

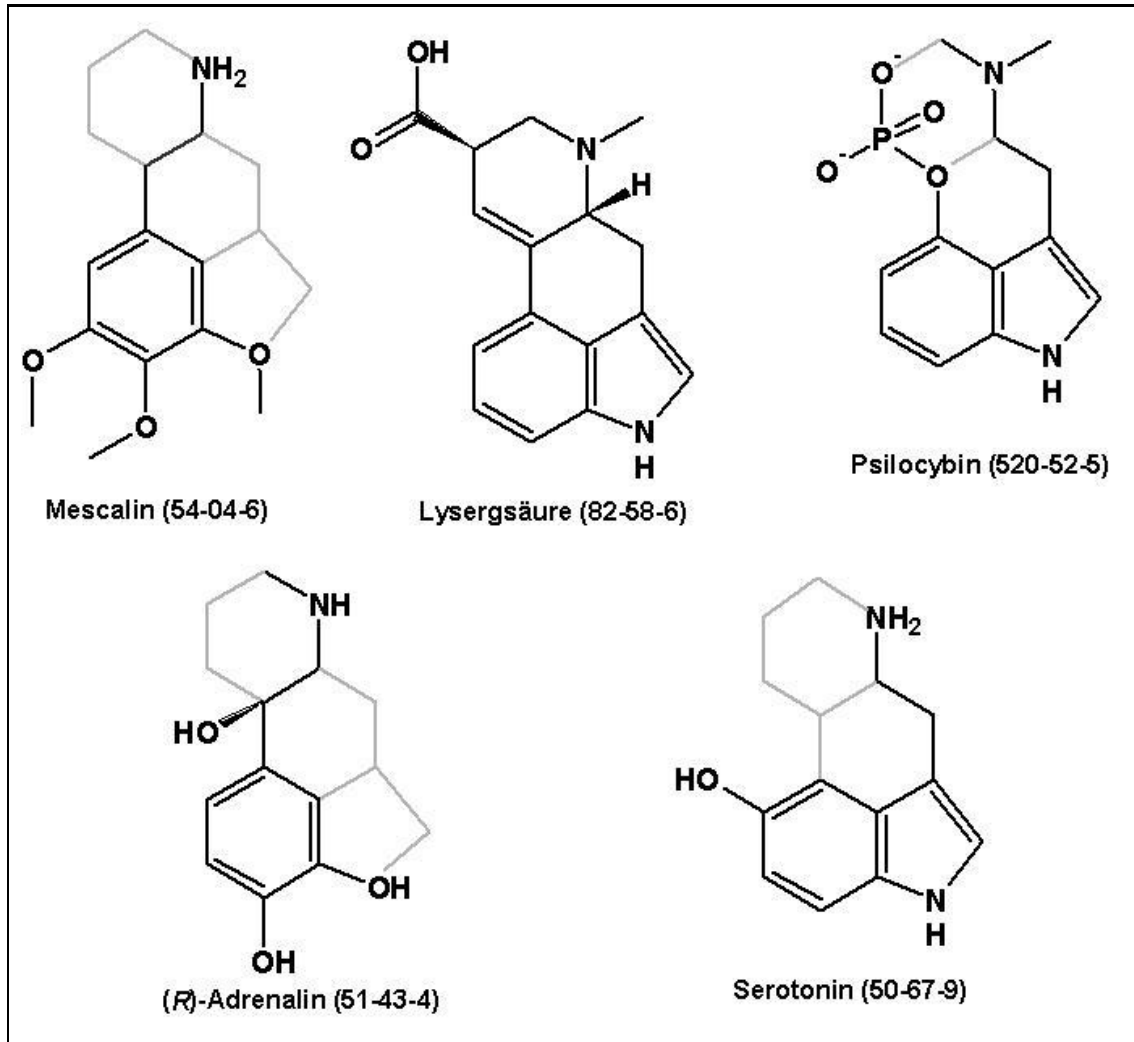
Graph ReWrite ?!@\$\$+*

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Motivation I?



What is Graph Rewrite ?

A grammar which operates on graphs instead of strings.

A grammar is a finite set of rules describing a formal language.

A formal language is a set of strings over some fixed alphabet.

$$\mathcal{L} \subseteq \mathcal{A}^*$$

Example: a grammar for RNA secondary structures

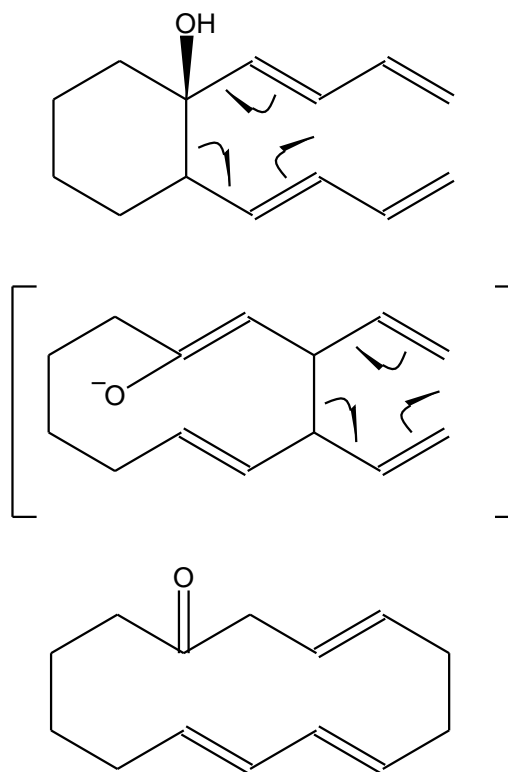
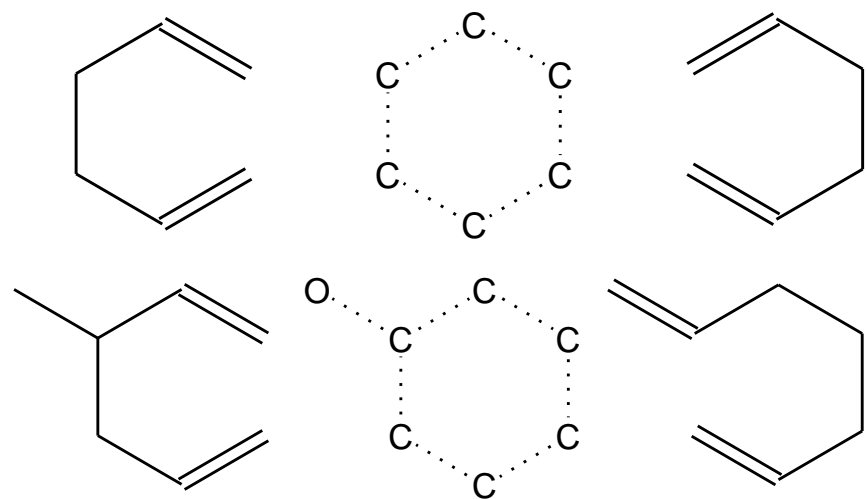
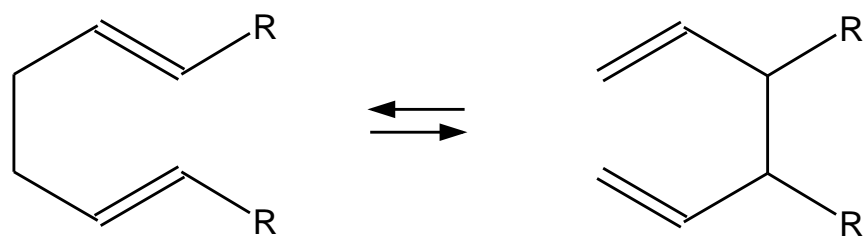
$$A = \{ (.) \}$$

$$R \rightarrow . \mid .. \mid S$$

$$S \rightarrow \dots \mid .S \mid S. \mid SS \mid (S)$$

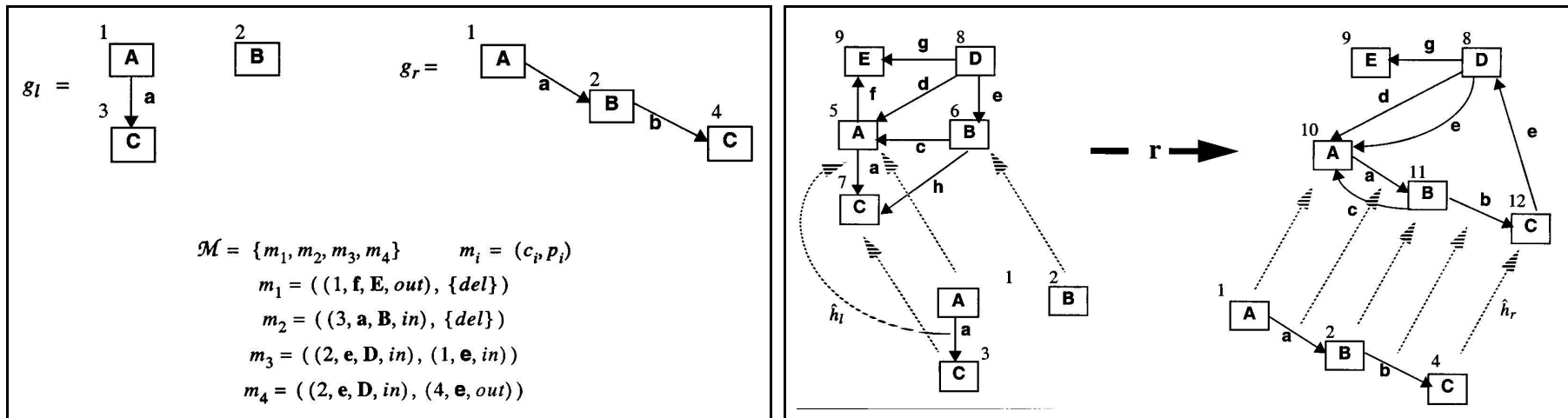
Graph Rewriting Rule

Cope Rearrangement



Graph Rewriting Step

- Step 1: **find** isomorphic subgraph (match left graph).
- Step 2: **remove** subgraph (don't touch context; keep dangling ends!!).
- Step 3: **insert** new subgraph (right graph).
- Step 4: **rewire** new subgraph (with respect to the dangling ends).

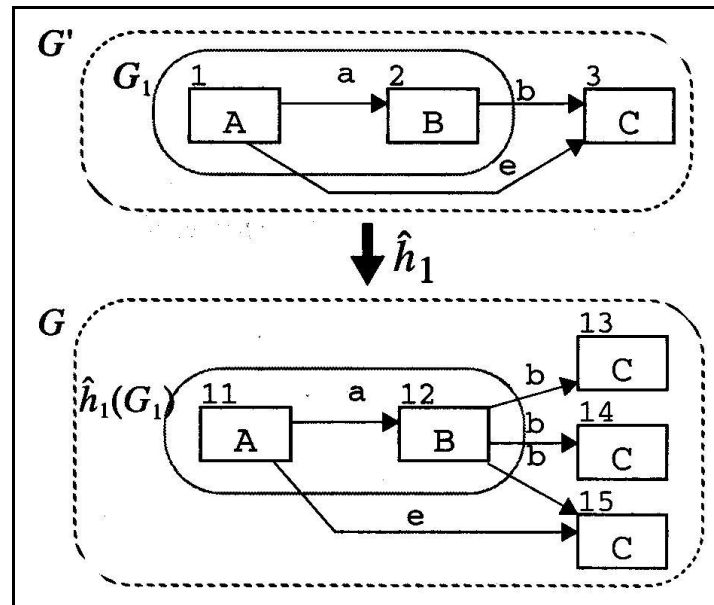


Bad News =:(

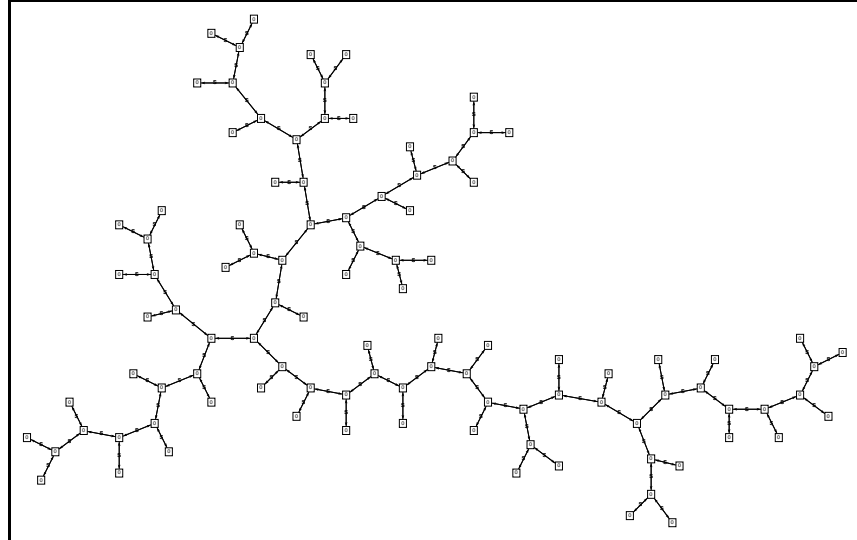
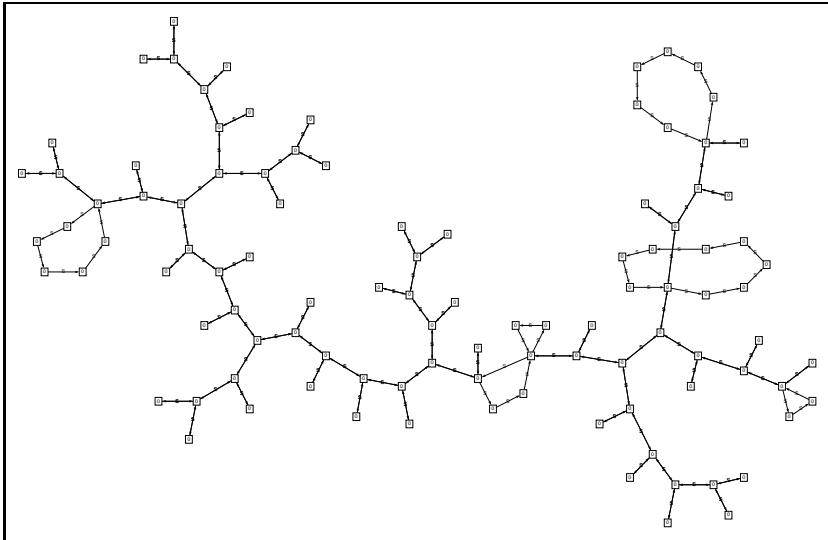
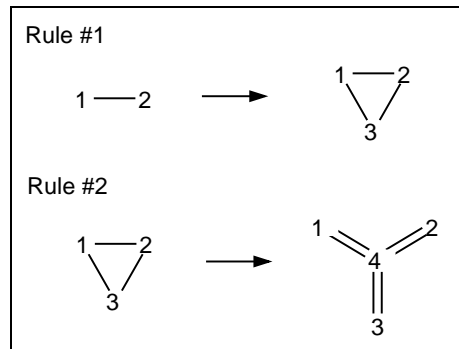
- The subgraph isomorphism problem is *NP-hard*.

Good News =;)

- For UBS graph rewrite systems the problem is *P*.
 - unique vertex label
 - bypass strong V-structures



Cayley Tree



Xworm

