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NextGen SynBio: Synthetic genomics and drug discovery

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We have developed simplified, purified, bacterial translation systems to facilitate studies of substrate recognition in protein synthesis and enable new applications. Surprises in translation include slower incorporation of proline and other N-alkyl amino acids and that peptide bond formation, not accommodation, is rate-limiting in dipeptide synthesis. One application is directed evolution *in vitro* of small-molecule, peptidomimetic drug candidates by redesigning the genetic code for the synthesis and display of polymers containing unnatural amino acids. Fast kinetics with unnatural amino acids has identified the causes of several inefficiencies and lead to ways of improving incorporation yields. Another application is cost-effective, scalable, purified, *in vitro* translation. The latter was achieved by total synthesis and BioBrick assembly of a 58-kbp module encoding 30 translation factor cistrons, breaking new ground in de novo design for synthetic genomics.

Biography

Anthony C Forster has discovered the hammerhead catalytic RNA structure, invented external guide sequences for ribonuclease P and created unnatural genetic codes *de novo*, all of which founded biotech companies. He has published in journals including *Cell*, *Nature* and *Science*, edited volumes of *Methods* and *Biotechnology Journal* and coauthored "*Synthetic Biology: A Lab Manual*."

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