

Causal Perspectivalism, Interventions, and Entropy

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Overview:

- 1) What is it for causation to be perspectival?**
- 2) Epistemic constraints on deliberation.**
- 3) The “trump card” for perspectivalism and entropy accounts of causation**
- 4) Of stargates and Trojan Horses**

1) **What is it for causation to be perspectival?**

- Price: perspectival concepts “only ‘make sense’ from [an] embedded perspective -- so that if, *per impossibile*, we could step outside this perspective, these aspects of science would cease to be relevant to us.”

1) What is it for causation to be perspectival?

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■ Analogy 1:

Distinction between locals and foreigners:

One way to understand concept:

‘ X is a foreigner with respect to country C ’.

→ Perspectival concepts understood as $n+m$ place relations, for which m relata are implicitly determined by the context in which the concept is applied.

■ Analogy 2:

The Rolling Stones in the Garden of the Forking Paths.

Point B is accessible from point A iff

- (1) B is to the north of A.
- (2) B is at a lower altitude than A.
- (3) a typical traveler arriving at A could proceed to B (at least in principle, perhaps). → REDUCTION TO THE TRAVELER'S PERSPECTIVE.

→ Explicitly the relation is a three-place relation: 'B is accessible from A for S'

→ A physical theory of accessibility: B is accessible from A for S, iff $E_{\text{kin}}(S) + E_{\text{pot}}(S, A) \geq E_{\text{pot}}(S, B)$

Analogy to causal case:

→ ‘A is a cause of B’ understood as a three-place relations: ‘A is cause of B for agent X’.

Price’s proposal for a reduction to the agent’s perspective:

“B is an effect of A iff doing A is a means of bringing about B, from an agent’s perspective—roughly, if controlling A is a means of controlling B.”

Two issues:

- 1) Are the analogies good ones—i.e. is the causal relation like that of accessibility really implicitly a three-place relation?
- 2) What is the status of the biconditional? Reduction or theory of causation?

→ Price's reductive account:

- The notion of causation has conceptual ties to the notions of intervention and deliberation. (this is in agreement with recent interventionist accounts, BUT:)
- Deliberations reflect our epistemic position—in particular certain temporal asymmetries concerning what we know and what we cannot know. → causal judgments are perspectival.
- These epistemic asymmetries have their root in the thermodynamic asymmetry.

2) Epistemic constraints on deliberations.

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Treat our actions as probabilistically independent of their causal past but not their causal future.

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Possible explanations:

- i) successful deliberative practices reflect the causal asymmetry.
- ii) this asymmetry reflects further asymmetries in our epistemic situation and is then ultimately 'spread over the objects'.

Additional epistemic constraints:

- c) Options vs. Fixtures: What is known and what is knowable are subsets of the Fixtures.
- d) The fixity of the past principle (FPP): “As information-gathering systems, we have epistemic access to things in (what we call) the past; but not, or at least not directly, to things in (what we call) the future.”

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Worries:

Do the constraints on knowledge imply the temporal asymmetry? How do we arrive at the FPP?

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Possible arguments for the claim? → Entropy accounts of causation.

Barry Loewer: The statistical mechanical probability distribution implies a tree structure for possible macro evolutions: small changes to the present micro state, compatible with the present macro state can lead to radically different future evolutions, but the distribution greatly restricts the macro past.

The tree structure grounds an asymmetry for ‘decision counterfactuals.’



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- And third, to the extent that the micro trajectories are instable, the instability assumption is time-symmetric: small changes to present also are associated with radically different pasts.

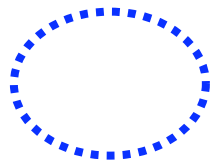
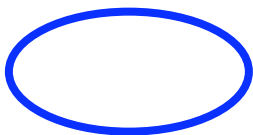
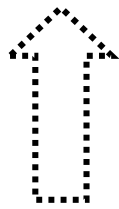
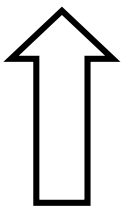
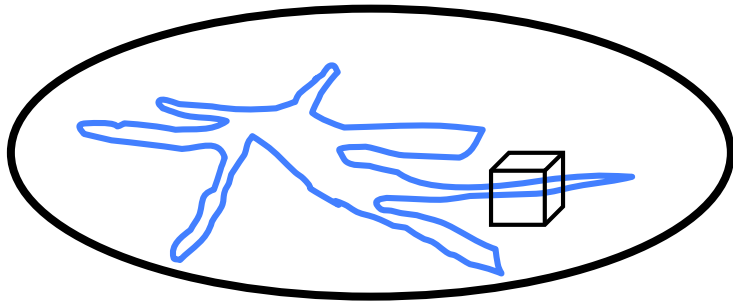
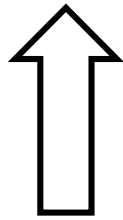
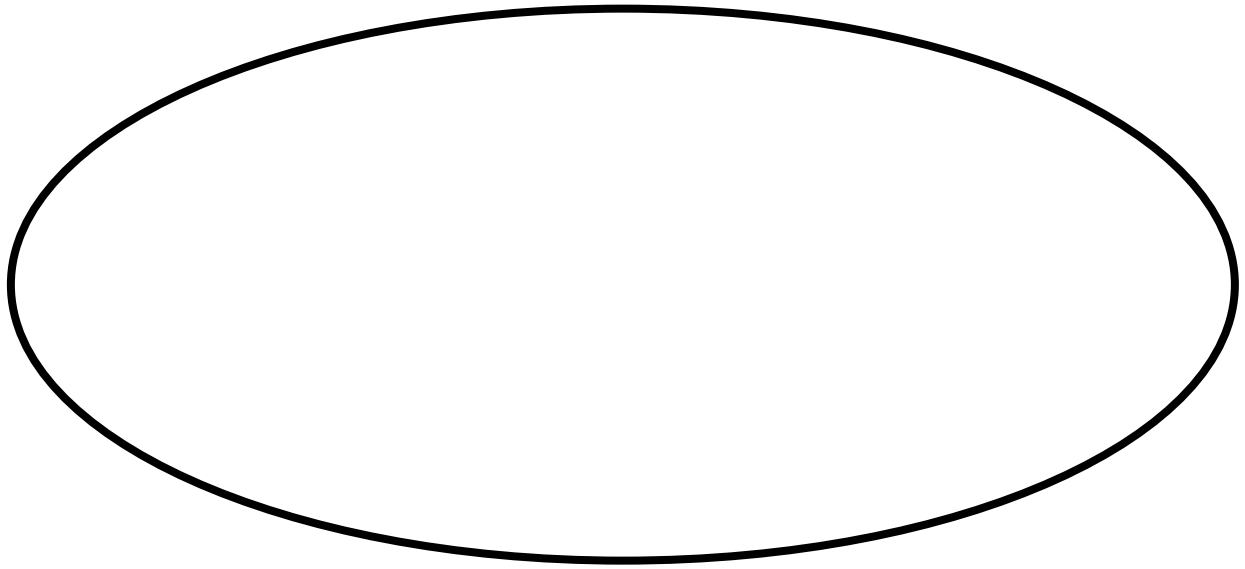
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- And third, to the extent that the micro trajectories are instable, the instability assumption is time-symmetric: small changes to present also are associated with radically different pasts.
- Here the past hypothesis is meant to help: Loewer points to the fact that positing a low-entropy past (*PH*) imposes a constraint on possible histories of the world and that there is no similar constraint on possible future evolutions.

- a first worry: “But isn’t imposing a time-asymmetric constraint cheating?” Answer: “No, because there is a constraint on the past that function as a law in statistical mechanics—the *PH*.” Lesson: we can’t stick more into the *PH* than is required by SM: that the universe originated in some extremely low-entropy state (perhaps adding also that the past is constrained to satisfy the gross, cosmological constraints that cosmology provides.)

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- a more substantive worry: doesn’t the constraint given by the *PH* suggest an upside-down tree structure? According to SM *future* states occupy vastly *larger* regions of phase space and *past* states occupy vastly *smaller* regions of phase space. That is, it follows from Liouville’s theorem that the present state of a system is compatible with a vast number of past states.

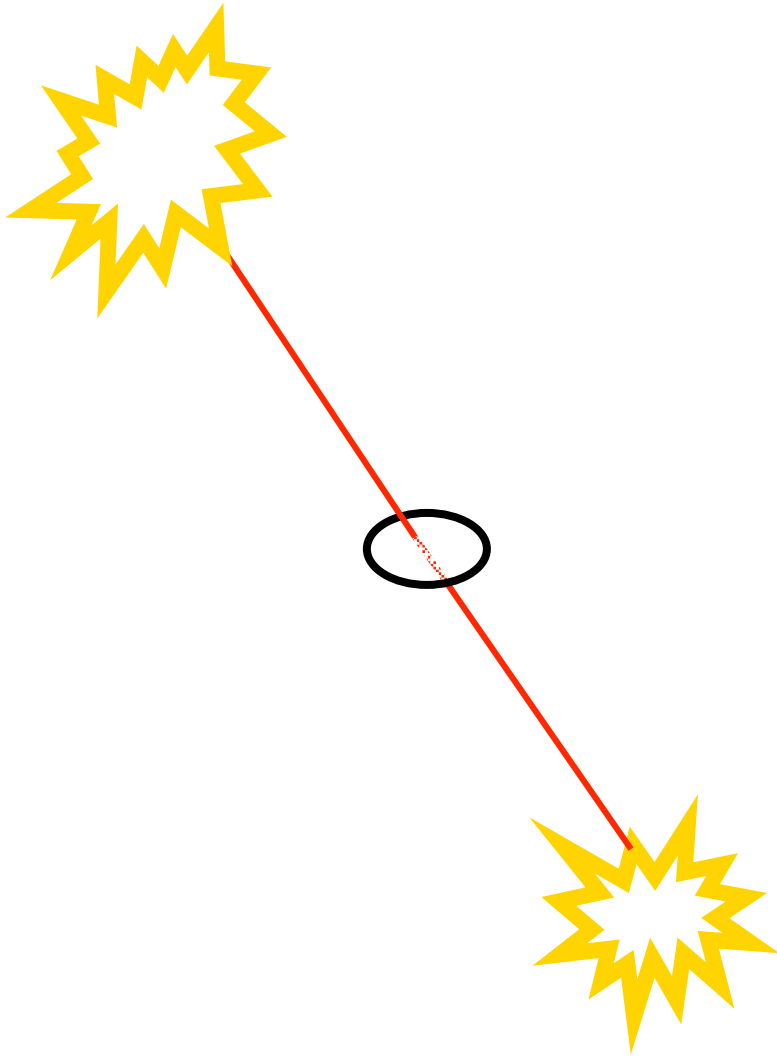
‘Most’ changes to the present micro state will result in micro states that evolved from a higher entropy past. But the probabilities for landing on different histories with different low-entropy pasts seem equal.



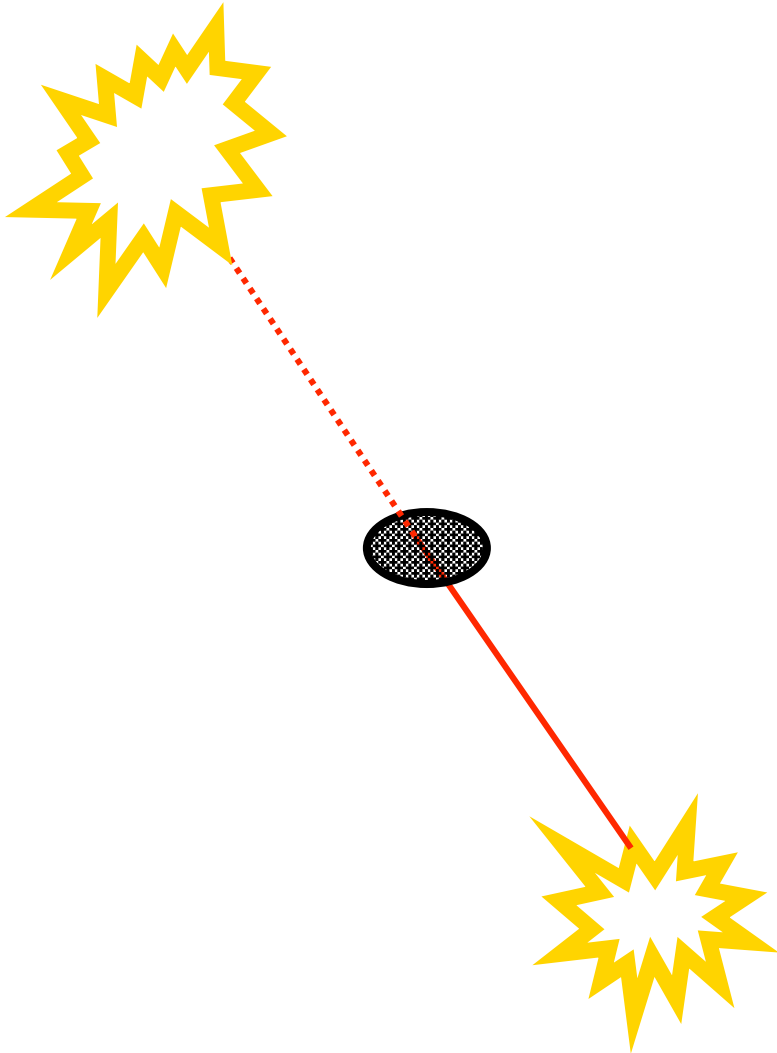
- Consider a toy universe consisting of a gas in a box and two possible low-entropy initial states: gas confined to the right half or to the left half. Assume the gas actually was confined to the left half and then spread out. Then most changes to the final micro state will be associated with a high entropy past. What if we constrain the changes to those that evolved from a low entropy initial state? If we assume that the system is mixing, each coarse-grained ‘box’ of phase space will have the same proportion of points that evolved from the two initial regions. That is, given the ‘past hypothesis’ the system is as likely to have evolved from some non actual low-entropy past as from the actual past.
- Possible reply: Add enough constraints into the formulation of the *PH* to pick out the actual past uniquely. But: then the account is in danger of being question-begging.

→ Conclusion: link between thermodynamic arrow and epistemic constraints remains doubtful.

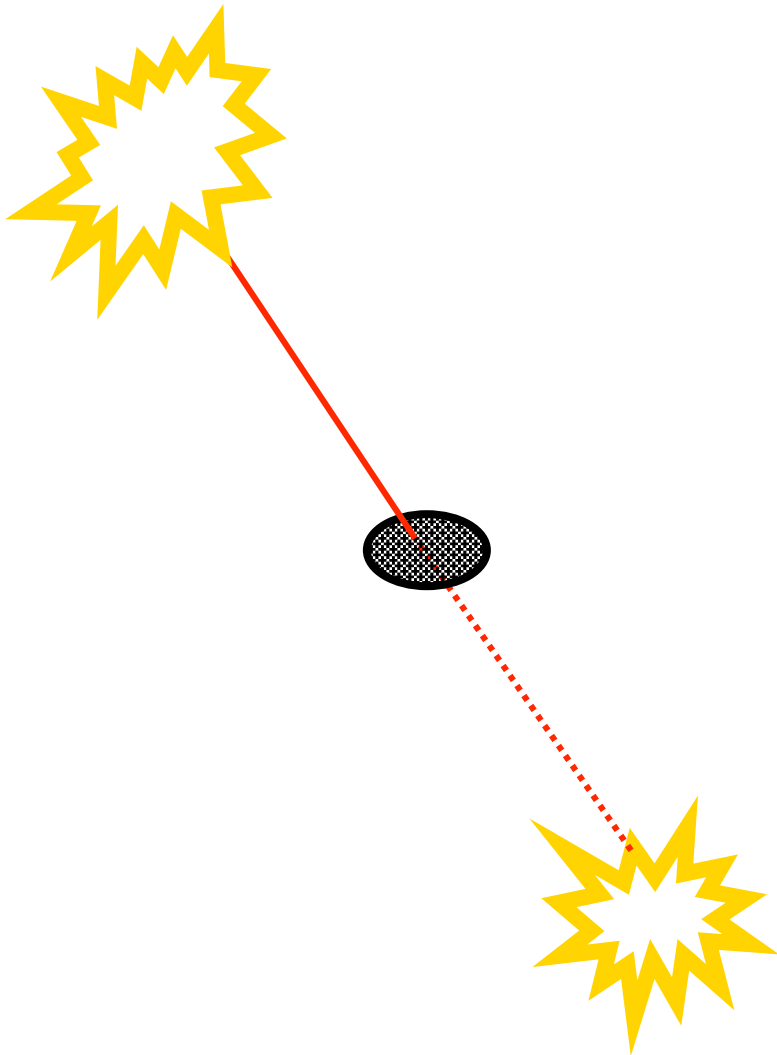
e) Of stargates and Trojan Horses



PROPOSITION 1: *If the stargate had been closed at time t , the photon p would not have been absorbed at G_{future} .*



PROPOSITION 2: *If the stargate had been closed at time t , the photon p would not have been emitted at G_{past} .*



What is the reason for endorsing 1 but not 2?

Objective causal asymmetry? Or our perspective?

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But: can there be experimental evidence for the asymmetry?

→ try to set up *initial state and intervention vs. final state and intervention*.

- We can imagine that Price’s epistemic constraints are violated.
- What would the result of such an experiment be in a region with reversed thermodynamic arrow?

→ dilemma for perspectival account:

Intervention arrow would not be reversed → objective irreducible causal asymmetry.

Intervention arrow would be reversed → objective thermodynamic reduction.

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Different types of interventions:

- Arrow-breaking interventions with no knowledge of past of the system → rely on thermodynamics.
- Arrow-breaking interventions that rely on recording past states → connection to thermodynamics?
- Non-arrow breaking interventions without knowledge of past → don't allow us to set up systems.