Remarks on the power of 1-depth P Systems with Active Membranes

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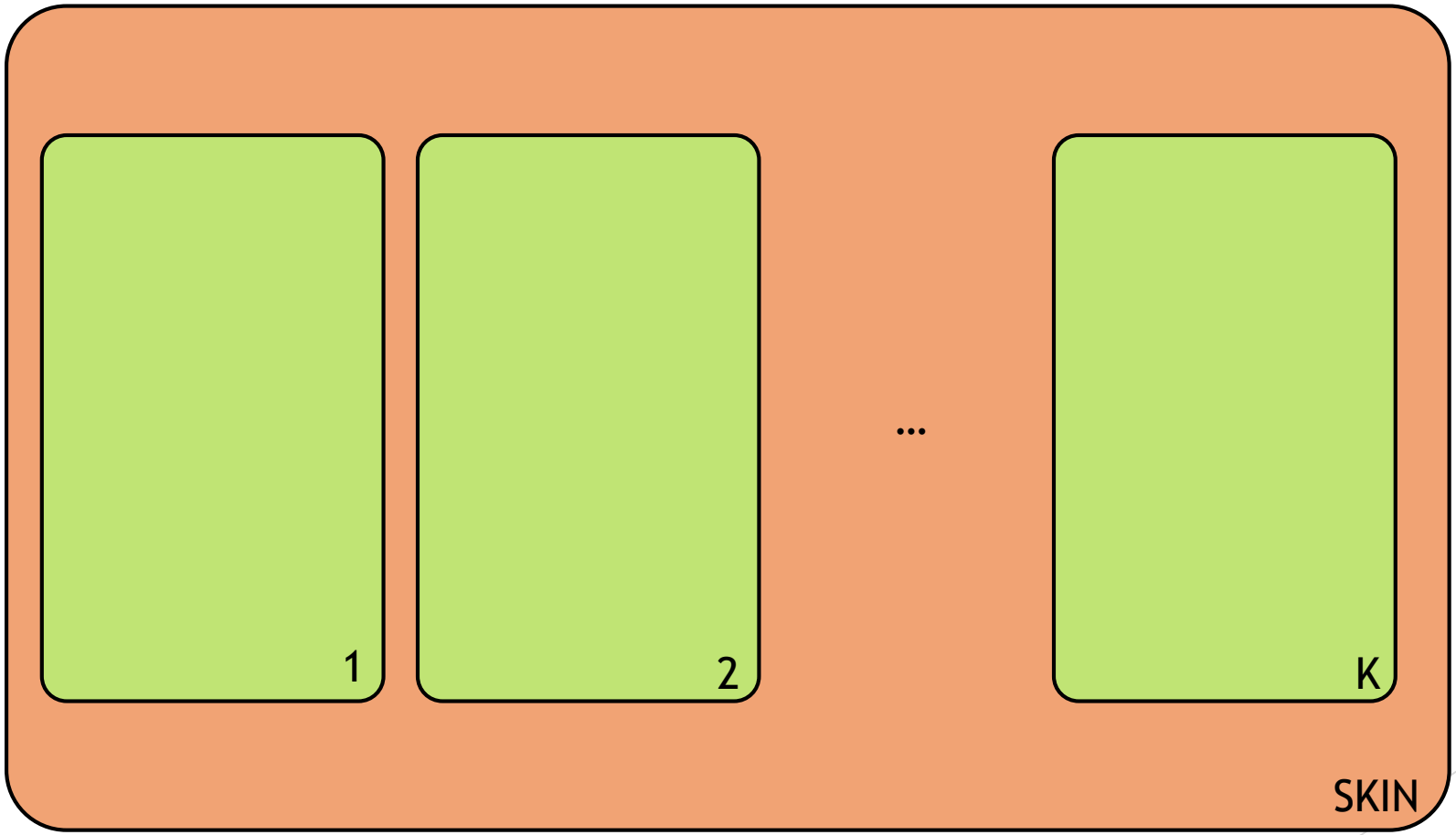
1-depth P Systems



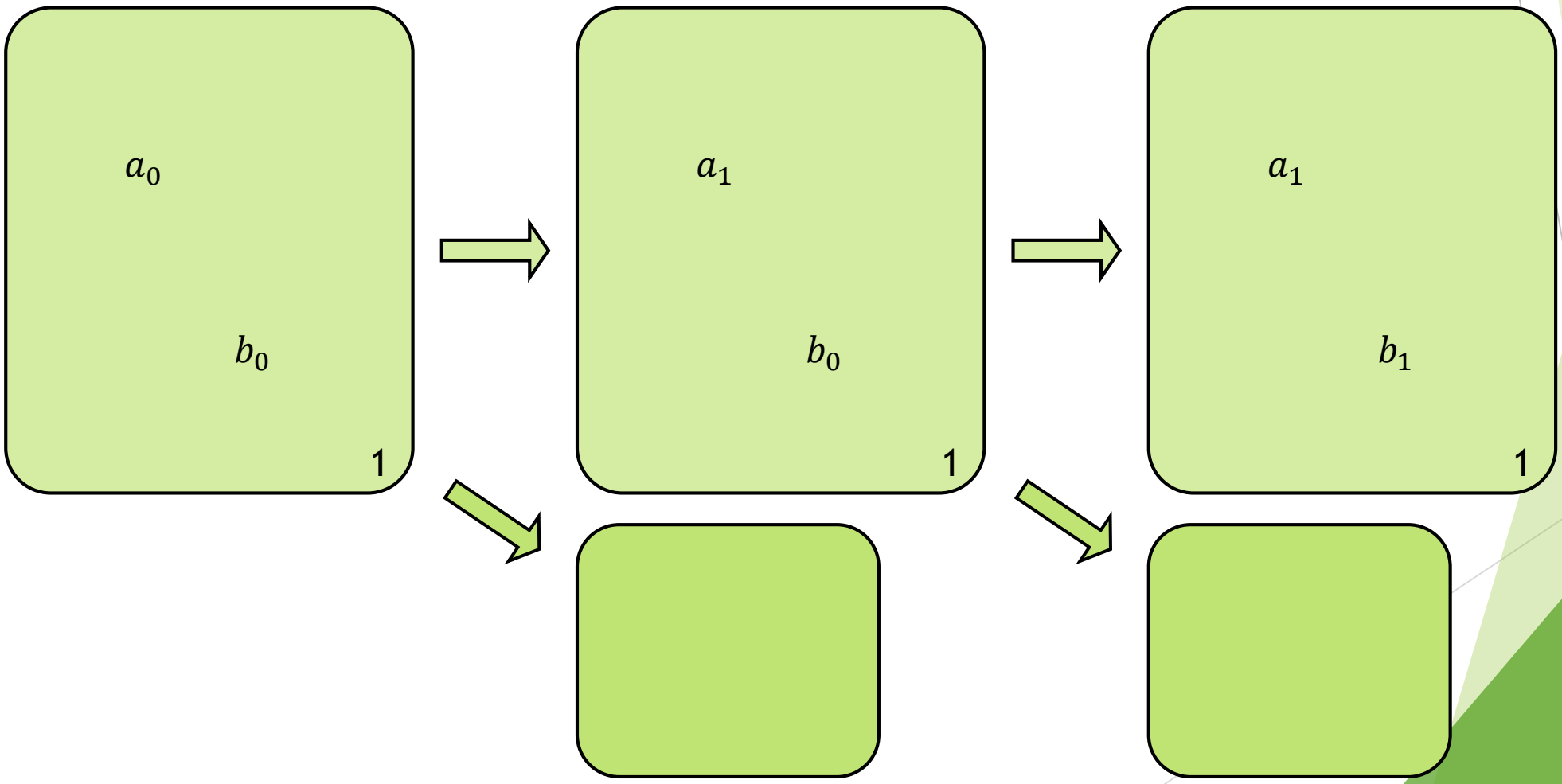
Simulating by non-deterministic Turing machines using logarithmic space

- If the system has no polarization and uses only dissolution and elementary division rules (so no evolution, communication or non-elementary dissolution rules are used), it can be simulated by non-deterministic Turing machines using logarithmic space
  - It seems that evolution rules can ruin things
- We only have to track two symbols: one that will „evolve” to *yes* and one that will dissolve the membrane around the first one

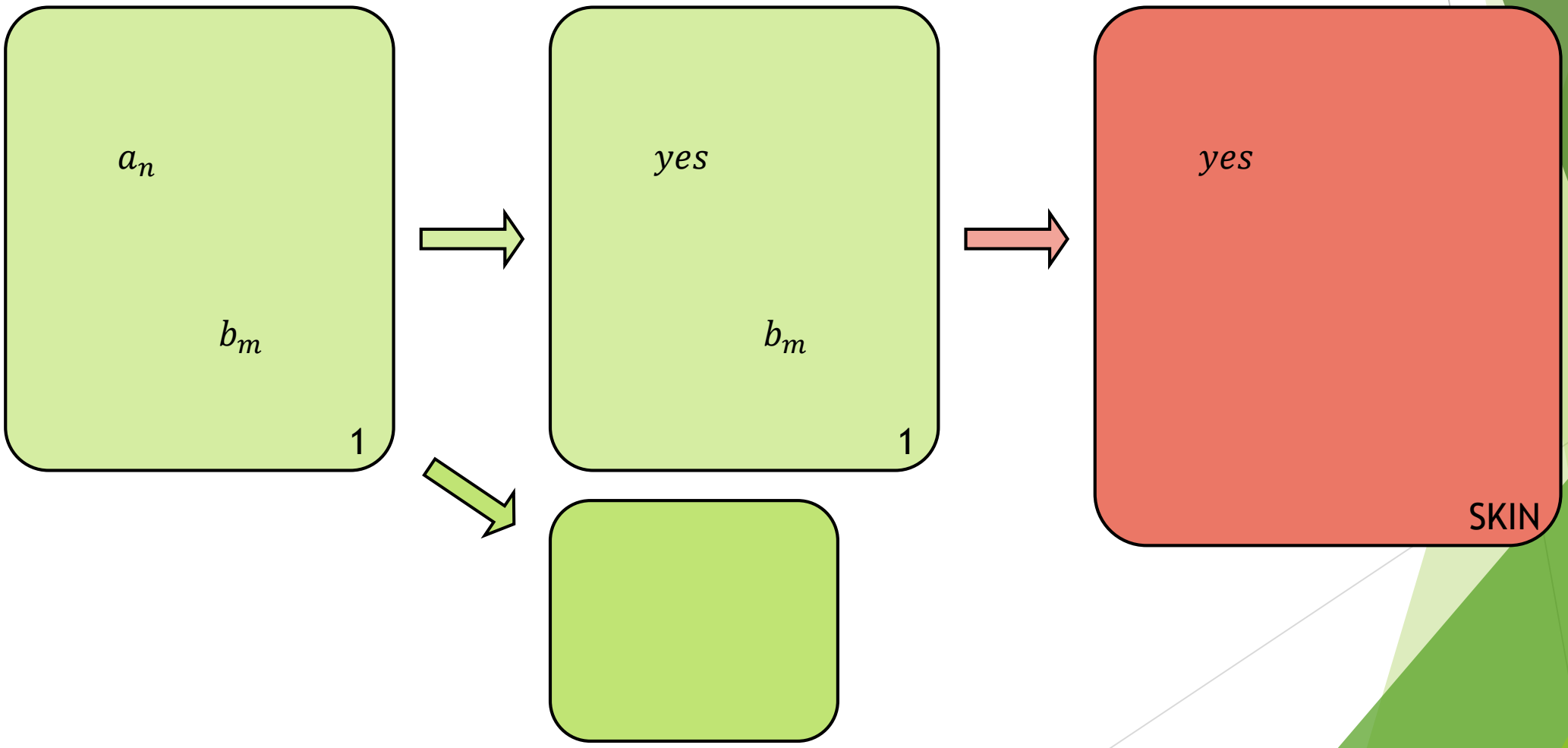
When we have only dissolution and elementary divison rules

- $[a_i]_1 \to [a_{i+1}]_1[\#]_1$ $(i \in [0..n-1])$
- $\left[b_j\right]_1 \to \left[b_{j+1}\right]_1[\#]_1$ $(j \in [0..m-1])$
- $[a_n]_1 \to [yes]_1[\#]_1$
- $[b_m]_1 \to \#$

When we have only dissolution and elementary divison rules



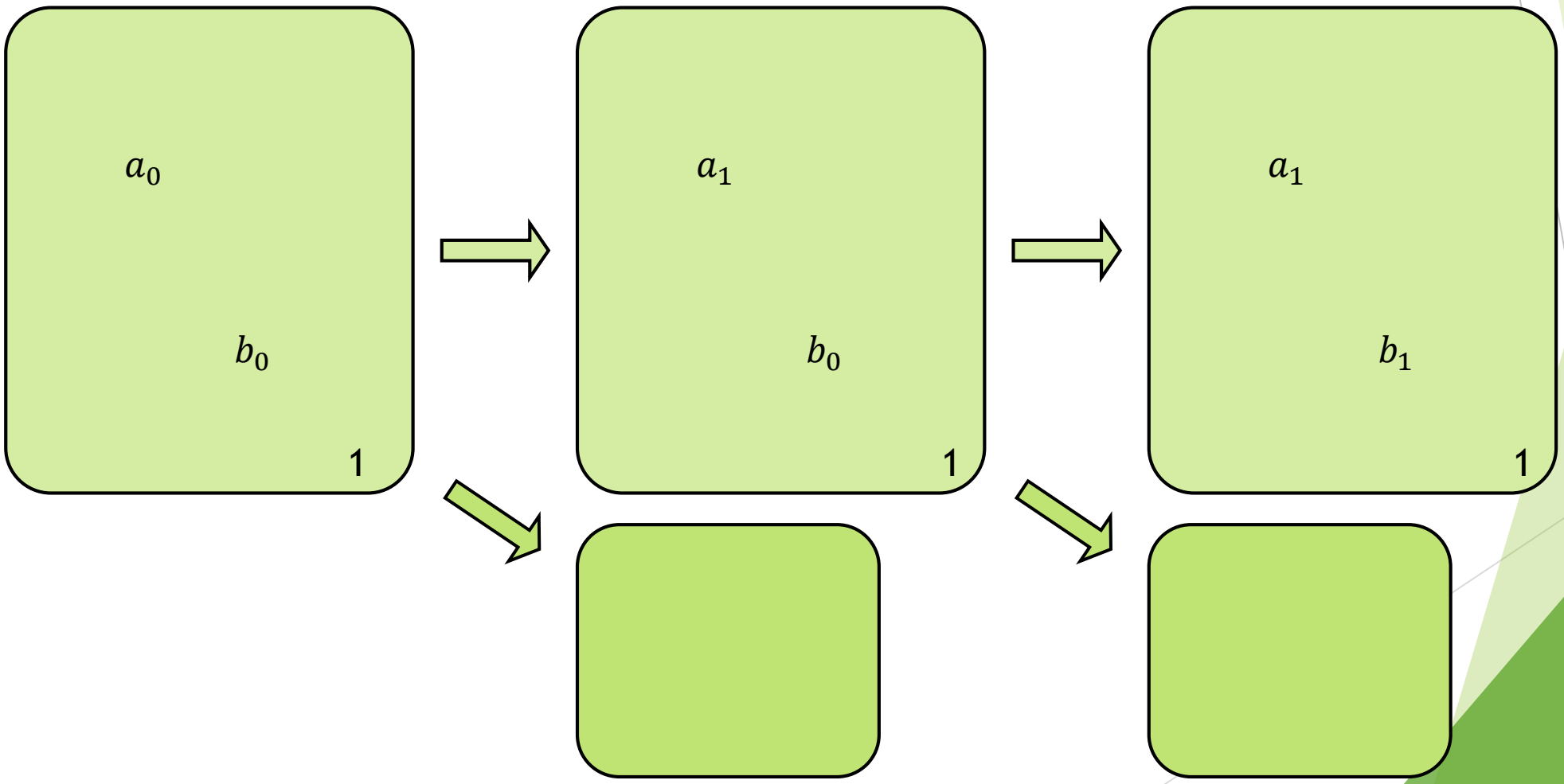
When we have only dissolution and elementary divison rules



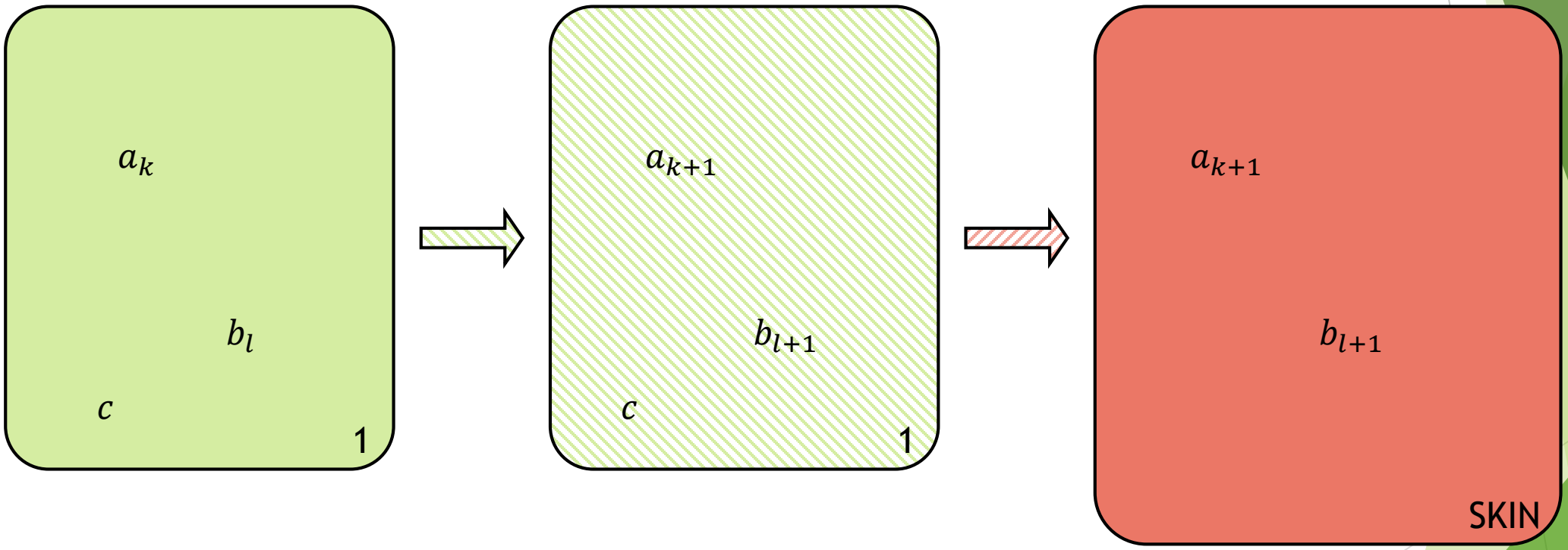
When we have evolution rules too

- $[a_i]_1 \to [a_{i+1}]_1[\#]_1$ $(i \in [0..n-1] \backslash \{k\})$
- $\left[b_j\right]_1 \to \left[b_{j+1}\right]_1[\#]_1$ $(j \in [0..m-1] \backslash \{l\})$
- $[a_k \to a_{k+1}]_1$
- $[b_l \to b_{l+1}]_1$
- $[a_n]_1 \to [yes]_1[\#]_1$
- $[b_m]_1 \to \#$
- $[c]_1 \to \#$

When we have evolution rules too



When we have evolution rules too



$[a_k \to a_{k+1}]_1$
$[b_l \to b_{l+1}]_1$

Further questions

- What about k-depth P Systems?
- What about P Systems with unlimited depth?

Thank you!