Philos520 R.O. Harry Luo Oct 1st

I. Introduction

- **Scope**: Historical research plays a crucial role in natural sciences.
- **Philosophical Focus**: Despite significant scientific achievements, philosophical discussions have largely overlooked historical natural sciences, except for evolutionary biology.
- **Methodological Distinction**: Building on Cleland's work (2001, 2002), the essay differentiates "prototypical historical science," which investigates unique, long-past events, from "classical experimental science," which examines regular patterns among event types.
- **Essay Focus**: explanation and justification in historical natural science, arguing that confirmation relies more on the explanatory success of hypotheses rather than their predictive accuracy.

II. Methodology of Historical Natural Science

- **Two Stages**:
  1. **Hypothesis Proliferation**: Scientists develop multiple competing hypotheses to explain puzzling evidence gathered from fieldwork.
  2. **Smoking Gun Search**: decisive evidence that clearly supports one hypothesis over the others.
- **Epistemic Context**: Findings in historical science are provisional and can be revised with new evidence or theoretical advancements.
- **Role of Technology**: Technological innovations are often essential for detecting and analyzing subtle or degraded traces, facilitating breakthroughs.
- **Complementarity**: The two methodological stages complement each other and are not in conflict.

III. Justification in Historical Natural Science

- **Primacy of Explanation**: Explanatory power is more important than predictive capabilities in evaluating historical hypotheses.
- **Limitations of Prediction**: Predictions in historical science tend to be vague and not decisive; failed predictions rarely lead to hypothesis rejection, while successful predictions are not always necessary for acceptance.
- **Common Cause Explanation**: Central to justification, narrative explanations in historical science rely on common causes for empirical support.
- **Response to Critics**: Turner and Jeffares : the role of prediction in historical science.

IV. Common Cause and Asymmetry of Overdetermination

- **Justification Basis**: The principle of common cause is supported by the asymmetry of overdetermination, where past events typically cause multiple diverse effects, unlike future events.
- **Empirical Foundation**: This asymmetry is grounded in physical principles.
- **Scientific Preference**: Scientists naturally prefer common cause explanations due to the overdetermination asymmetry.
- **Information Dynamics**: Technological advances mitigate concerns about information degradation, allowing for better evidence extraction.

V. Case Studies

- **Examples**: End-Cretaceous extinction and the Alvarez hypothesis, Snowball Earth, Last Universal Common Ancestor (LUCA), and End-Permian extinctions.
- **Purpose**: These cases illustrate the methodology and justification processes in historical science.

VI. Philosophical Implications

- **Defense of Common Cause**: The essay addresses and counters critiques by philosophers like Sober and Tucker.
- **Role of Background Theories**: Background theories, such as Darwin's evolution theory, influence the preference for common cause explanations over separate causes.

VII. Conclusion

- **Distinct Methodology**: Emphasizes that historical science prioritizes explaining traces rather than making predictions.
- **Empirical Foundation and Preference**: Based on the asymmetry of overdetermination, supporting a default preference for common causes.
- **Epistemic Equality**: Argues that historical sciences are epistemically comparable to, and may even surpass, experimental sciences in certain aspects.