

Curiosity in Evolution

Introduction

- **Objective:** Simplify the interpretation of nature using evolutionary tools.
- **Goal:** Equip learners with the ability to:
 - Interpret traits and behaviors in organisms.
 - Ask "why" questions to uncover evolutionary answers.

"Look at all the questions!" – John Vandermeer, on exploring the jungle.

Key Stories to Frame Evolutionary Thinking

1. The Jungle of Questions

- **Context:** A graduate field season in Costa Rica.
 - **Initial perspective:** Nature appeared overwhelming and impenetrable.
 - **Lesson:** Over time, curiosity revealed questions hidden in plain sight.
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2. Tent Bats and How to See

- **Challenge:** Finding elusive tent bats in the jungle.
 - **Advice from John Vandermeer:** Stop searching for tents; look under every leaf.
 - **Discovery:**
 - Seeing bats in their natural 3D environment transformed understanding.
 - Takeaway: Observation requires learning "how to look."
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3. Moken People and Tsunami Survival

- **Event:** 2004 Boxing Day tsunami.
 - **Why They Survived:**
 - Retained cultural memory about the sea.
 - Mastered the art of observation: "They know how to look."
 - **Key Lesson:** Learn not just to look but to interpret the world effectively.
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Understanding Evolution

Microevolution vs. Macroevolution

- **Microevolution:** Small-scale changes in gene frequency within populations.
 - **Macroevolution:** Large-scale evolutionary changes that lead to new species.
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The Purpose of Life

"All creatures are striving to lodge their genes deeply into the future."

- Not solely about reproduction; it's about maximizing genetic survival.
 - Sometimes, not reproducing immediately is more advantageous.
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Adaptation: The Key Process

1. **Selection:** A filter determining which traits persist.
2. **Heredity:** The ability of traits to be passed on to future generations.
3. **Outcome:** Adaptations that better match organisms to their environments.

Adaptation is the cumulative outcome of natural selection and heredity working together.

Tests for Adaptation

1. **Complexity:** The feature must be intricate and specific.
2. **Cost or Risk:** Visible trade-offs among individuals.
3. **Persistence:** Long-term survival of the feature across generations.

Examples:

- The proboscis monkey's large nose (likely linked to sexual selection).
- Eyelash viper's scales (hypothesis: camouflage or detection aid).
- Woolly monkey's prehensile tail (enhanced grip for survival and movement).

Ecological and Sexual Striving

- **Ecological Striving:** Surviving predators, finding food, resisting pathogens.
- **Sexual Striving:**
 - Male competition (e.g., deer antlers).
 - Female choice (e.g., frigate bird's inflated red pouch).

Strategies in Evolution

Annuals and Perennials

- **Annuals:** Flower themselves to death (e.g., petunias).
- **Perennials:** Survive winter to regrow (e.g., lupins).

Biennials

- Example: **Foxglove**
- Year 1: Stores resources underground.
- Year 2: Uses stored energy to outcompete others.

Convergent Evolution

- When different species evolve similar solutions to the same problem.
 - Examples:
 - Bald-faced hornet (annual) vs. thatch ant (perennial).
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Adaptive Hypotheses: Real-World Examples

- **Leaf-nosed bats:** Speculated to assist in echolocation.
 - **Wood duck iridescence:** An adaptation for sexual selection.
 - **Cats delivering prey:** Demonstrating hunting skills for survival.
 - **Radishes and carrots:** Biennial strategy repurposed by humans.
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Final Thoughts

"The more you understand adaptive striving, the simpler the world gets."

- **Homework:** Apply the adaptation test to organisms around you.
 - Why do fruit bats have nose leaves?
 - What purpose do blue-footed boobies' displays serve?
 - Develop your evolutionary lens to uncover the stories behind nature's wonders.
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"You live on a planet full of miracles, but they are comprehensible miracles."