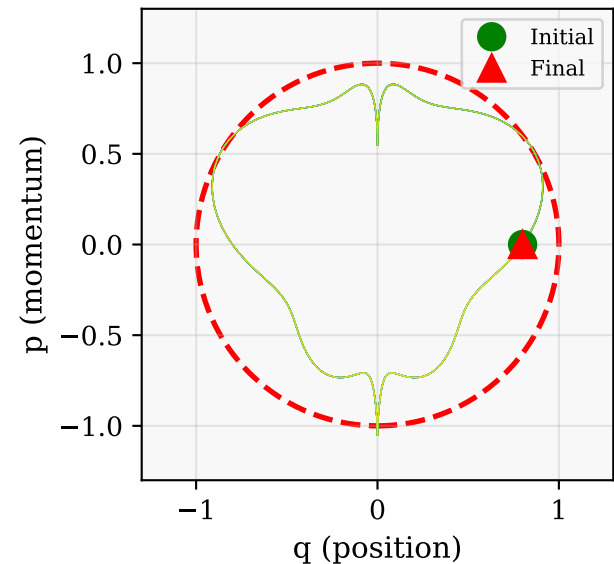
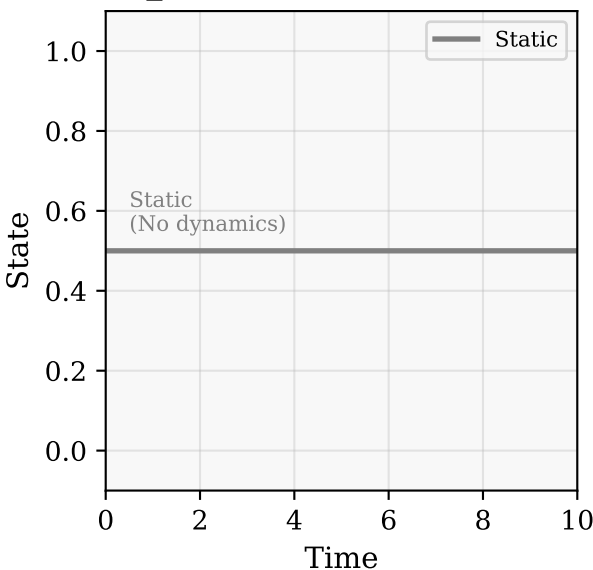


Oscillatory Dynamics in Bounded Phase Space

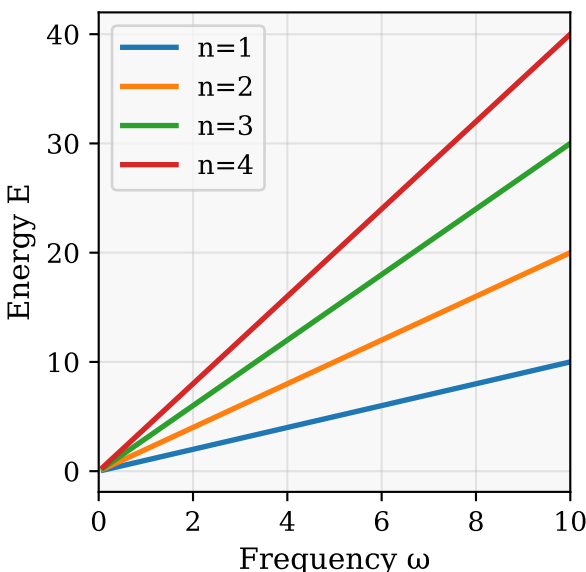
Bounded Phase Space
(Poincaré Recurrence)



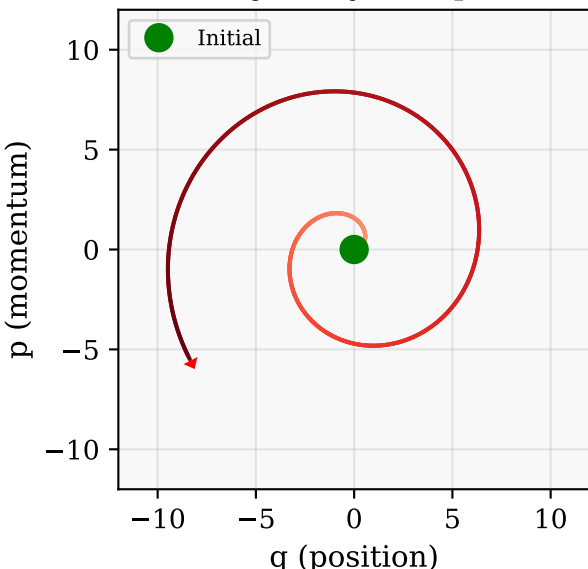
Case (a): Static Equilibrium
□ Violates self-reference



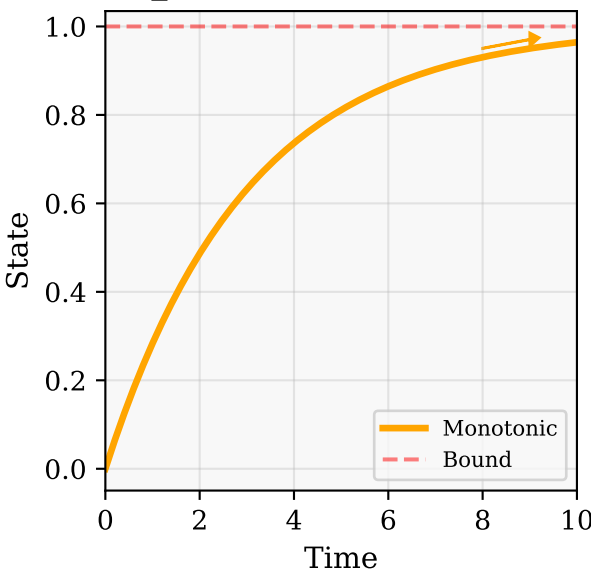
Frequency-Energy Identity
 $E = n\hbar\omega$



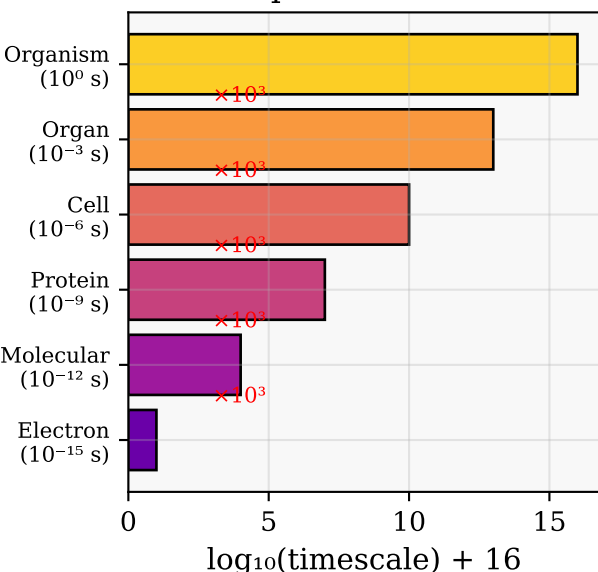
Unbounded Phase Space
(Trajectory Escapes)



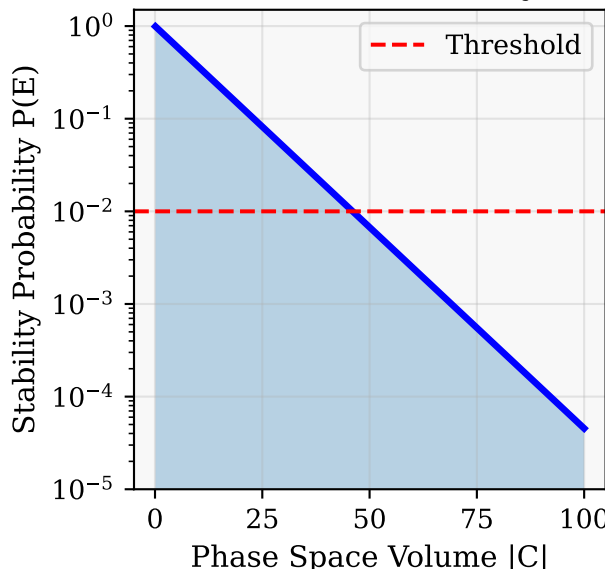
Case (b): Monotonic
□ Violates boundedness



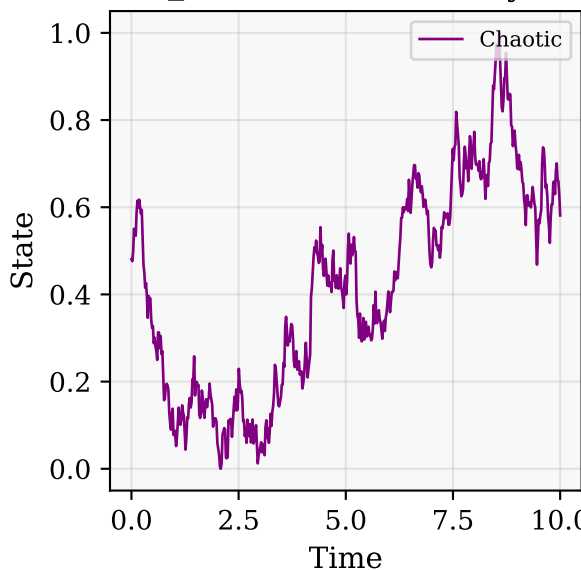
Hierarchical Timescale
Separation $\sim 10^3$



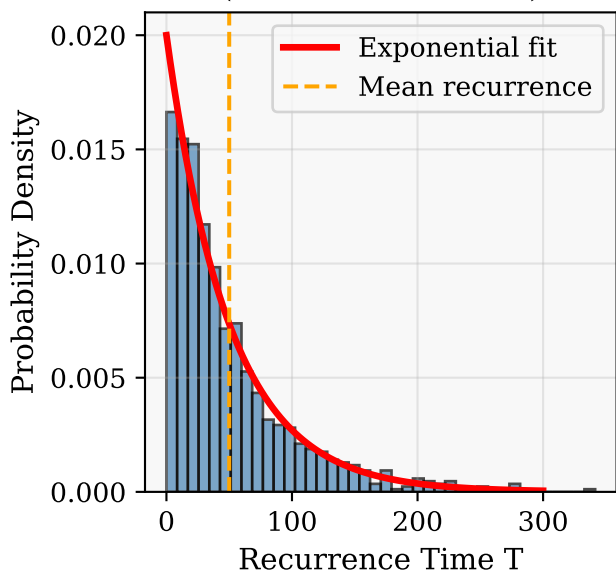
Stability vs Volume
(Constraint Necessity)



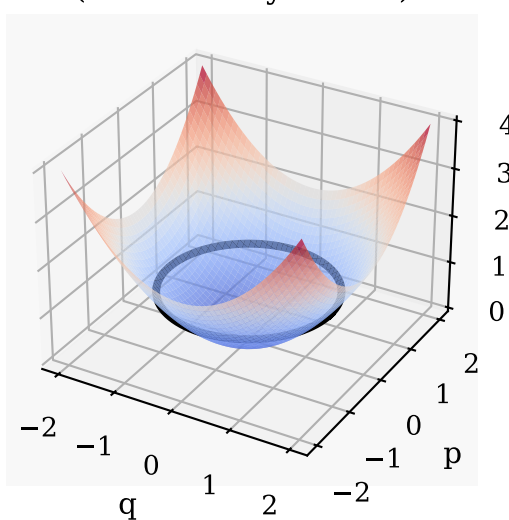
Case (c): Chaotic
□ Violates consistency



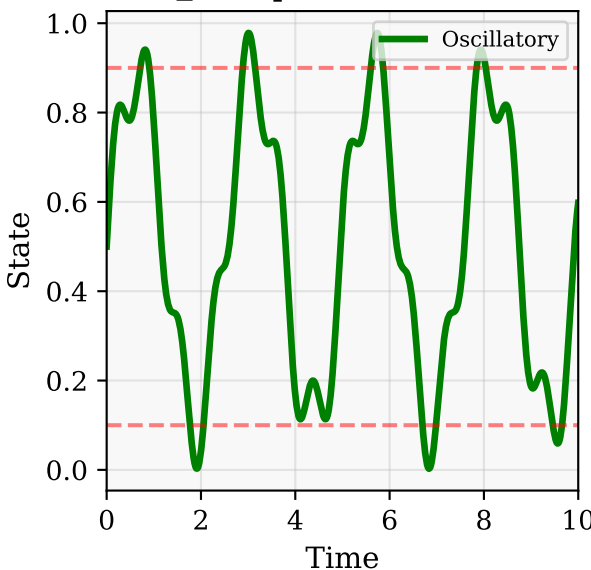
Recurrence Time Distribution
(Poincaré Theorem)



Energy Surface
(Bounded Dynamics)



Case (d): Oscillatory
□ Unique valid mode



Action Quantization
 $S = \oint p dq = n\hbar$

