



SST-20 Evolutionary Summary of Constraint Regulation

Stage	Emergent Property	Constraint Type	Constraint Regulation Function	Result
1	Catalysis	Material	Reduces constraints on reactions	Sustained processes
2	Autocatalysis	Material	Enables self-reinforcing processes	Persistent networks
3	Autocatalytic sets	Material	Stabilises production systems	Organised chemistry
4	Compartmentalisation	Material	Reduces dispersion and interference	Stable internal environment
5	Metabolism	Material	Regulates intake of inputs	Needs emerge
6	Replication	Material	Enables continuity over time	Persistence beyond individuals
7	Cellular coupling	Structural	Coordinates interacting units	Multicellular organisation
8	Differentiation	Structural	Enables specialised roles	Increased efficiency
9	Nervous systems	Structural	Coordinates behaviour	Adaptive response
10	Learning	Structural	Modifies behaviour	Behavioural adaptation
11	Self-representation	Structural	Internal modelling	Agency emerges
12	Symbolic communication	Cultural	Shared meaning systems	Normative coordination
13	Reflexive agency	Cultural	Deliberate regulation	Morphogenetic action
14	Social assembly	Material	Cooperative regulation	Improved survivability
15	Functional differentiation	Structural	Specialised roles	Social efficiency
16	Infrastructure	Material	Resource distribution	Large-scale systems
17	Stored knowledge	Cultural	Continuity of information	Cultural accumulation
18	Governance / science	Structural & Cultural	Deliberate regulation	Societal self-modification
19	Reflexive social systems	Integrated	Full constraint regulation	Morphogenetic cycle