# Categorical Structure and Partition Geometry
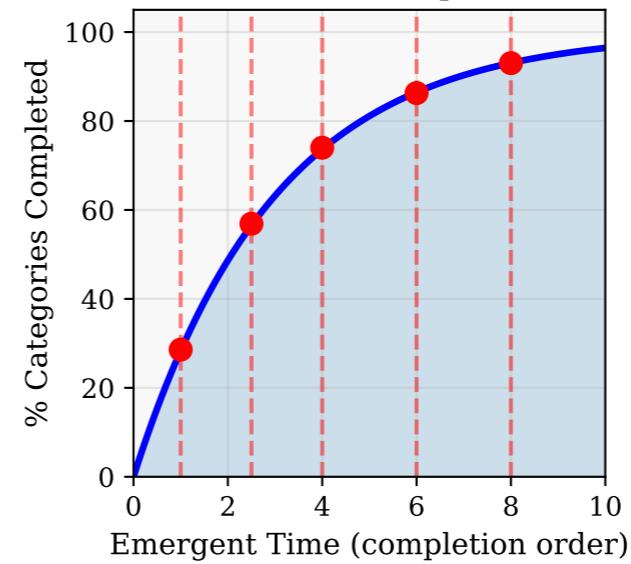
Continuous → Categorical (Finite Observer Resolution)

Value vs Continuous Variable
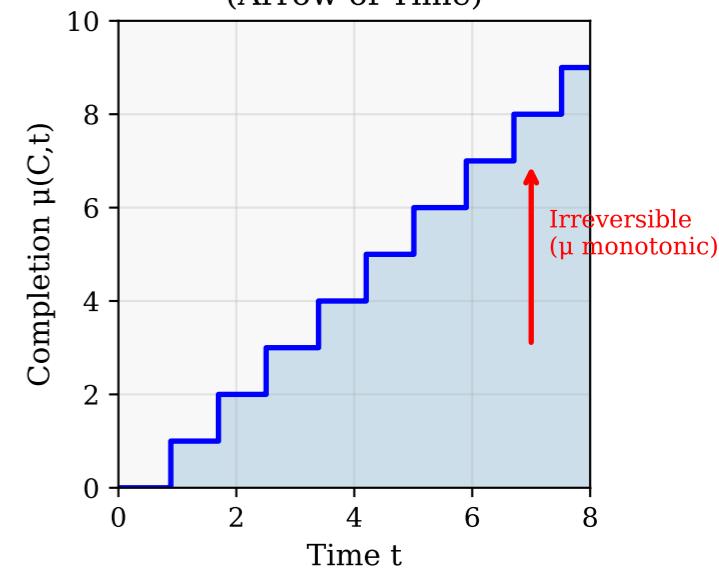
Completion Order (◻) (Hasse Diagram)

Time axis with nodes: 7, 8, 3, 4, 5, 6, 1, 2, 0
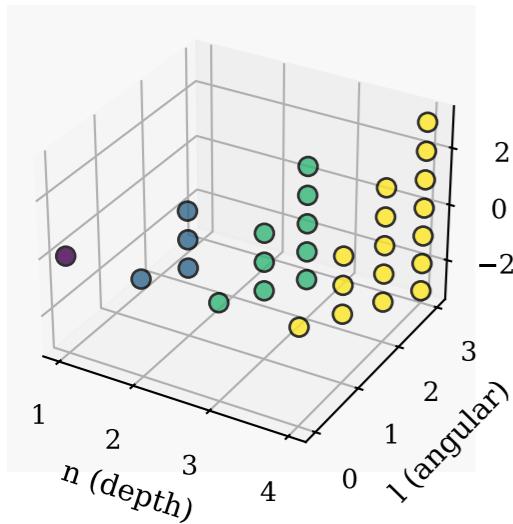
Temporal Emergence (Time from Completion)

% Categories Completed vs Emergent Time (completion order)
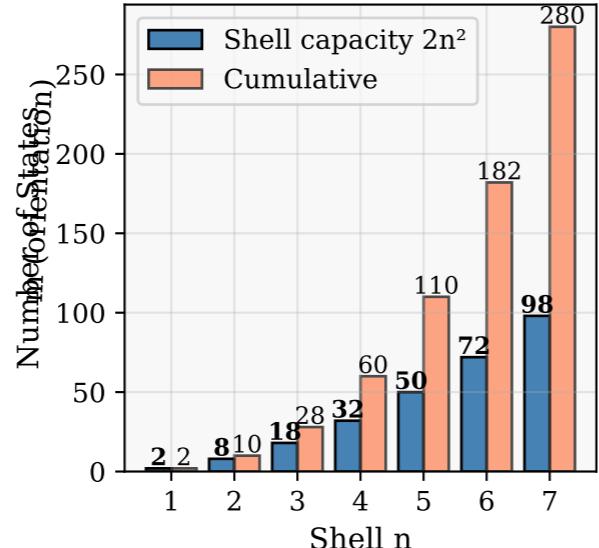
Categorical Irreversibility (Arrow of Time)

Completion $\mu(C,t)$ vs Time t

Irreversible (μ monotonic)
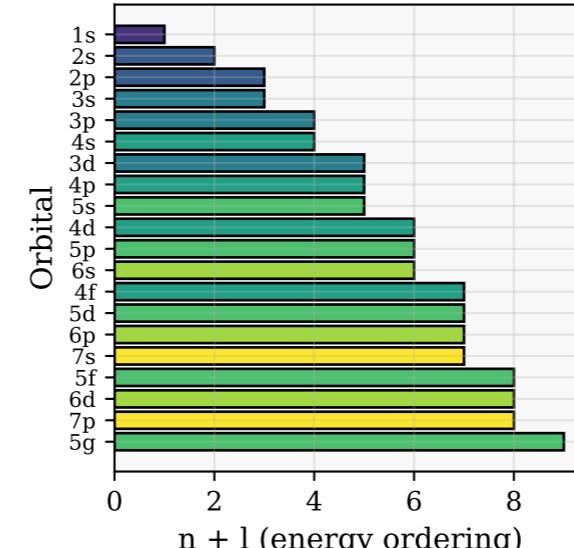
Partition Coordinates (n, l, m) Space

n (depth), l (angular)
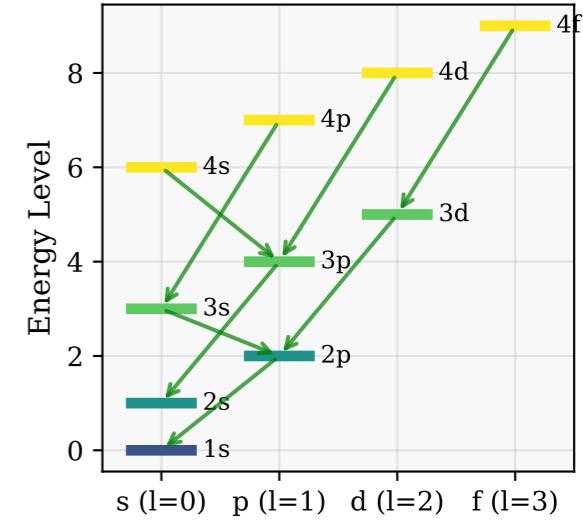
Shell Capacity Theorem $N(n) = 2n^2$

Number of States vs Shell n

- Shell capacity $2n^2$
- Cumulative

Values: 2, 2; 8, 10; 18, 28; 32, 60; 50, 110; 72, 182; 98, 280
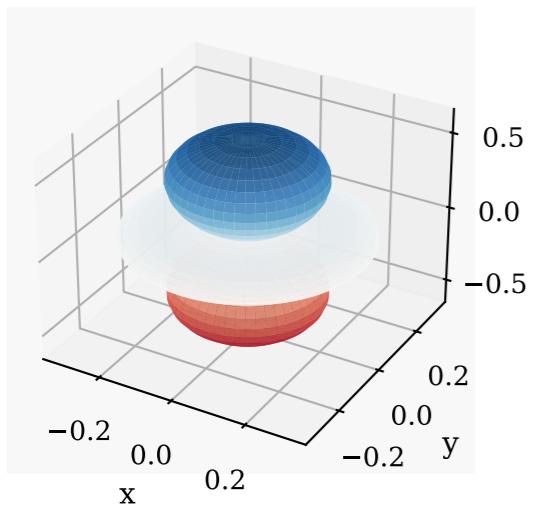
Energy Ordering Rule $(n + \alpha l)$, $\alpha \approx 1$

Orbital vs $n + l$ (energy ordering)

Orbitals: 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p, 5g
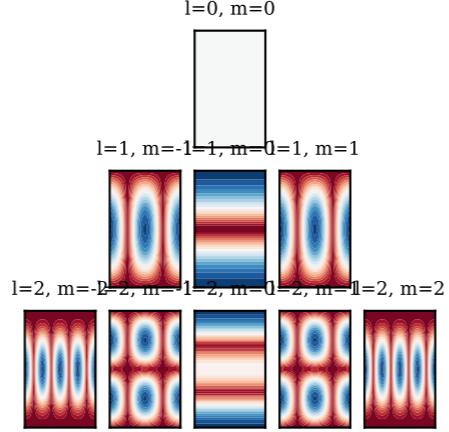
Selection Rules $\Delta l = \pm 1$ (allowed)

Energy Level

Orbitals: 4f, 4d, 4p, 4s, 3d, 3p, 3s, 2p, 2s, 1s

$s\ (l=0)$, $p\ (l=1)$, $d\ (l=2)$, $f\ (l=3)$
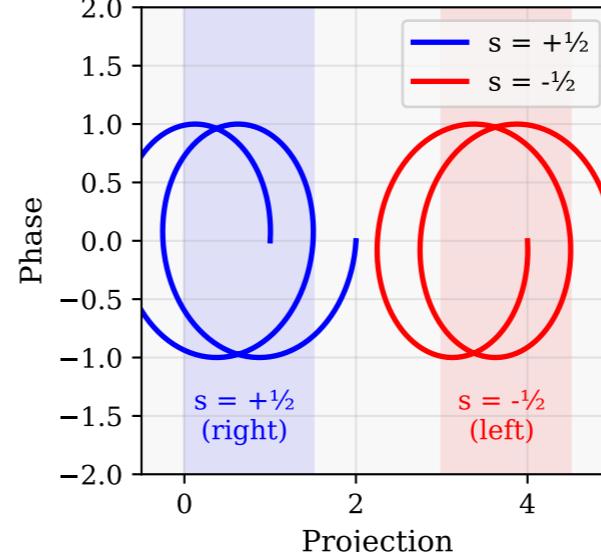
Spherical Harmonic $Y_2^0(\theta, \varphi)$

x, y, z axes

Angular Momentum States $l = 0, 1, 2$

l=0, m=0
l=1, m=-1; l=1, m=0; l=1, m=1
l=2, m=-2; l=2, m=-1; l=2, m=0; l=2, m=1; l=2, m=2

Chirality $s = \pm\frac{1}{2}$ (Spin)

Phase vs Projection

- $s = +\frac{1}{2}$
- $s = -\frac{1}{2}$

$s = +\frac{1}{2}$ (right)
$s = -\frac{1}{2}$ (left)

State Degeneracy $g(n) = 2n^2$

- n=4: 32 states
- n=3: 18 states
- n=2: 8 states
- n=1: 2 states