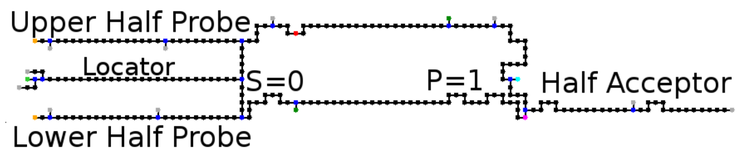
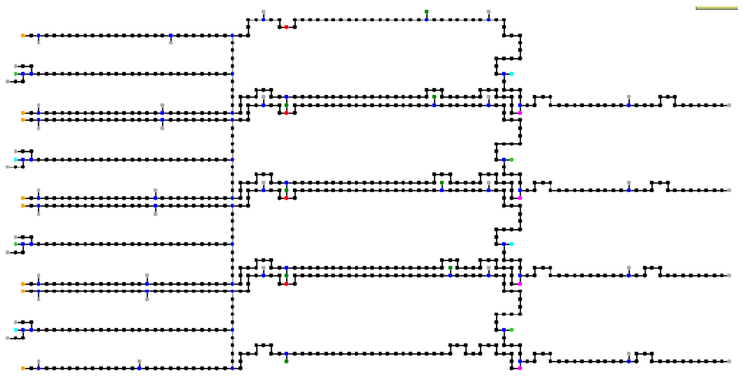
Non-Template Molecules Designed For Open-Ended Evolution - 3

Memory Unit Molecule Structure And Dimer Splitting

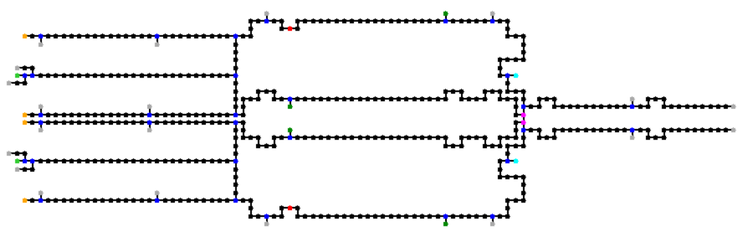
Example Monomer, Polymers, And Closed Dimer



Monomer M_{01} showing structural units

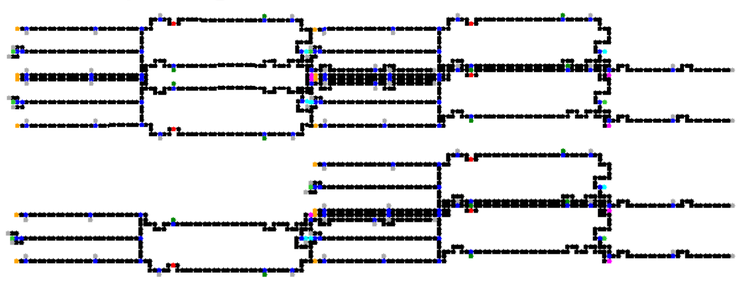


Polymer P_{03}, formed from M_{00},M_{01},M_{02}, and M_{01}

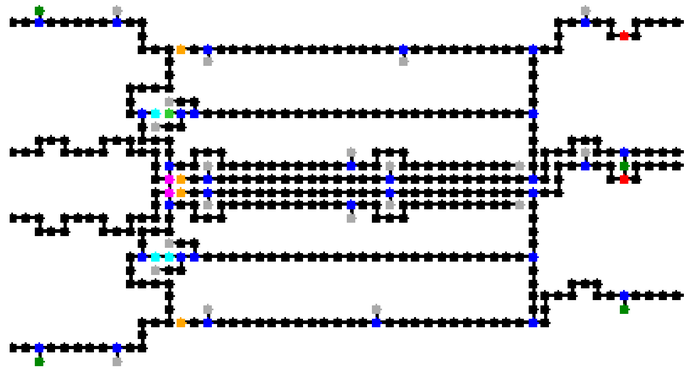


Closed Dimer D_{01}, formed by joining two M_{01} monomers 'back to back'

Dimer Splitting Intermediates $P_{01}D_{01}$ and $P_{01}M_{01}$



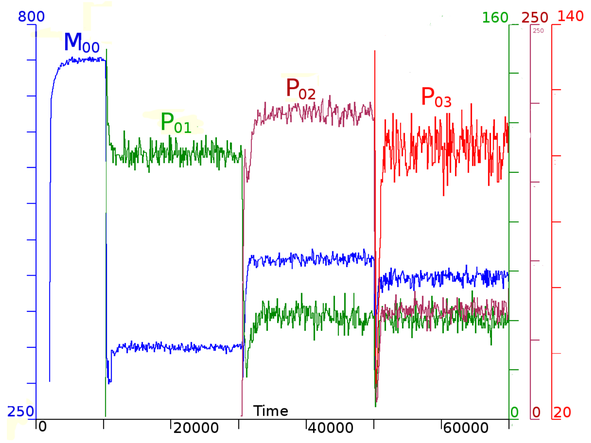
Dimer Splitting: Polymer Part (P_{01}) Of Weakly Bound $P_{01}D_{01}$ Attacks Closed Dimer (D_{01}) Part



- $P_{01}D_{01}$ temporarily bound by **Anti-Loosium** Atoms
- The **Metal** Atoms on the polymer (P_{01}) part on the right 'attack' and weaken the dimer (D_{01}) part on the left at the bond between the two **Perturbium** Atoms.

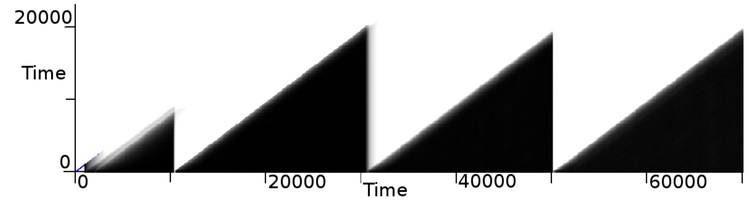
Results, Conclusions, and Prospects

Introduction Of 'Seed' Monomers Triggers Appearance Of New Maintained Polymers



- Scenario: Constant 'food' supply is provided to a well-stirred Reactor. 'Seed' Molecules are added: M_{01} at $t = 10000$, M_{02} at $t = 30000$, M_{03} at $t = 50000$
- Each seeding triggers the appearance of a new polymer that is autocatalytically maintained

Reactor Composition Changes Sharply At Seedings, And Is Stable Between Seedings



- Above 'Manhattan Plot' highlights changes in Reactor composition
- The triangles indicate periods of constant Reactor composition. The right hand edges indicate sharp changes in composition

Conclusions

- An artificial chemical network and associated molecular structures designed to support up to 10^{10} persistent states has been shown[a]
- It is reasonable to suppose that this level of variability would be sufficient for open-ended evolution to begin
- The designed monomers are moderately complex, although far below the complexity of DNA and RNA and the molecules involved in their replication
- It can be envisaged that they could be products of some systematic process that would result in co-ordination of the positions of the various projections and recesses
- A small set of memory units has been simulated, completing the first part of the proof of concept
- Supplementary material for this paper is available at http://www.simsoup.info/Publications.html

[a] The s and p indices both vary from 0 to 9. This gives 10 series each consisting of polymers of length between 1 (food) and 10.

Prospects

- It will be appropriate to make optimisations enabling a larger set of Memory Units to be tested
- The author would like to hear from anyone interested in transferring these ideas to 'real' chemistry