

When Should Absence of Evidence Be Evidence of Absence?

A Case Study from Paleogeology

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1. Introduction

- **Main Idea:** Challenges the aphorism “absence of evidence is not evidence of absence” and introduces the need for a nuanced understanding in paleogeology.
- **Example:** Coelacanth fish case, illustrating the pitfalls of equating AoE with EoA.
- **Objective:** Defend the practice of interpreting AoE as EoA in paleosciences.

2. The Probabilistic View and Its Historical Antecedents

- **Historical Context:** Origins of the phrase in late 19th-century geology.
- **Probabilistic View:** Articulated by Sober and Wallach, AoE is strong EoA only when evidence is highly expected.
- **Limitations:** Inadequate for contexts where evidence is not typically expected, such as paleogeology.

3. Case Study: Absence of Evidence for Plate Tectonics

• 3.1 Timing the Onset of Plate Tectonics

- **Debate:** No consensus on when plate tectonics began, with dates ranging from the Neoproterozoic to the Hadean era.
- **Key Evidence:** Blueschist, ophiolites, and UHP rocks, which are indicative of plate tectonics.
- **Interpretations:** Some geologists treat AoE as EoA, while others suggest evidence was destroyed or not produced.
- **Challenge:** Probabilistic View deems AoE as weak EoA in deep past contexts.

• 3.2 The Pragmatic View

- **Introduction:** Treating AoE as EoA is justified by pragmatic benefits.
- **Theoretical Scaffold:** Enables investigation of auxiliary hypotheses, such as preservation conditions.
- **Contrastive Testing:** Facilitates testing hypotheses against a range of alternatives.
- **Encouraging Investigation:** Promotes exploration of why evidence is absent, leading to theoretical advancement.

4. Application to Plate Tectonics

- **Stern’s Arguments:** Evidence should have been preserved if plate tectonics operated before the Neoproterozoic.
- **Auxiliary Hypotheses:** Investigate preservation conditions and alternative geological processes.
- **Advantages:** Supports comprehensive investigations and richer hypothesis testing, enhancing understanding of Earth’s history.

5. Conclusion

- **Critique of Probabilistic View:** Inadequate for paleogeology where evidence is not typically expected.
- **Advocacy for Pragmatic View:** Balances probabilistic considerations with practical needs, facilitating progress in understanding Earth’s history.
- **Implications:** Encourages a nuanced understanding of evidence and inference in the philosophy of science, promoting more refined scientific theories.