🔬 **Scientific Method (Descriptive science:** Observation, Pattern, Conclusion, **Hypothesis-based:** Observation,Hypothesis, Experiment , Conclusion)

🌍 **Evolutionary Theory**

Evidence:

Species change → fossils, extinction, transitional forms

Species related → homology, molecular phylogenies

Process (how, the mechanisms): natural selection, drift, mutation, gene flow

Misconceptions:❌ Individuals evolve (populations do) ❌ Goal-oriented (mutations random)

❌ Perfect adaptation (some are neutral, maladaptive, or neutral) ❌ Humans “most evolved” (one of few cousins

Darwin: common descent + natural selection (evolution definition)

🐦 **Natural Selection**

3 Postulates (individuals vary, variation is heritable, fitness correlates with heritable variation)

1. Variation is heritable
2. Fitness differs with variation
3. **Why gradual?** traits polygenic, mutations small

- **Selection types:(**Directional, Stabilizing, Disruptive)

4 Mechanisms of Evolution:

- Natural selection
- Mutation
- Genetic drift (random)
- Gene flow (migration)

🐾 **Species & Speciation (**Biological = interbreeding, fertile offspring, Morphological = looks, Phylogenetic = DNA) smallest monophyletic group

Speciation: 1 lineage → 2 (Vicariance = barrier splits, Dispersal = subset colonizes)

Secondary contact outcomes: reinforcement, hybrid species stable hybrid zones, fusion

🚫 **Reproductive Isolation (Premating:** temporal, ecological, behavioral, **Postmating (prezygotic):** mechanical, gametic, **Postzygotic:** hybrid inviability, sterility)

🌳 **Phylogenetic Trees**

- **Types:** phylogeny (history), chronogram (time), cladogram (branching only)
- **Skills:** time = vertical axis; rotate nodes freely; relatedness = nodes, not distance
- **Key:** all extant species equally evolved; trees show ancestry, not progress