Evolution as a Cycle of Multi-level Processes

- Introduction:

Genotype → Phenotype → Interaction

sequence | structure | ecosystem
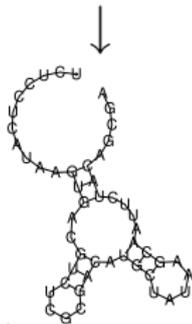
cat-C   cat-A
par-G   par-U
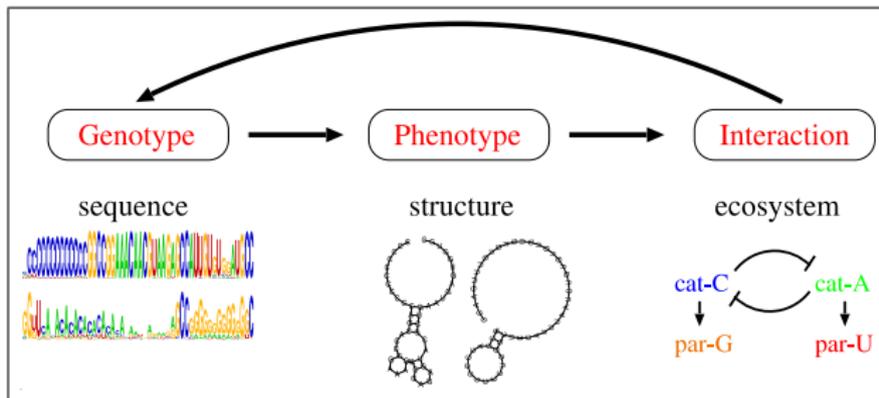
- Question/Conclusion
  - Evolution of Information & Organization
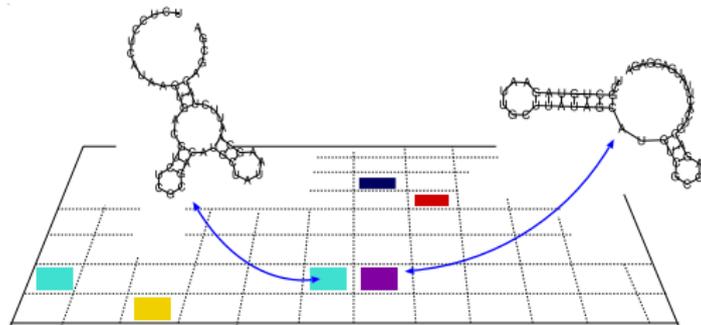 - Evolution of Complexity

Spatial RNA Replicator System

Genotype → Phenotype

(E.g.)

UCUCCUCAU ∼ CUACAGCGA

↓

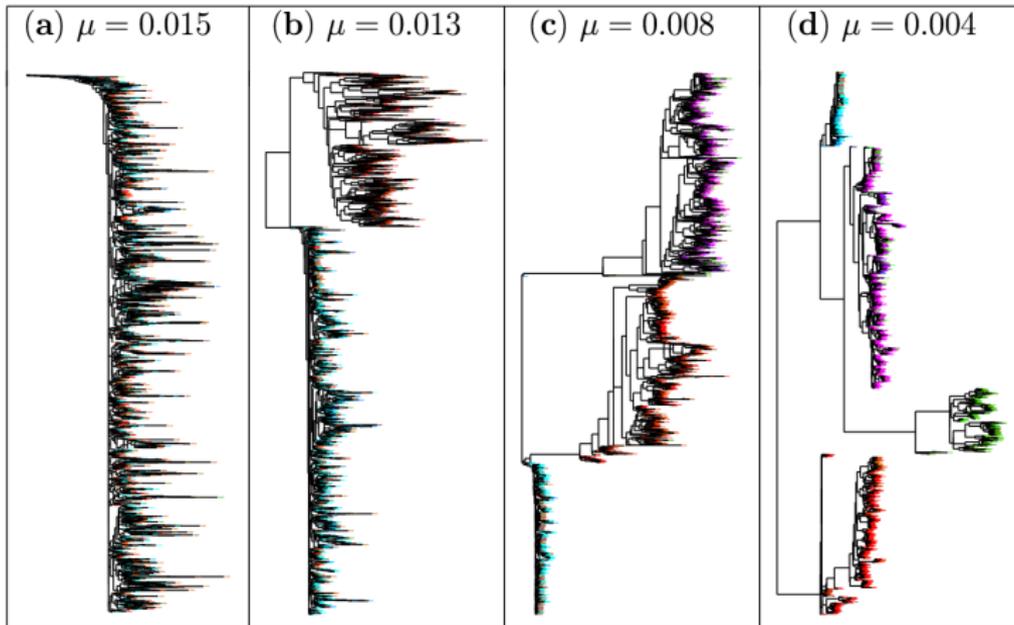Phenotype → Interactions
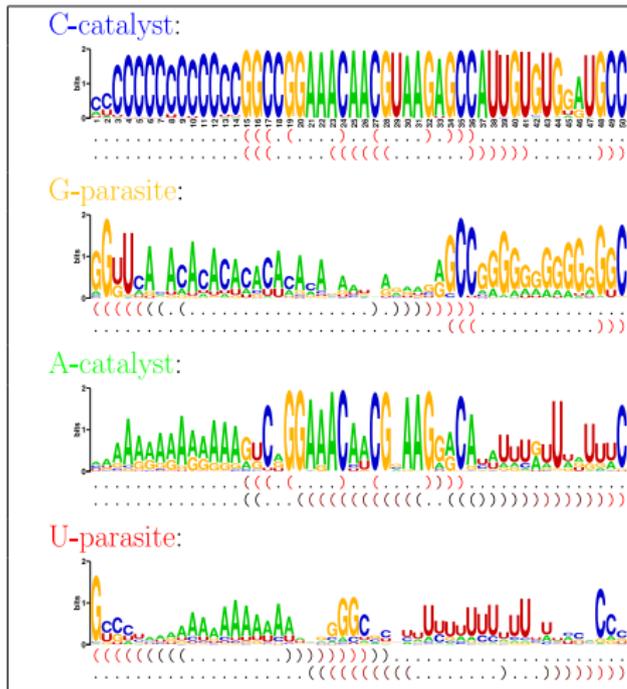

- Complex: 5'-end → 3'-end
- Replication: if phenotype correct

Evolution of Populations

(a) $\mu = 0.015$ (b) $\mu = 0.013$ (c) $\mu = 0.008$ (d) $\mu = 0.004$
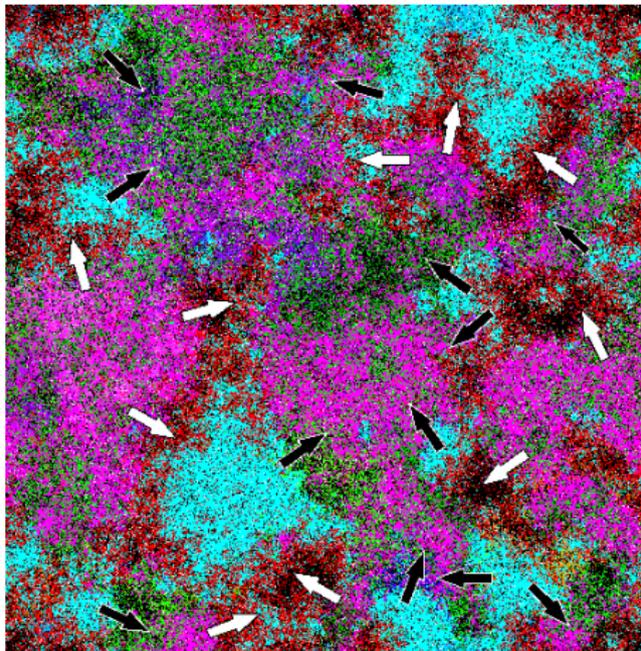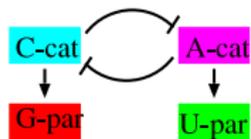
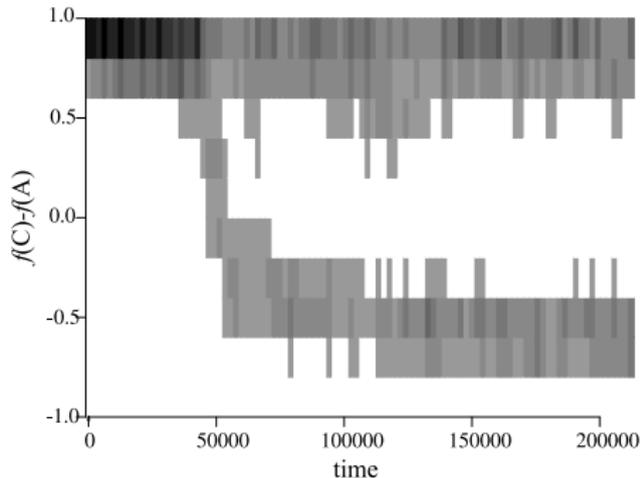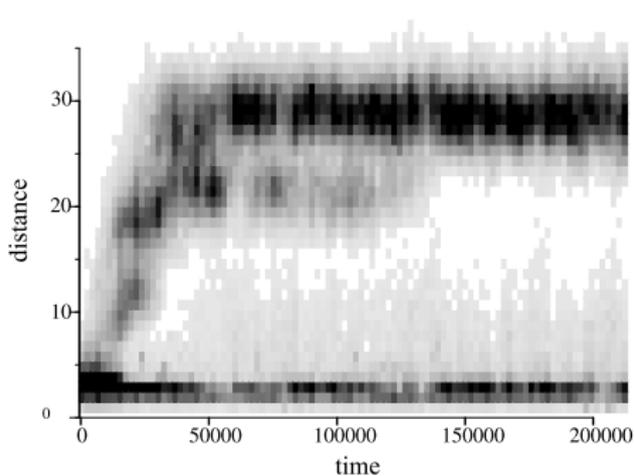# Evolution of Sequences, Structures & Interactions

$\mu = 0.004$
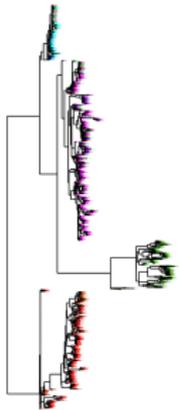
Evolution of Ecosystem

Speciation

■ Chain reactions of niche generation & speciation