Assessing regulatory information in developmental gene regulatory networks

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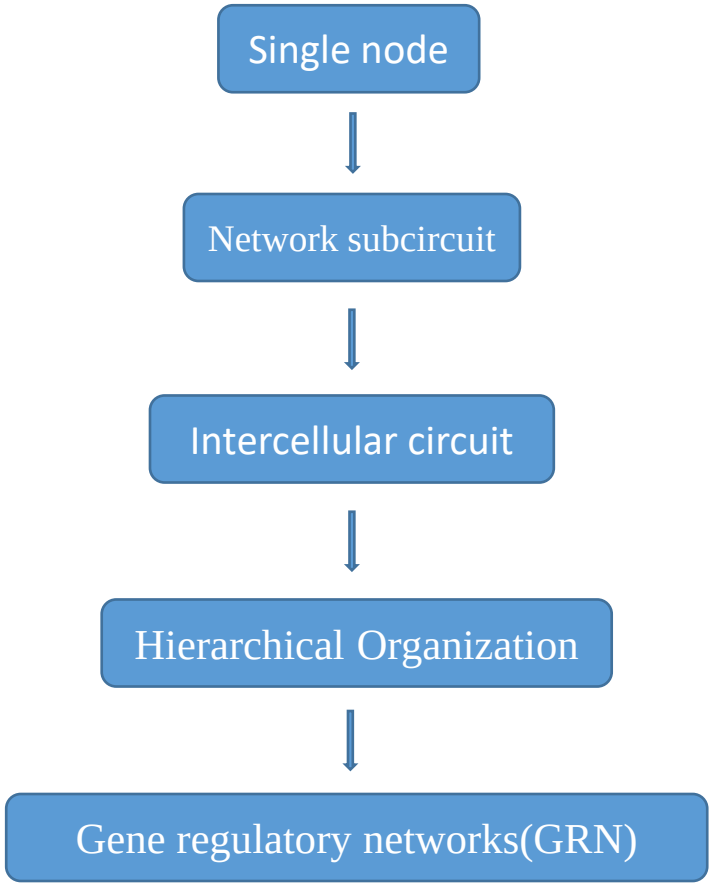
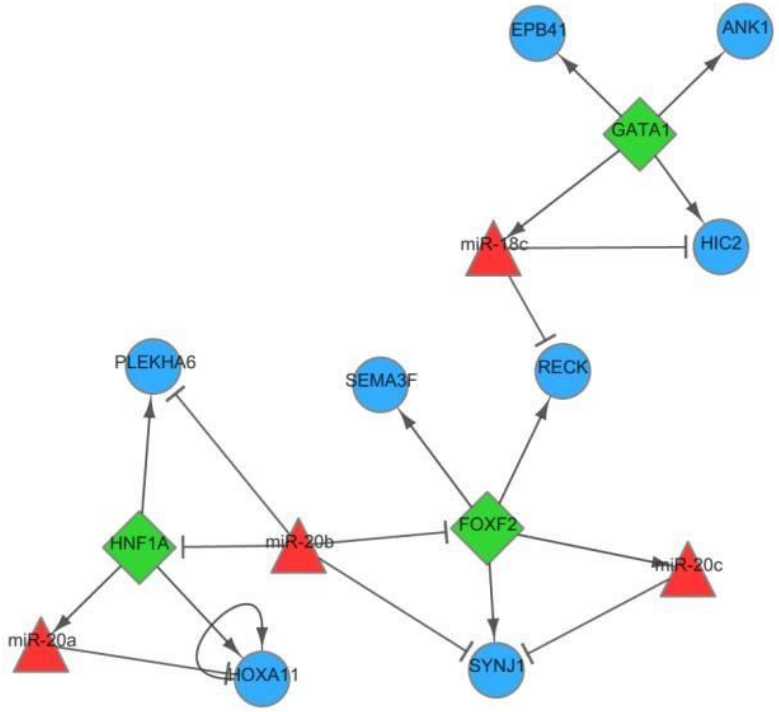
catalog

- Background & Problems to be solved
- few perspectives to the network
- conclusion

Background & Problems to be solved





Features of GRN

- the static genomic sequence →the spatial specification processes operating development
- GRNs control the differential specification of cell fates and determine the organization of body parts, organs, and cell types within the body
- Given types of subcircuits are often found at given positions within the GRN hierarchy
- Subcircuits are recurrently deployed in very different biological contexts

Few perspectives to the network

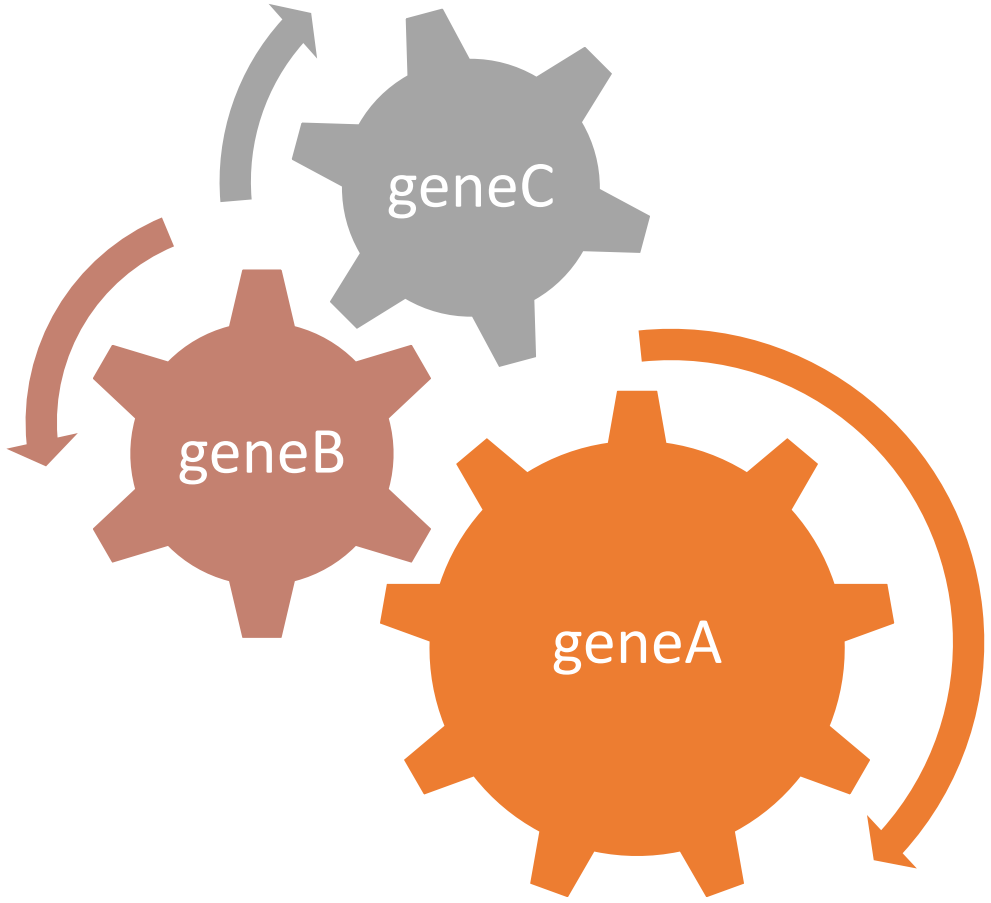
Materials

sea urchin endomesoderm GRN

Methods

- The single-node level
- The subcircuit level
- The network level

Single node level

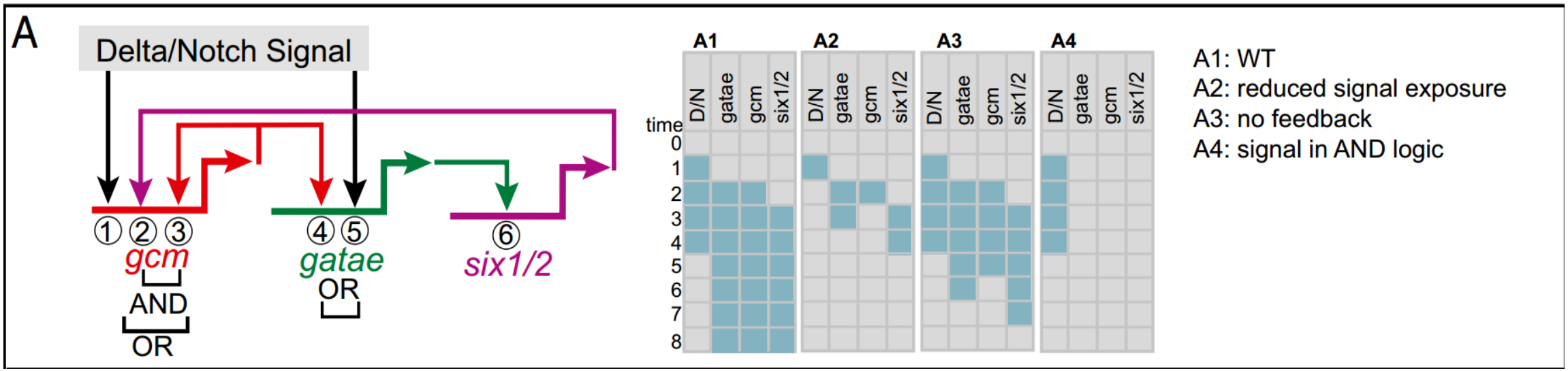


Min： n-1
Max： n^2

a high number of regulatory interactions may control the expression of a gene of little regulatory significance

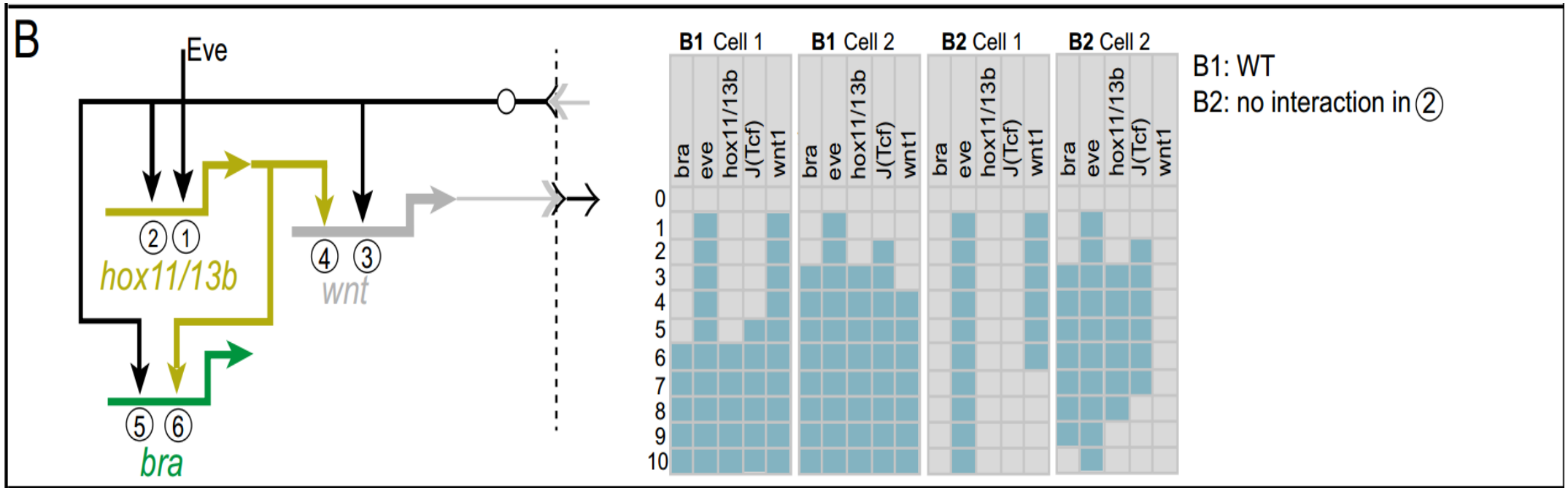
The subcircuit level

Positive Feedback Subcircuit



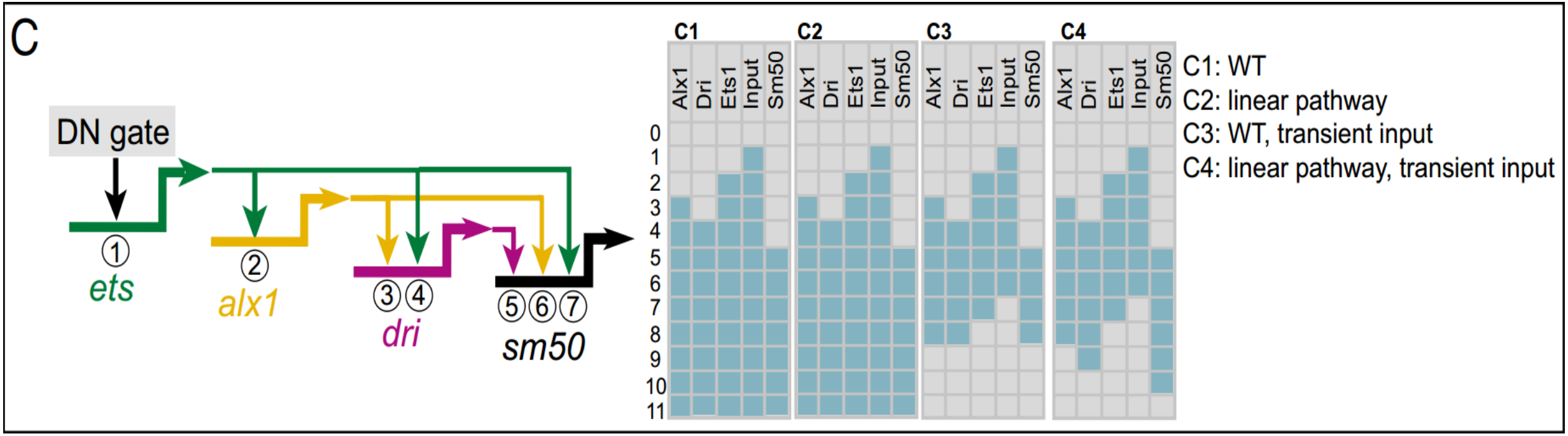
The subcircuit level

Community-Effect Subcircuit



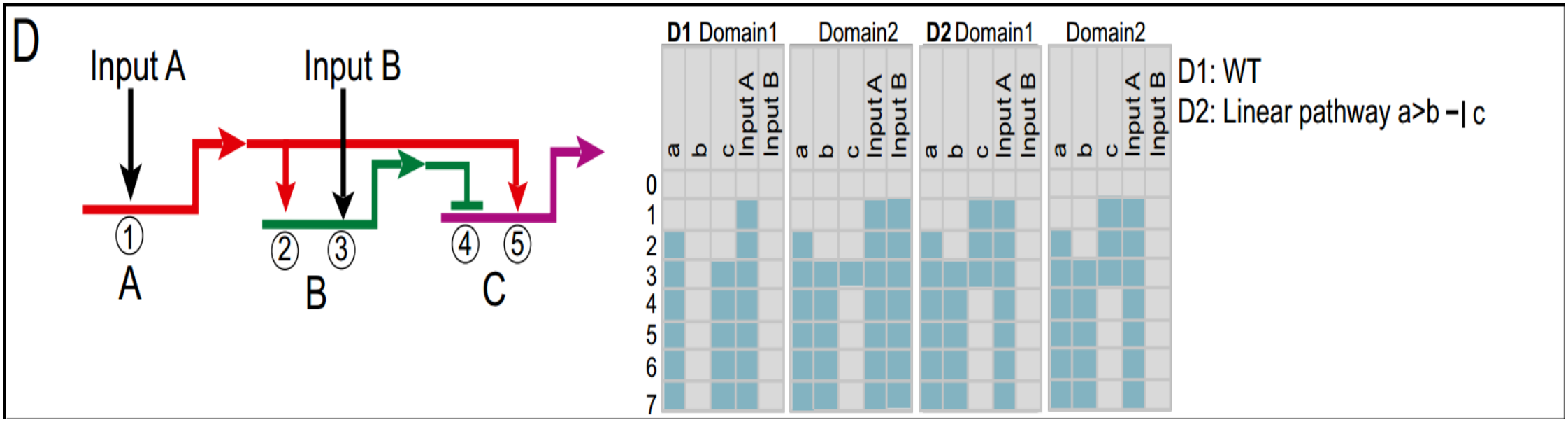
The subcircuit level

Coherent Feedforward Subcircuit



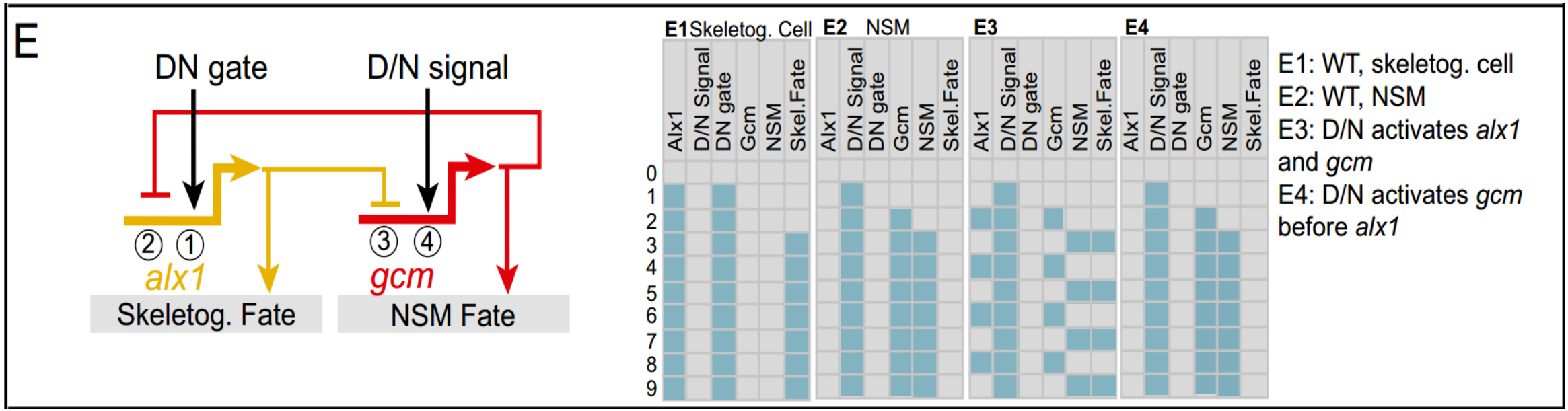
The subcircuit level

Incoherent Feedforward Subcircuit



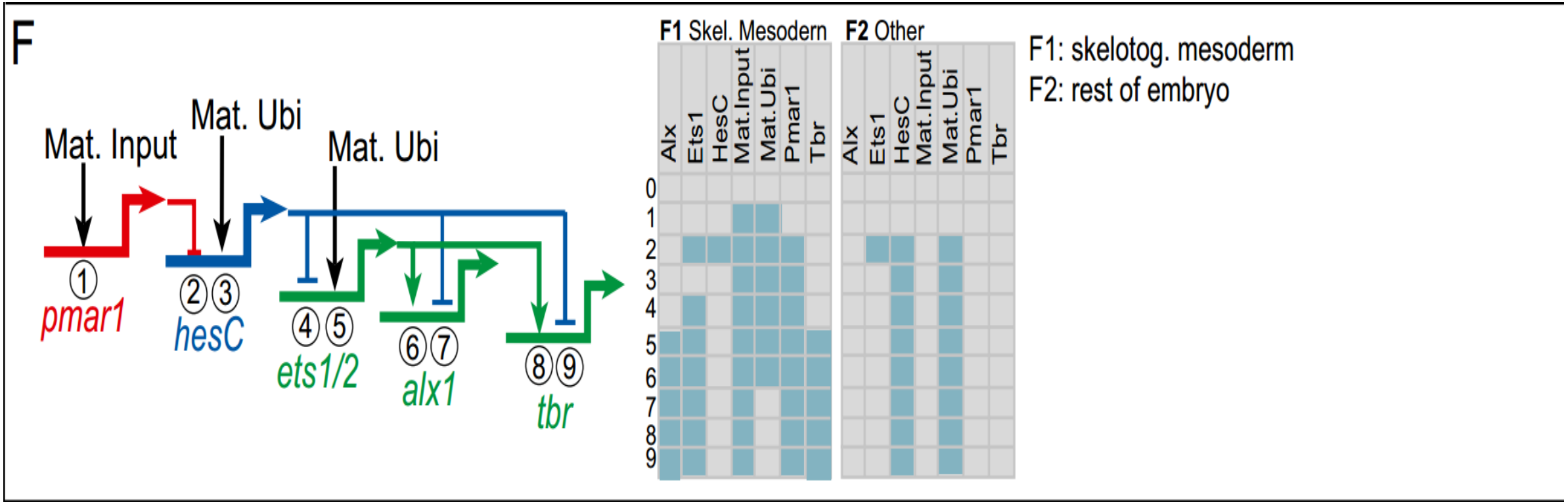
The subcircuit level

Mutual-Repression Subcircuit

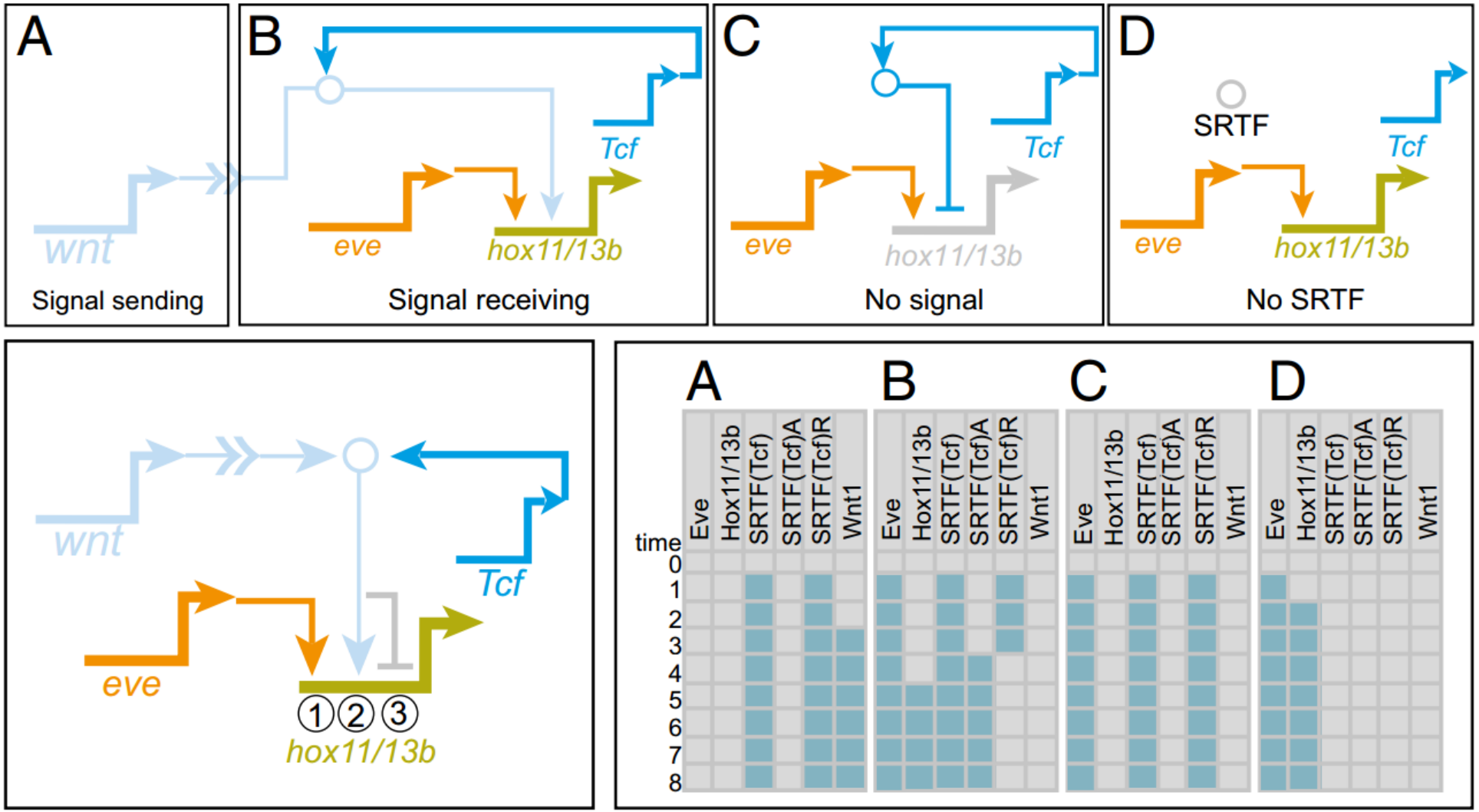


The subcircuit level

Double-Negative Gate Subcircuit



The network level



Information in Hierarchical Organization

- Developmental hierarchy is a result of the unidirectionality and irreversibility of regulatory interactions
- Change in a patterning circuit operating downstream(√)
- Change in upstream patterning circuits(really matters)

Conclusion

- All regulatory information in GRNs is ultimately encoded in individual cis-regulatory
- How individual network nodes are wired within a developmental GRN
- How individual subcircuits are organized to process developmental functions
- How subcircuits are connected within the overall network hierarchy

Question

- Only on sea urchin？(改进)

human’s developmental system is more advanced than sea urchin , exploration only at this sea urchin level is not enough, but we do find some commoms between creatures’ GRN which might be some insights for us to study human’s GRN

- Human-made developmental system?(启发)

This can be achieved if I give it a thought, according to this paper’s statements, important subciruits are recurrently deployed,based on this information, we actually can develop our artificial GRN

- Conclusion(主要结论)

Explore the regulatory information encoded in GRN from many hierarchical organization levels based on Boolean Model, which gives us some insights to deeper into creatures’ developmental process

Thanks for your attention