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Editorial

Editorial: Yeast synthetic biology: new tools to unlock cellular function

Yeasts play a central role in industrial biotechnology and basic genetic research. Recently, we have seen an expansion of their traditional role in food and wine making to one of industrial chemical and protein production. This transition is, in part, enabled by a convergence of new capacities that have shaped the ability to rewire this organism. Namely, the past decade has seen genome sequence availability, cheap DNA synthesis, rapid assembly technologies and newfound capacity to understand synthetic parts and build these parts into complex pathways and circuits. Collectively, these capabilities embody the central tenets of the emerging field of 'synthetic biology'.

Synthetic biology aims to build genetic circuits and cells from the ground-up. The parts-to-circuits-to-function paradigm of the field has been compared to many other physical systems including electrical circuits, building blocks, automobiles and other large-scale construction. Regardless of the analogies, biological circuits are arguably more complex and suffer from more non-linearity and context-dependent function of parts. Despite this, major advances have been made across the scale of yeast synthetic biology.

In recent years, yeast synthetic biology has begun to emerge. While many of the first advances have been made in *Escherichia. coli*, the field of yeast synthetic biology is quickly coming to its own. Synthetic part identification and even *de novo* synthesis is possible. Rapid synthesis capacities, including harnessing yeast homologous recombination, can replace traditional cloning and enable combinatorial circuit assembly. This synthesis capacity has even served as a platform to assemble the first completely synthetic bacterial genome and served as a test bed to create a purely synthetic chromosome. These successes highlight the expanding scale of yeast synthetic biology complexity.

Perhaps one of the most tangible outcomes of synthetic biology is a more rapid and facile approach to metabolic engineering. Rapid and combinatorial strain engineering has led to the development of new company paradigms and faster timelines for strain engineering. We are quickly moving to an era where multiple hypotheses can be simultaneously tested. In fact, due to these advances, one can measure progress by the speed at which the design-build-test cycle can be performed. These tools have emboldened the field to tackle ever complex production phenotypes and pathways. Without question, there is a renaissance in the yeast community.

This special issue of *FEMS Yeast Research* is a collection of 11 minireviews intended to highlight recent advances in yeast synthetic biology covering parts design-to-circuit development and assembly to enabled advances in the field of metabolic engineering. We are particularly thankful to all of the authors of these minireviews for providing these timely perspectives and hope that they serve as a useful and enjoyable resource for those in the field and the overall readership of the journal.

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