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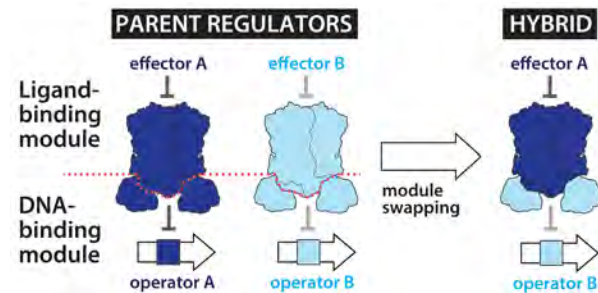
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Protein Engineering, Cellular Engineering, Genetic Sensing Systems, Design of Genetic Circuit, Biological Monitoring Device, Biocontainment of Engineered Organisms, Quantitative Systems Biology

Engineering biological sensors for creating new cellular decision-making behaviors that facilitate biomedical applications

Engineering genetic sensors

- Establish design principles for building modular transcriptional regulators
- Harness these engineered proteins to develop new connections between environmental signals and genetic units



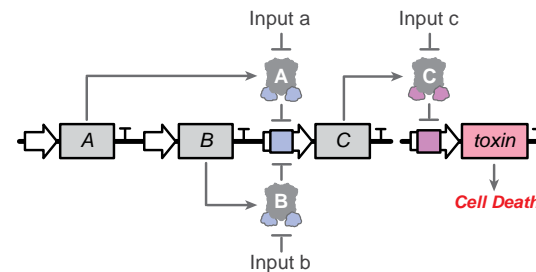
Nature Chemical Biology, 2016, 12(2), 82-86.

Nucleic Acids Research, 2019, 47(10), 5449-5463.

Nucleic Acids Research, 2019, 47(16), 8913-8925.

Genetic circuit: Programmable biocontainment system

- Engineered cells only survive under a unique combinations of three signals
- Constrains hazardous living entities in highly specific environments, such as bioreactors
- Biocontainment conditions can be easily reprogrammed

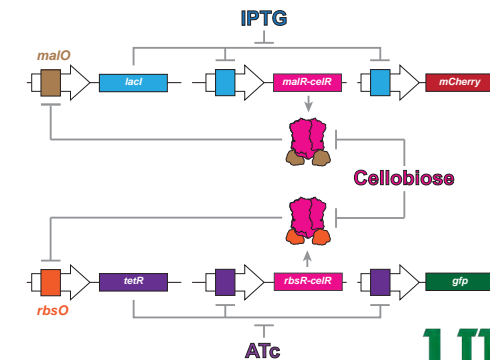


Input-output table

Input a	0	1	0	0	1	1	0	1
Input b	0	0	1	0	1	0	1	1
Input c	0	0	0	1	0	1	1	1
Output	1	1	1	1	0	1	1	1

Cellular device: Simultaneous monitoring and reporting multiple harmful chemicals

- Cells serve as monitoring devices to detect target toxicants
- Each toxicant triggers cells to continuously generate a unique color pigment
- Generation of all pigments is stopped with a master OFF signal; cells are reset for detecting the next pulse of toxicants



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