**Connecting biology and electronics with artificial protein switches**

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The central tenet of the emerging field of Synthetic Biology is that biological components can be refined into a toolkit of plug-and-play building blocks. The experimental evidence supporting this idea has so far been limited to relatively slow synthetic gene expression circuits. Real-time events in biological process are mediated by protein-based signaling circuits that can operate up to the millisecond scale. Ability to design protein-based signaling circuits would in principle enable us to design of analytical and diagnostic tests for any analyte.

To create orthogonal toolbox of protein-based signal detectors and amplifiers we combined structure-based engineering and directed evolution of proteins and created a range of synthetic signaling systems. I will discuss the way this signaling systems can be connected to electronic devices and how these developments were used to create a diagnostic company.