

## A Novel Approach for Controlling Gene Expression (Arbitrium - a Novel approach) (Yeda)

**code:** T4-1847

[Rotem Sorek](#), Biochemistry, Molecular Genetics

### Summary

One of the challenges in the areas of synthetic biology and its clinical applications, is the capacity to control the induction of different genes, whether for the purpose of activating genetic circuits or inducing the expression of a specific protein. Present approaches are limited to the number of systems available, inconsistent behavior among systems, and requiring high concentrations of signaling molecule. A paradigm-shifting discovery by the research team led by Prof. Rotem Sorek, published in the prestigious journal of Nature<sup>[1]</sup>, reveals a new system, termed Arbitrium, which can effectively control gene expression. The basis of the discovery is that phages (viruses) have a quorum sensing system, similar to that found in bacteria, that communicates information to help determine whether a lytic or lysogenic cycle is to be entered. The Arbitrium system has numerous biotechnological and synthetic biology applications, and functions as a new- generation of easy-to-control genetic switches, to induce or shut off the expression of different genes. <sup>[1]</sup>Erez Z, et al. Nature. 2017 Jan 26;541(7638):488-493. doi: 10.1038/nature21049. Epub 2017 Jan 18.


### Applications

? **Unique system** - Effectively induces or shuts off expression of a gene.? **Standard Chemistry** - Uses regular peptides, therefore standard synthesis can be used. ? **Wide Dynamic Range?** **Over 100 Different Systems ? Uniformity Among Systems**

### Technology's Essence

The research group led by Prof. Rotem Sorek from the Weizmann Institute of Science (WIS) has discovered a novel family of expression systems. The basis of said expression systems is that a six (6) amino acid peptide binds a transcription factor (TF), inhibiting it. The peptide/TF system is shown to be sequence specific, such that a TF only responds to its corresponding peptide. Additionally, each peptide/TF pair only activates an explicit promoter. The Sorek group has discovered over 100 unique peptide/TF pairs, each with a specific TF that binds a specific peptide sequence. Consequently, this generates a large array of orthogonal transcription systems that have a standardized dynamic range and expression profile. This system could be used in the design and control of gene expression across both prokaryotic and eukaryotic systems, as well as applications in controlling genome editing.

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