Abduction as Premature Induction

Phil Stilwell

Independent Scholar

Thesis. *Abduction, properly construed in the Peircean sense as hypothesis nomination in response to surprising evidence, is not an autonomous inferential method but a strict subroutine of induction; treating abduction as justificatory without subsequent testing is premature induction.*

This paper articulates and defends a containment view on which abduction launches inquiry by proposing candidates, while induction—via discriminating tests, replication, and convergence—alone licenses acceptance. We (i) situate abduction historically and conceptually with Peirce, Harman, and Lipton; (ii) formalize the containment claim with a Bayesian partition that makes explicit the penalizing roles of rivals and unconceived alternatives; (iii) model inquiry as a repeated game against Nature to show why myopic abductive "best responses" incur high regret absent exploration; and (iv) examine domains (e.g., miracle reports) where unknowns dominate priors and likelihoods, rendering abductive acceptance indefensible until testing collapses the catch-all mass. The result preserves abduction's indispensability as the first step of inquiry while disallowing its elevation to a rule of acceptance.

Opening Narrative

The label *abduction* has long been pulled between two projects. A broadly Peircean strand construes it modestly as the act of *proposing* an explanatory hypothesis in response to recalcitrant observations (Douven, 2021; Peirce, 1931). By contrast, the Harman–Lipton tradition embeds abduction within a justificatory norm—*inference to the best explanation* (IBE)—on which explanatory virtues themselves underwrite acceptance (Harman, 1965; Lipton, 2004). This paper adopts the Peircean usage and argues that, under that usage, abduction is neither a third sui generis mode of reasoning alongside deduction and induction nor a direct warrant to believe. Rather, abduction is *induction in embryo*: a nomination stage whose safety depends entirely on its feeding-forward into testing.

Two families of arguments support the thesis. First, a Bayesian partition shows structurally why abductive acceptance is premature: without testing that reduces the posterior weight of rivals and the residual mass of unconceived alternatives, the numerator favored by an elegant hypothesis is outpaced by a stubborn denominator (Norton, 2021; Stanford, 2006; Weisberg, 2009). Second, a game-theoretic recast represents inquiry as a repeated interaction against Nature under a proper scoring rule. Abductive choice is a *myopic* best response relative to a currently salient set; inductive method is a *long-horizon* exploration–exploitation policy that designs severe tests and thereby secures equilibrium (Mayo, 2018; Sober, 2008). Both perspectives converge on a single moral: abduction nominates; induction justifies.

Bayesian Foundations: Containment and the Denominator Problem

Let H be a nominated hypothesis to explain evidence E; let $\{R_i\}_{i=1}^{k}$ enumerate salient rivals; and let U denote the catch-all of unconceived/unspecified alternatives (Stanford, 2006). Bayes' theorem yields

$$P(H \mid E) = \frac{P(E \mid H)P(H)}{P(E \mid H)P(H) + \sum_{i=1}^{k} P(E \mid R_i)P(R_i) + P(E \mid U)P(U)}. \tag{1}$$

Explanation. The numerator rewards H for fit and prior plausibility. The denominator carries three debits: (i) known rivals, (ii) their evidential fits, and (iii) the unknowns mass U, which absorbs possibilities not yet articulated.

Acceptance at threshold $\tau \in (0, 1)$ requires

$$P(E \mid H)P(H) \;\geq\; \frac{\tau}{1-\tau}\left(\sum_{i=1}^{k} P(E \mid R_i)P(R_i) + P(E \mid U)P(U)\right). \tag{2}$$

Explanation. Even a large $P(E \mid H)$ is insufficient if $P(E \mid U)P(U)$ is large; in immature domains with many live unknowns, the catch-all dominates the right-hand side. Testing must shrink the rival terms and the U-mass to clear the threshold.

Equation (1) exposes the *denominator problem* for IBE: abductive elevation on explanatory grounds does nothing, by itself, to collapse the weight on rivals or U (Weisberg, 2009). Severe, discriminating tests are the mechanism that exponentially damp those terms by replication (Mayo, 2018). Thus, abduction *contained within* induction ($A \subset I$) is not a mere slogan but a structural fact: what abduction proposes, induction must test.

Inquiry as a Repeated Game

Model inquiry as a repeated game between an *Investigator* and *Nature*. At round t, the Investigator selects a hypothesis h_t (possibly designing an experiment x_t); Nature returns $e_t \sim P(\cdot \mid h^*, x_t)$ for the true but unknown h^*. Payoffs are predictive accuracy under a proper scoring rule. Two pressure results follow:

Myopic regret. If the true h^* is outside the currently entertained set, a purely abductive best response (choose the apparently most coherent h_t each round) incurs unbounded regret relative to a policy that allocates exploration to expand the set. *Abduction can be locally sensible yet globally brittle.*

Severe testing as denominator control. If there exist tests with positive Kullback–Leibler discrimination between H and its rivals, then replication drives the Bayes factors multiplicatively, collapsing $\sum_i P(E \mid R_i)P(R_i)$ and the effective U-mass. *Inductive method is precisely the policy that schedules such tests to trade off exploration and exploitation until an equilibrium of stable credence is reached* (Mayo, 2018; Sober, 2008).

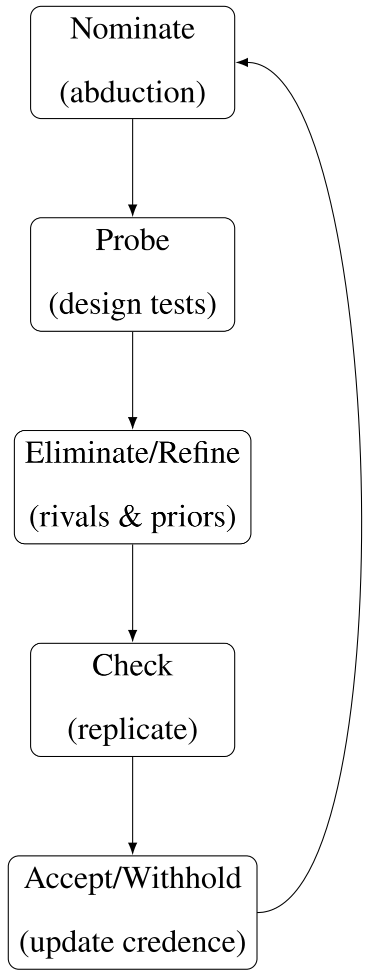

Figure 1

Inquiry as a vertical cycle: abduction initiates, induction completes.

Figure 1 visualizes the containment thesis as a cycle: abduction nominates, induction probes and eliminates, replication checks, and only then does acceptance (or withholding) rationally follow.

Where Abduction Misleads: A Case on Miracle Reports

Consider a specific miracle claim M supported by testimonial evidence T in an immature domain where mechanisms are poorly constrained. Let H_M be the hypothesis that a particular supernatural intervention occurred; let $\{R_i\}$ include naturalistic misperception, memory error, deception, and rare but mundane coincidences; and let U represent not-yet-conceived natural mechanisms (Earman, 2000). Even if $P(T \mid H_M)$ is high, the priors $P(H_M)$ are typically small (base-rate scarcity of such events), and both $\sum_i P(T \mid R_i)P(R_i)$ and $P(T \mid U)P(U)$ are substantial. On (2), abductive acceptance is unjustified until rigorous controls (blinding, instrumentation, preregistration) drive down the rival terms. In mature sciences—e.g., lightning once attributed to gods—the U-mass collapsed only after experiments disclosed atmospheric electricity and its signatures. Abduction launched inquiry; induction earned belief.

Objections and Replies

"Best Explanation" as Independent Justifier

One might insist that explanatory loveliness (*consilience, simplicity*) itself justifies belief. Within Bayesianism, those virtues influence priors and likelihoods but cannot delete denominators (Weisberg, 2009). Within anti-Bayesian programs, worries about global priors motivate local material accounts of induction, but these, too, require domain-specific warrants that are produced by testing, not nomination (Norton, 2021). Thus, loveliness without testing remains premature.

Realism Pressures and No-Miracles

Scientific realism often appeals to IBE: the success of science would be "miraculous" unless approximately true. Yet the historical problem of unconceived alternatives counters that past successes underwrote theories later replaced (Stanford, 2006; van Fraassen, 1980). The reconciliation, if any, occurs after induction has constrained the alternative space—not at the abductive moment.

Is Abduction Just a Label for Discovery?

Peirce located abduction at the *beginning* of inquiry, linking it to the generation of explanatory conjectures responsive to surprise (Peirce, 1931). That generative role is indispensable. The present claim is not deflationary about abduction's value, but about its justificatory standing: discovery is necessary but insufficient for acceptance.

Broader Implications

Methodologically, the containment view reframes debates over IBE, realism, and statistical practice. It favors research designs that maximize discriminating power, penalizes premature credence elevation in high-U domains, and clarifies why replication crises are not merely sociological but epistemic: without convergence pressures, denominators do not shrink. Pedagogically, it recommends teaching abduction as the art of proposing *testable* conjectures and induction as the craft of *severely* testing them.

Conclusion

Abduction is indispensable as the nomination engine of inquiry, but it is epistemically incomplete on its own. A Bayesian partition and a repeated-game model jointly explain why: abductive advantages live in the numerator, while rational acceptance is won in the denominator by eliminating rivals and taming unknowns through severe tests and replication. Recognizing abduction as premature induction—a contained subroutine within the larger inductive method—preserves what is right in IBE while forestalling premature closure, especially in domains rich with unconceived alternatives.

References

Douven, I. (2021). Abduction. In E. N. Zalta (Ed.), *The stanford encyclopedia of philosophy* (Fall 2021). https://plato.stanford.edu/archives/fall2021/entries/abduction/

Earman, J. (2000). *Hume's abject failure: The argument against miracles*. Oxford University Press.

Harman, G. (1965). The inference to the best explanation. *The Philosophical Review*, *74*(1), 88–95. https://doi.org/10.2307/2183532

Lipton, P. (2004). *Inference to the best explanation* (2nd ed.). Routledge.

Mayo, D. G. (2018). *Statistical inference as severe testing: How to get beyond the statistics wars*. Cambridge University Press. https://doi.org/10.1017/9781107286184

Norton, J. D. (2021). *The material theory of induction*. Johns Hopkins University Press.

Peirce, C. S. (1931). *Collected papers of charles sanders peirce* (C. Hartshorne, P. Weiss, & A. W. Burks, Eds.) [Volumes 1–8, 1931–1958]. Harvard University Press.

Sober, E. (2008). *Evidence and evolution: The logic behind the science*. Cambridge University Press. https://doi.org/10.1017/CBO9780511812850

Stanford, K. (2006). *Exceeding our grasp: Science, history, and the problem of unconceived alternatives*. Oxford University Press.

van Fraassen, B. C. (1980). *The scientific image*. Oxford University Press.

Weisberg, J. (2009). Locating IBE in the Bayesian framework. *Synthese*, *167*(1), 125–143. https://doi.org/10.1007/s11229-008-9330-6

Appendix

Formal Notes and Annotations

A1. Partition with Unknowns

$$P(E) = P(E \mid H)P(H) + \sum_{i=1}^{k} P(E \mid R_i)P(R_i) + P(E \mid U)P(U).$$

Note. The U-term is not metaphysical inflation but a bookkeeping device reflecting the open texture of hypothesis space in immature domains.

A2. Acceptance Threshold Inequality

$$P(H \mid E) \geq \tau \quad \Longleftrightarrow \quad P(E \mid H)P(H) \ \geq \ \frac{\tau}{1-\tau}\left(\sum_{i=1}^{k} P(E \mid R_i)P(R_i) + P(E \mid U)P(U)\right).$$

Note. Increases in explanatory "fit" matter most when paired with experimental designs that reliably depress the rival/unknowns mass.

A3. Replication and Exponential Collapse

If an experiment yields Bayes factor $\mathrm{BF}_{H:R} > 1$ per replication under independence, then after n replications,

$$\frac{P(R \mid E_{1:n})}{P(H \mid E_{1:n})} = \frac{P(R)}{P(H)} \cdot \mathrm{BF}_{R:H}^{n} \quad \to 0 \quad \text{as } n \to \infty.$$

Note. "Severe" tests are exactly those with expected $\mathrm{BF}_{H:R} \gg 1$ *when H is true, hence with rapid posterior concentration under replication (Mayo, 2018).*

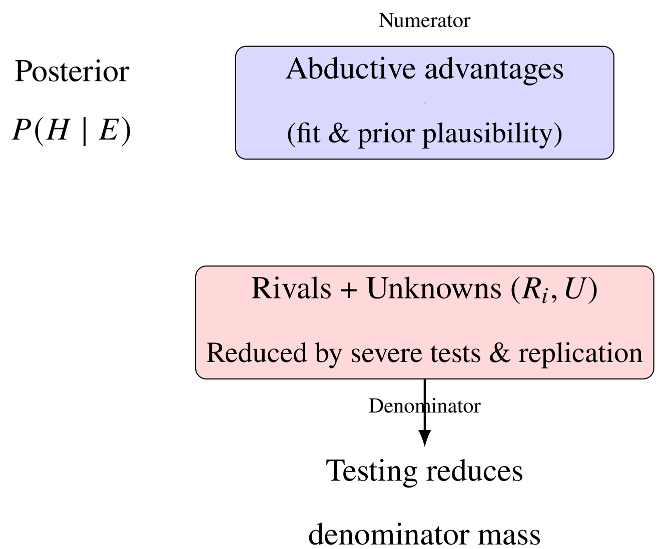

Figure A1

Posterior as a fraction: abductive advantages live in the numerator, while rational acceptance is secured in the denominator by eliminating rivals and taming unknowns through severe tests and replication.