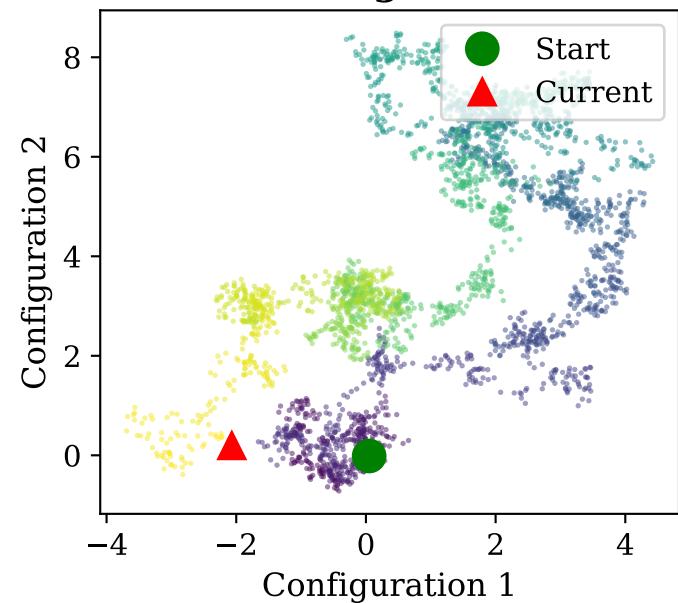
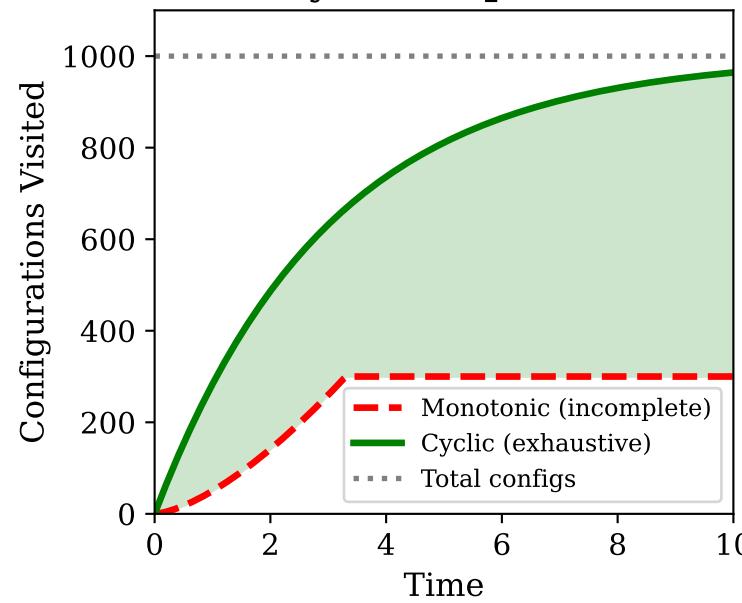


# Figure 6: Categorical Exhaustion → Cyclic Cosmology

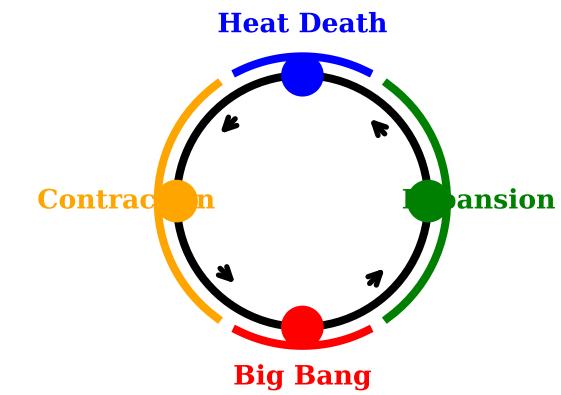
## A. Configuration Exploration (Visiting States)



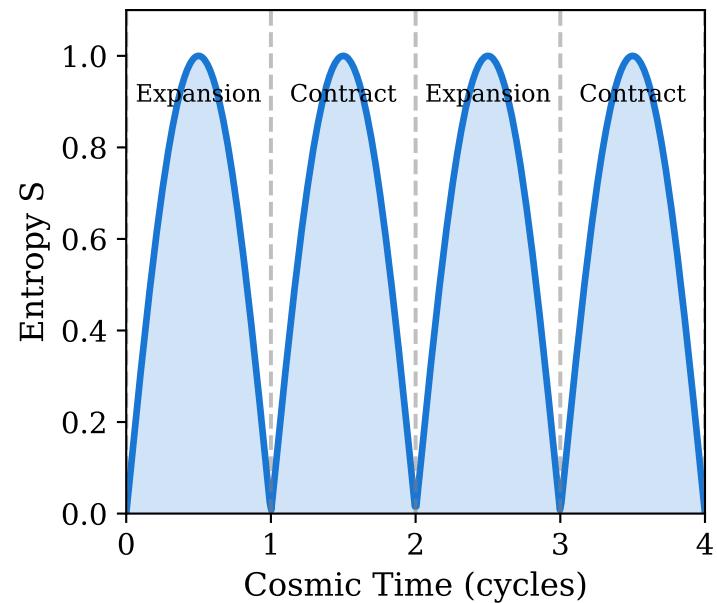
## B. Exploration Comparison (Cyclic Required)



## C. The Cosmic Cycle (Categorical Exhaustion)



## D. Entropy is Cyclic (Not Monotonic)



## E. Heat Death is Incomplete

### WHY HEAT DEATH ≠ END

Heat death = maximum entropy  
= maximum degeneracy

- But maximum degeneracy means:
- Only HIGH-entropy states visited
  - LOW-entropy states never explored (stars, galaxies, life...)

Categorical completeness requires ALL states visited.

→ Contraction phase explores low-entropy configurations.

## F. Cyclic Universe Derived

The universe MUST be cyclic.

This is not assumption—it follows from:

1. Bounded phase space (Poincaré recurrence)
2. Categorical completeness (all states must be visited)
3. Consistency requirements (no state left unexplored)

Big Bang → Heat Death → Big Crunch → Big Bang →...