# Engineering homeostatic genetic circuits in mammalian cells

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## Description

Cell-based therapies have emerged as a powerful platform for treating pathological phenotypes [1]. However, even the most successful approaches to date act in "open-loop" (without feedback regulation), and thus ensuring the desired therapeutic window is challenging. A focus of synthetic biology is to engineer cellular systems that can act in "closed-loop", autonomously sensing/monitoring a physiological/disease marker and precisely responding by releasing a therapeutic actuator [2]. Developing such closed-loop regulatory circuits to endow cells with homeostatic responses remains a great challenge.

The goal of this project is to engineer genetic circuits in human cells and establish cell lines that can act as biomolecular controllers. Within this task, the prospective student may explore different genetic topologies and develop various cell line engineering workflows and co-culture assays.

The ideal candidate should be highly motivated and able to work both in a group and independently. Although there are no mandatory requirements, basic expertise in cell culture, flow cytometry and cloning is desirable as well as some experience with mathematical modeling and numerical simulations.

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## References


[1] Caleb J Bashor et al. "Engineering the next generation of cell-based therapeutics". In: *Nature Reviews Drug Discovery* 21.9 (2022), pp. 655–675.

[2] Wendell A Lim. "The emerging era of cell engineering: Harnessing the modularity of cells to program complex biological function". In: *Science* 378.6622 (2022), pp. 848–852.