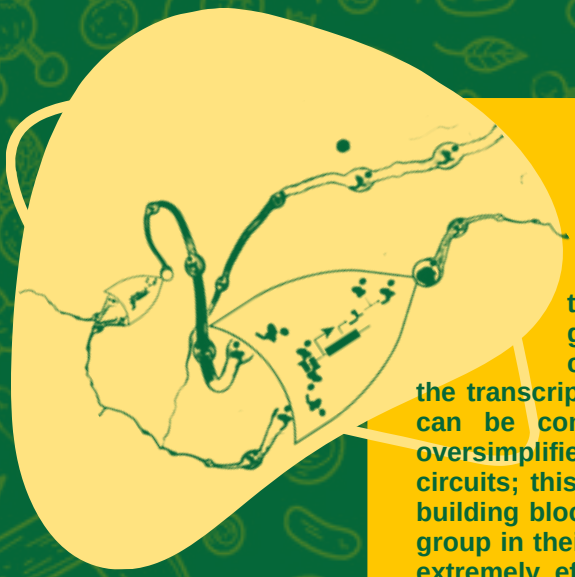
BUILDING CIRCUITS WITH LIVING CELLS



GENETIC CIRCUITS

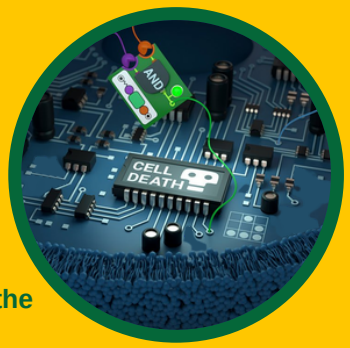
Cells process information similarly to computers. One method they use to do this is to change the informational sequence in DNA genes into a chemically related sequence in a different molecule called RNA. Transcription is the name of this technique. You can see the transcription of a gene as turning on a circuit. The choice to not transcribe can be compared to turning off a circuit. That comparison, though, is oversimplified. Genes almost never completely shut off, in contrast to electrical circuits; this is referred to as "leakiness." Because of this, they are inadequate building blocks for computer circuits. The Mxi1 protein was used by the Klavins group in their experimental yeast cells to solve this issue. In this cell, Mxi1 is an extremely effective silencer of transcription - bringing the leakiness down to acceptable levels.

How to link one circuit to another is another issue. Earlier research used CRISPR technology to solve this problem. The term "Clustered Regularly Interspersed Palindromic Repeats," or CRISPR, is used. Some bacteria have an immune system like this. These bacteria retain a copy of a portion of the viral gene sequence as a brief fragment in between palindromic (back to front) repeats in their DNA when they survive a contact with a virus. A cluster is what is created when several of these sequences are gathered together.

We can develop bio circuits that follow the same logic as cell differentiation, development, and morphogenesis. the process by which organisms form tissues and body parts and by which cells decide what they will be when they grow. A tissue's cells that have been transformed with bio circuits determine whether the tissue needs treatment and administer it from within the tissue.

LOGICAL CIRCUIT

The Boolean Logic operator NOR is used. (Boolean operators are typically written in all caps.) The search engines in libraries occasionally employ boolean logic. An additional Boolean operator is "AND." In a Boolean library system, searching for "puppies AND cute" will return any papers that contain both terms; documents that refer to puppies that aren't cute won't be returned. Also, you won't receive any paperwork that solely mention adorable kittens (or any other cute thing, just puppies). Both terms must be present in the documents.



The transcriptional start point for RNA synthesis in the genetic NOR gate is "on" if left unattended. The output is created by that. However, it incorporates two distinct dCas9 target sites. With the aid of two distinct guide RNAs, the dCas9-Mxi1 fusion protein can bind to either one or both of these locations. In that case, no output is produced because the Mxi1 component inhibits RNA transcription. Only if both of the dCas9 target sites (the inputs) are empty will there be an output. Another dCas9 guide that might bind to an additional NOR gate is present in the RNA transcript output. In a circuit, this would link two gates together.