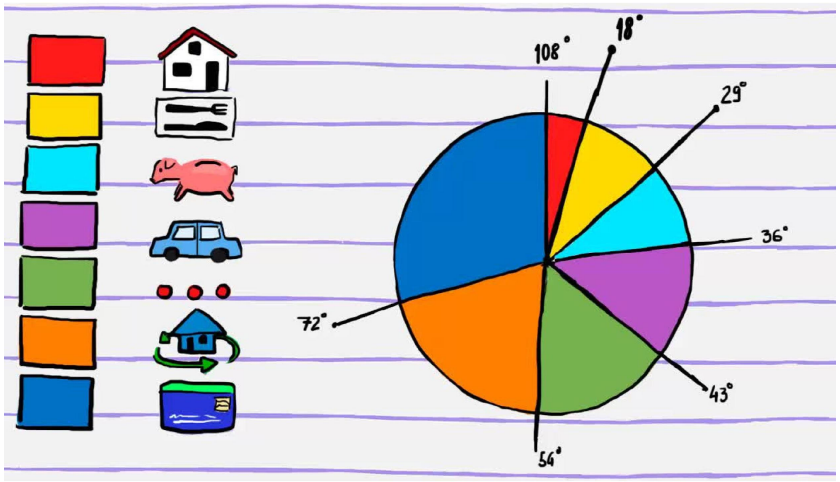
D. Designing Controlled Experiments

- Whenever possible, a hypothesis should be tested by a **controlled** experiment in which only **one variable** is changed.

- All other variables should be kept unchanged, or **controlled**.

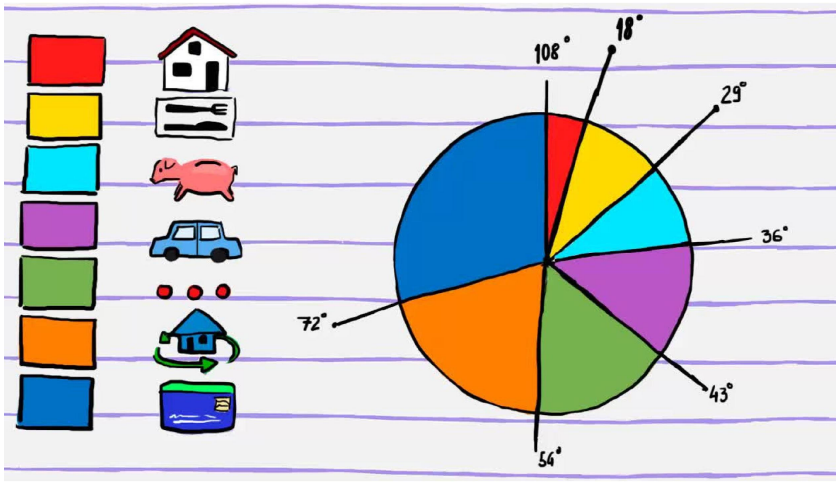
E. Collecting and Analyzing Data

- Scientists record experimental observations, gathering information called **data**.
- Data should be recorded in an appropriate table, chart, and/or graph to display the results.



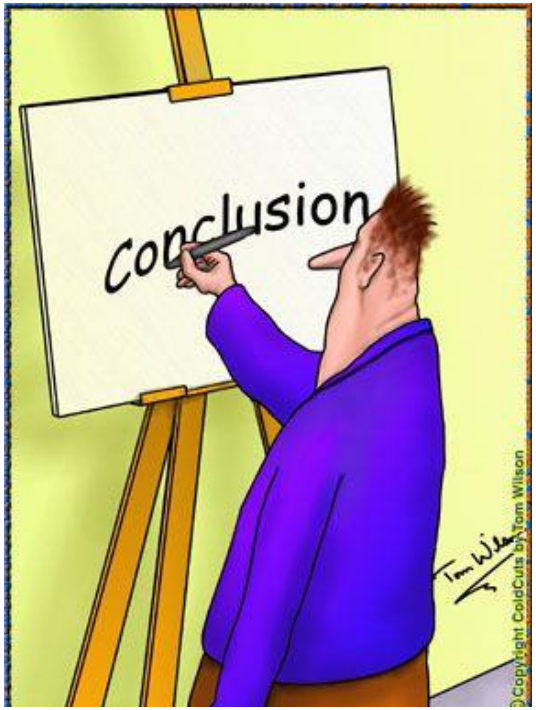
E. Collecting and Analyzing Data

- **Quantitative** data are numbers obtained by counting or measuring.
- **Qualitative** data are descriptive and involve characteristics that cannot usually be counted.



F. Drawing Conclusions

- Scientists use experimental data as evidence to **support** or **reject** the hypothesis being tested, and to draw a valid conclusion.
- If the data does not support the hypothesis, do NOT change the data.



EXIT SLIP

- Use your notes to answer the exit slip questions on the back of your guided notes.