
Microfluidic cell-free protein synthesis

Nadanai Laohakunakorn*¹

¹University of Edinburgh – United Kingdom

Abstract

Cell-free protein synthesis (CFPS) systems were historically used to elucidate molecular mechanisms, but have increasingly been adopted as a synthetic biological platform in their own right. These biochemical systems have been harnessed to manufacture difficult-to-express proteins, operate sophisticated genetic and metabolic circuits for sensing and diagnostics applications, and construct biomimetic synthetic cells from their constituent parts, in a bottom-up manner.

In this talk I will describe how we use microfluidic technology to control CFPS reactions. The first project involves using the combined system to engineer libraries of synthetic transcription factors based on the zinc finger motif. I will discuss how these can be characterized in detail, and integrated into more complex circuits encoding logical operations. The second project uses a microchemostat to run reactions in a dynamic steady state. This allows us to probe the regeneration of components in a purified CFPS reaction, which is an essential process underlying self-replicating synthetic cells.

Keywords: cell free protein synthesis, transcription factor, synthetic cells, microfluidics

*Speaker