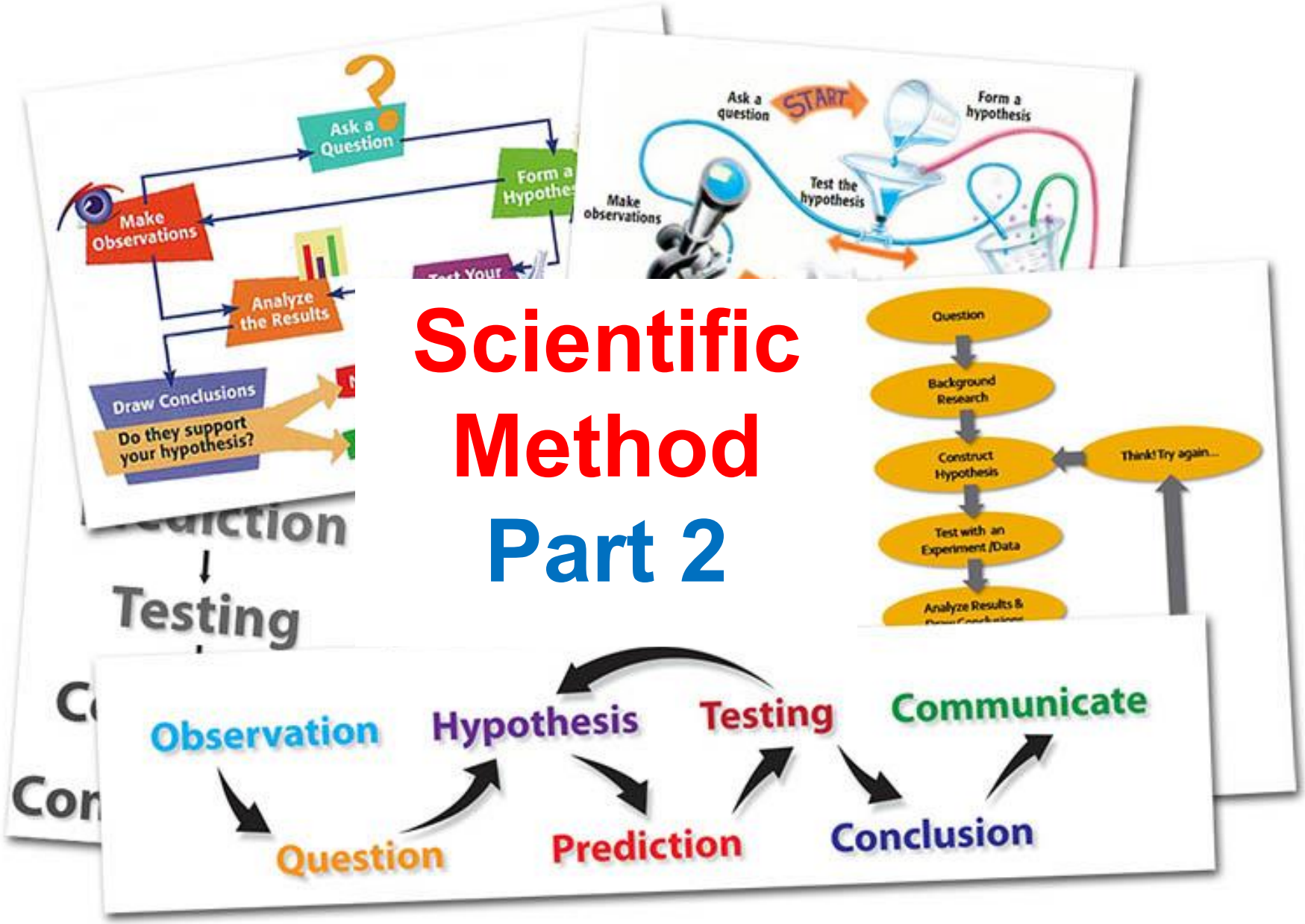


Scientific Method Part 2

DIY: Octopus Minor

QUESTION:

Where does this creature live?

POSSIBLE ANSWER?

Make at least **one qualitative observation** and at least **two quantitative observations** about the specimen in the picture above.

Hypothesis is a statement

that tries to answer a scientific question. Hypothesis is based on initial observations and must be *testable*.

1. **You want to know what is the best place to plant sunflowers in your yard.**

Hypothesis: sunflowers grow best in full sun ☺

2. **You want to know how big your paper airplane should be for it to make across the room and maybe even the front lawn…**

Hypothesis: A larger paper airplane flies longer distance ☺

The Case of the Oviraptor

Egg-stealer or …?

OBSERVATION: First fossil of this dinosaur ever discovered was found *next to a nest filled with another dinosaur eggs*. Its powerful beak was strong enough to crack open an egg.

HYPOTHESIS: assumed to be an egg-thief. The paleontologists thought that the Oviraptor was stealing eggs when it died…

NAME GIVEN: **Oviraptor** (125-100 mya) means **"egg thief"**.

The case of the oviraptor

…good parent!

Controlled **EXPERIMENT**: not possible!

MORE DATA: A recent study found an **oviraptor embryo** inside one of those eggs, so actually the oviraptor was by **its own nest!**

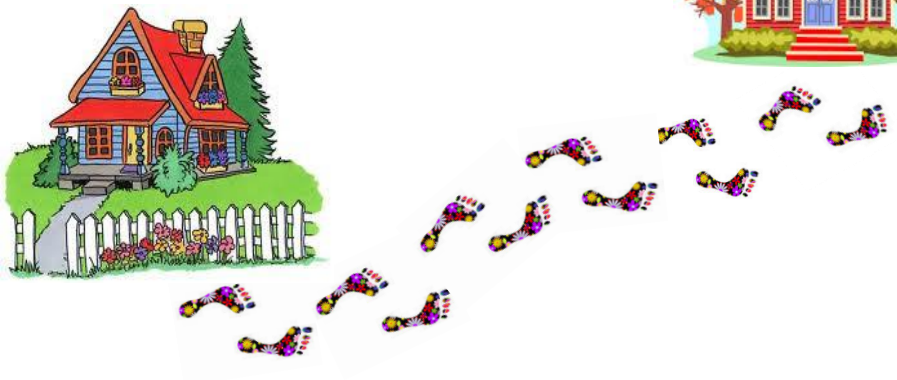
More expeditions have found **oviraptor skeletons on top of nests** — these devoted parents apparently died in sudden sandstorms while **guarding their nests**!

HYPOTHESIS DISPROVED but the **NAME STAYED**…

Experiment

- **Experiment is a "cause-effect" procedure to test the hypothesis. Must be *repeatable* and *reproducible*.**
- **Experiment is designed by a researcher (materials and instructions) and deals with variables (factors that change).**

"Q: What is the fastest walking route from your house to your school?"



"H: the one across the soccer field ☺"

To find your fastest route home you would walk several different routes and time your trip – you would vary the route (cause) and measure time (effect).

What is important here?

Experiment variables

1. **Independent** (manipulating) **variable – factor that is *deliberately changed* by researcher. Good practice: one at a time!**

   Your *route* from house to school.

2. **Dependent** (responding) **variable – factor that is *measured or observed*.**

   ***Time* it takes you to walk.**

3. **Control variables** (constants) **– factors that are *kept the same*. Good practice: these should be *all other factors* that a researcher has control over!**

   You are walking *yourself* every time.

   Anything else?

Analyzing results of the experiment

1. **Organize your observations:**
   - ✓ Make a table.
   - ✓ Make a graph.
2. **Review data (look with a critical eye):**
   - ✓ Is it ***complete***, or did you forget something?
   - ✓ Do you need to collect ***more data***?
   - ✓ Did you make any ***mistakes***?
   - ✓ Decide on the next actions to take (repeat? analyze?).
3. **Analyze:**
   - ✓ If appropriate, ***calculate an average*** for the different trials of your experiment.
   - ✓ Observe ***trends*** (increasing or decreasing numbers), outcome ***frequency***, and note ***correlations***.