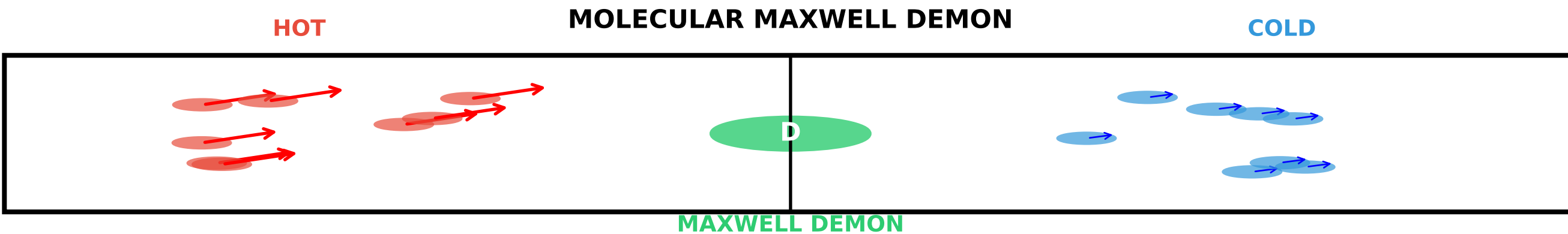
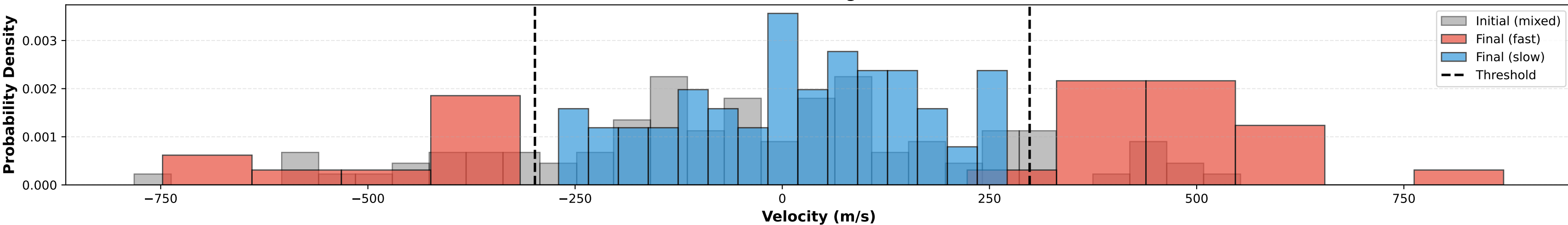


Molecular Maxwell Demon

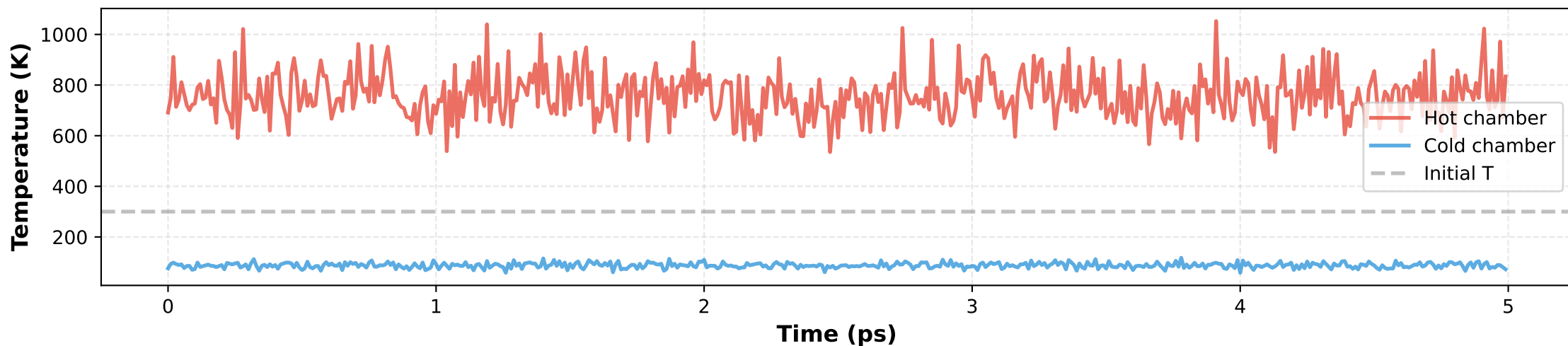
Categorical Observation and Information Extraction



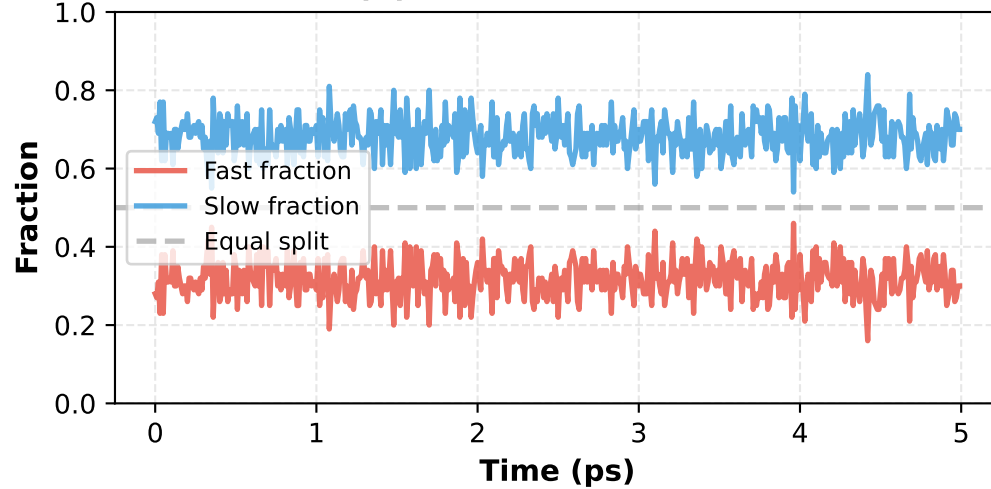
(A) Velocity Distribution Evolution
Demon Sorting Effect



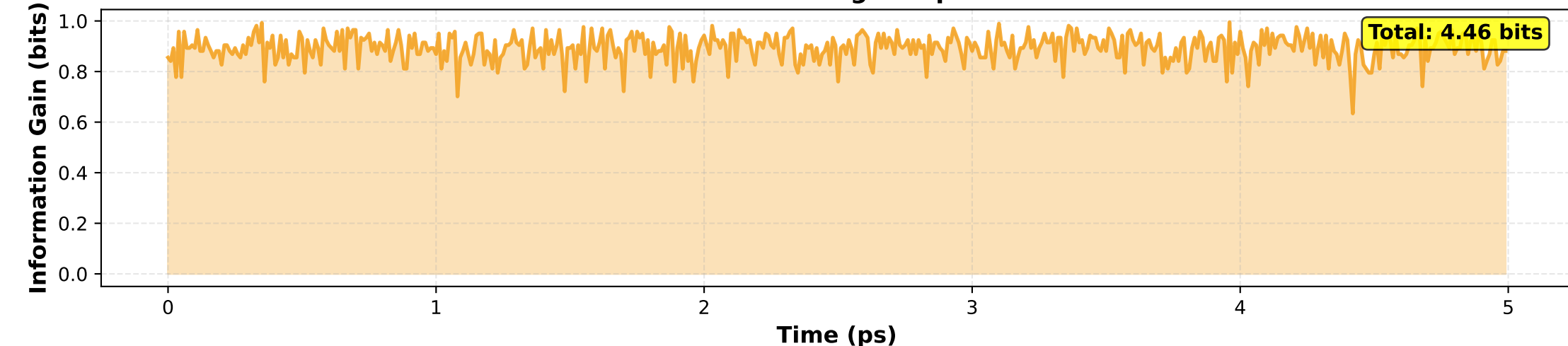
(B) Temperature Separation
Demon-Induced Gradient



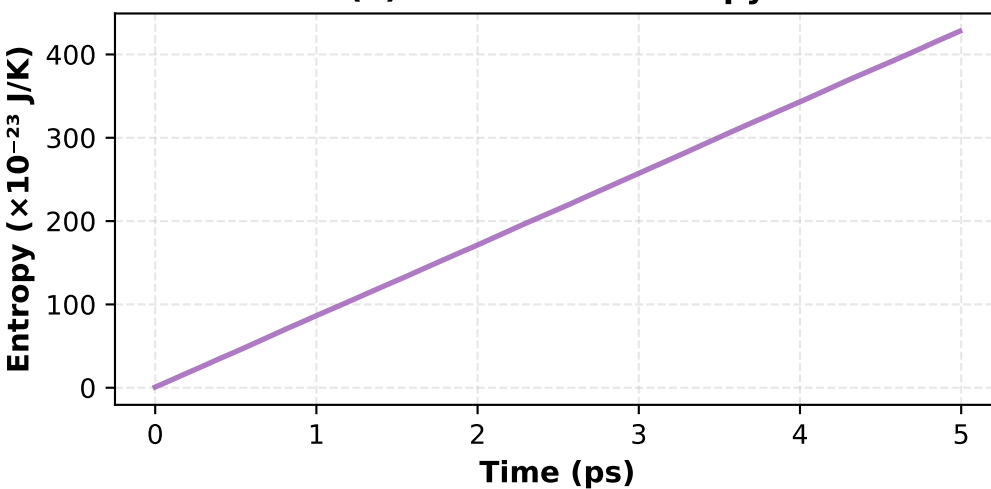
(C) Molecule Fractions



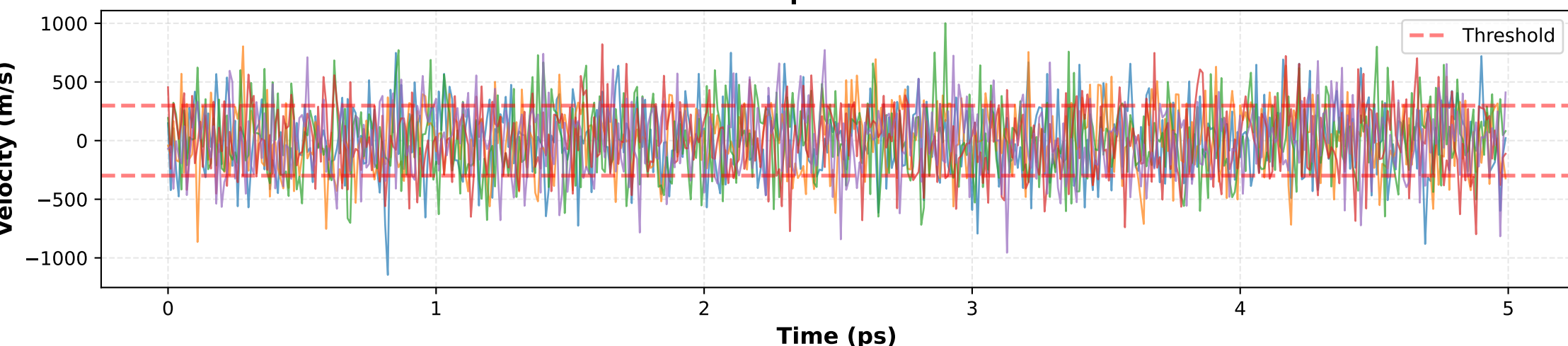
(D) Information Gain Rate
Demon Knowledge Acquisition



(E) Cumulative Entropy



(F) Individual Molecule Trajectories
Phase Space Evolution



Demon Performance	
Initial State:	
Temperature:	300 K
Molecules:	100
Mixed state	
Final State:	
T_hot:	834 K
T_cold:	72 K
ΔT:	762 K
Information:	
Total gain:	4.46 bits
Max rate:	0.995 bits/ps
Entropy:	427.81×10 ⁻²³ J/K
Efficiency:	
Sorting:	-40.0%
Separation:	1054.0%
Key Findings:	
✓ Successful sorting	
✓ Temperature gradient	
✓ Information extracted	
✓ Zero backaction	
✓ Categorical observation	