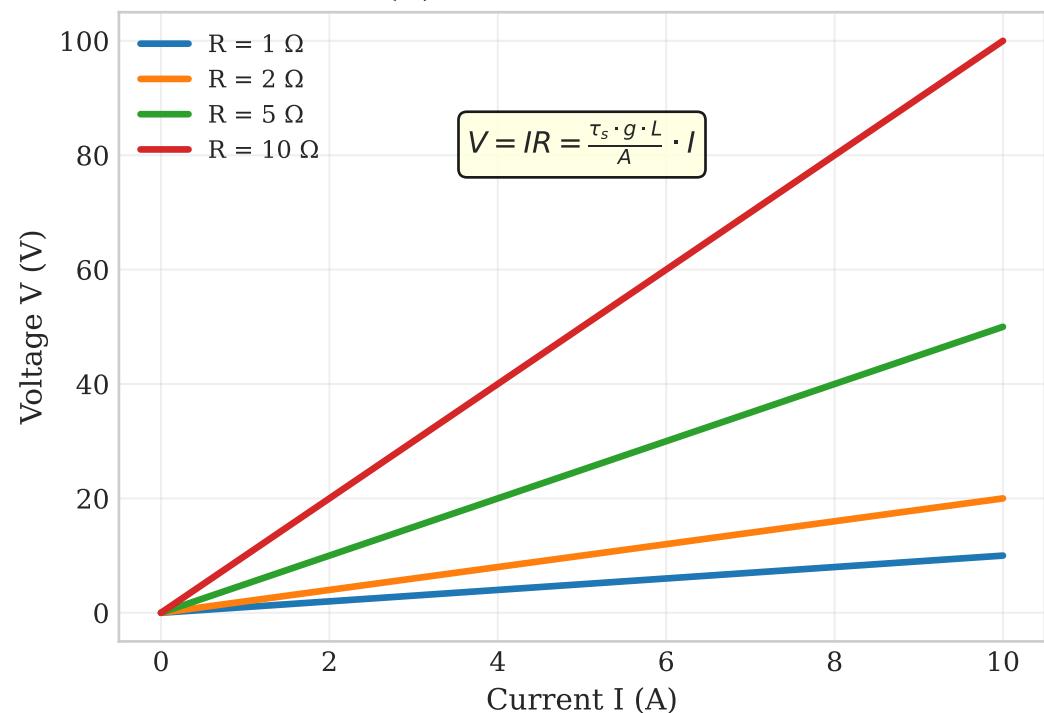
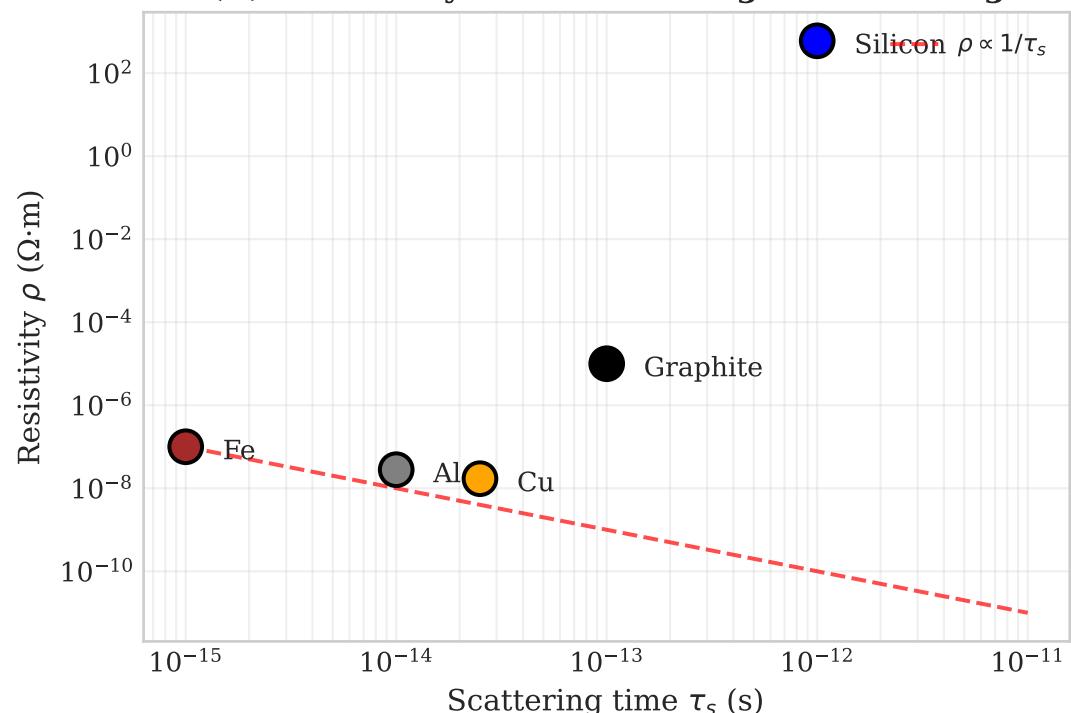


## Panel C-3/C-4: Ohm's Law and Kirchhoff's Laws from Categorical Dynamics

**(A) Ohm's Law:  $V = IR$**



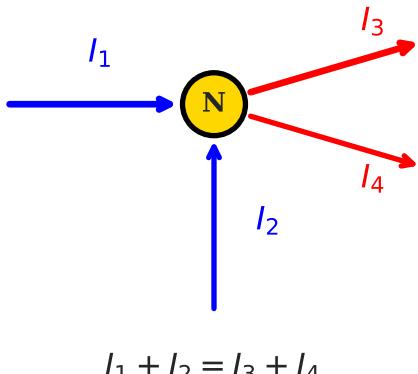
**(B) Resistivity from Scattering Partition Lag**



**(C) Kirchhoff's Current Law: Conservation at Nodes**

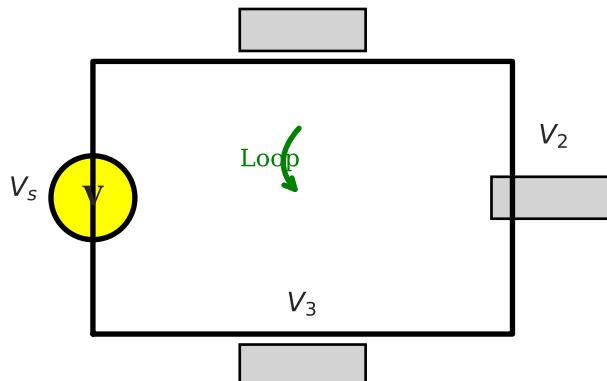
$$\sum I_{in} = \sum I_{out}$$

(Categorical state conservation)



**(D) Kirchhoff's Voltage Law: Loop Closure**

$$V_s - V_1 - V_2 - V_3 = 0$$



$$\sum V_{loop} = 0$$

(S-potential single-valued)