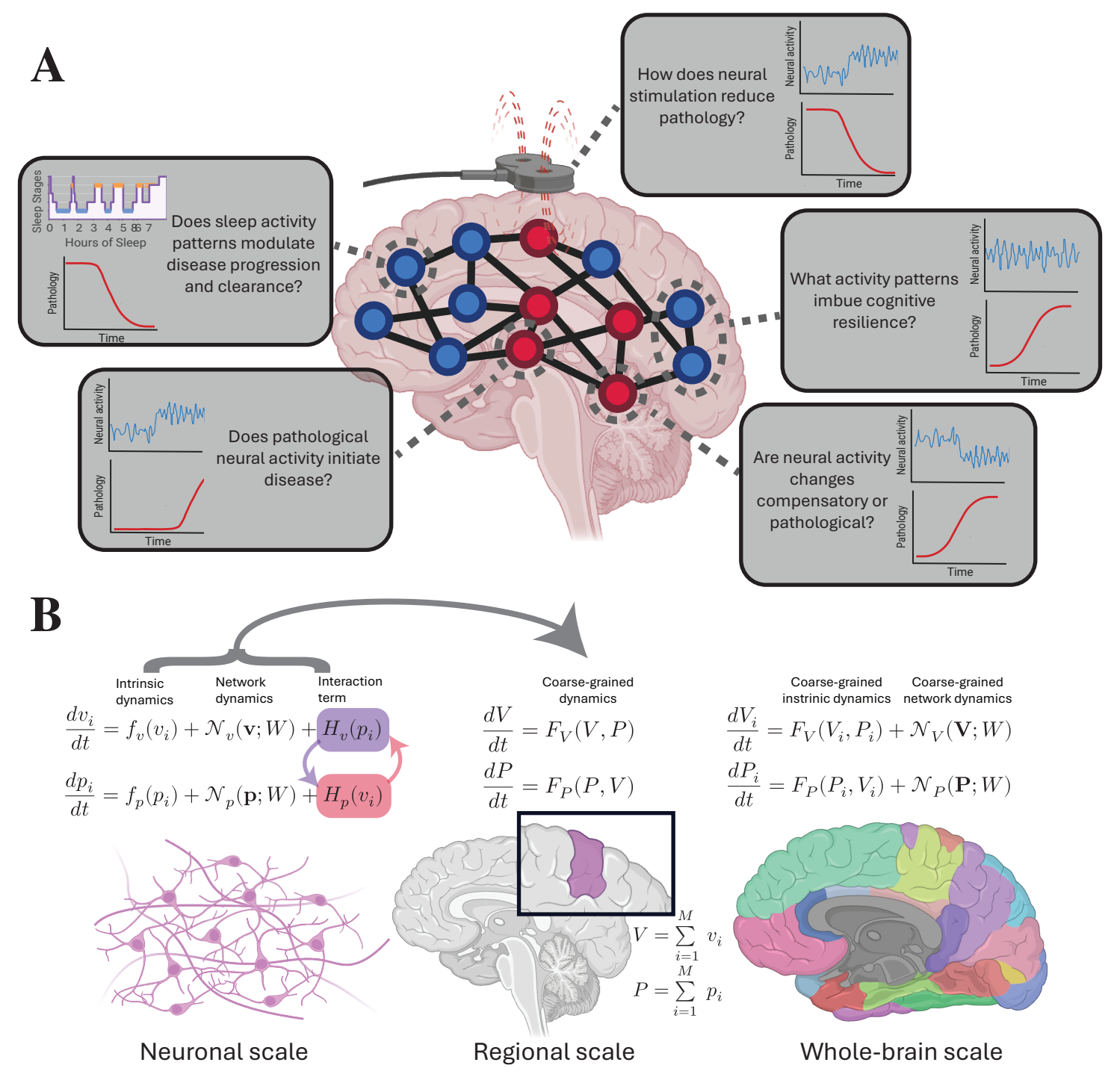
A
How does neural stimulation reduce pathology?
Neural activity
Pathology
Time
Sleep Stages
0 1 2 3 4 5 6 7
Hours of Sleep
Does sleep activity patterns modulate disease progression and clearance?
What activity patterns imbue cognitive resilience?
Does pathological neural activity initiate disease?
Are neural activity changes compensatory or pathological?
B
Intrinsic dynamics
Network dynamics
Interaction term
$\frac{dv_i}{dt} = f_v(v_i) + \mathcal{N}_v(\mathbf{v}; W) + H_v(p_i)$
$\frac{dp_i}{dt} = f_p(p_i) + \mathcal{N}_p(\mathbf{p}; W) + H_p(v_i)$
Coarse-grained dynamics
$\frac{dV}{dt} = F_V(V, P)$
$\frac{dP}{dt} = F_P(P, V)$
Coarse-grained instrinic dynamics
Coarse-grained network dynamics
$\frac{dV_i}{dt} = F_V(V_i, P_i) + \mathcal{N}_V(\mathbf{V}; W)$
$\frac{dP_i}{dt} = F_P(P_i, V_i) + \mathcal{N}_P(\mathbf{P}; W)$
$V = \sum_{i=1}^{M} v_i$
$P = \sum_{i=1}^{M} p_i$
Neuronal scale
Regional scale
Whole-brain scale