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REVIEWS

may 2014 volume 12 no. 5
www.nature.com/reviews

 Synthetic biology

MICROBIOLOGY

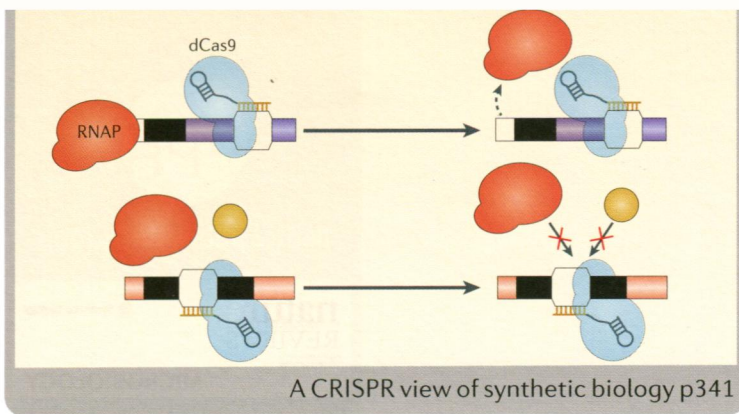


STEPPING STONES TO SUCCESS

Semi-synthetic artemisinin

Engineering synthetic non-coding RNA devices

Diversity and versatility



REVIEWS

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FEATURED
ARTICLE

Coordination of microbial metabolism

Victor Chubukov, Luca Gerosa, Karl Kochanowski and Uwe Sauer

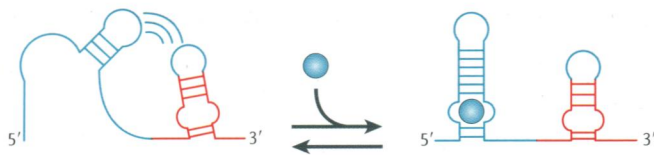
In this Review, Sauer and colleagues outline how microorganisms coordinate common metabolic tasks. By illustrating the information transfer and flux adaptation for key regulatory circuits in *Escherichia coli*, *Bacillus subtilis* and yeast, they conclude that cells rely on a few conserved metabolites to report on their global metabolic status and mount appropriate responses.

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A versatile framework for microbial engineering using synthetic non-coding RNAs

Lei S. Qi and Adam P. Arkin

Non-coding RNA devices, such as CRISPR–Cas systems, riboswitches and RNA scaffolds, have emerged as a versatile class of genetic regulatory elements that are used in a broad range of synthetic biology applications. In this Review, Arkin and Qi discuss the design, engineering and application of synthetic non-coding RNA devices for microbial engineering.

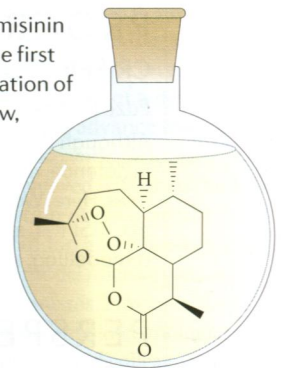


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Semi-synthetic artemisinin: a model for the use of synthetic biology in pharmaceutical development

Chris J. Paddon and Jay D. Keasling

Entry of the antimalarial drug precursor semi-synthetic artemisinin into industrial production is the first major milestone for the application of synthetic biology. In this Review, Paddon and Keasling discuss the metabolic engineering and synthetic biology approaches that were used to engineer *Escherichia coli* and *Saccharomyces cerevisiae* to synthesize a precursor of artemisinin, which should aid the development of other pharmaceutical products.



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Biotechnological domestication of pseudomonads using synthetic biology

Pablo I. Nikel, Esteban Martínez-García and Víctor de Lorenzo

Much of synthetic biology research makes use of model organisms, such as *Escherichia coli*. Here, Víctor de Lorenzo and colleagues emphasize the need for a wider choice of model organisms and advocate the use of environmental *Pseudomonas* strains as model organisms that possess the necessary metabolic traits required to meet current and future synthetic biology and biotechnological needs.

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FOCUS ON SYNTHETIC BIOLOGY

This issue features a focus on synthetic biology — see the articles marked with the above logo. These articles can also be found online at: <http://www.nature.com/nrmicro/focus/synbio>

Links to further information

The full text of articles includes author biographies, links to glossary terms and links to websites and databases with relevant information.

Key points provides a bullet-pointed summary of the main topics covered in each article.

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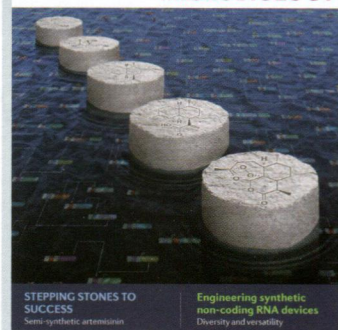


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Synthetic biology

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STEPPING STONES TO SUCCESS
Synthetic artemisinin

Engineering synthetic non-coding RNA devices
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► **COVER:** 'Stepping stones to success' by Philip Patenall, inspired by the Focus on synthetic biology.

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- 317 **CRISPR–Cas systems: beyond adaptive immunity**

Edze R. Westra, Angus Buckling and Peter C. Fineran

Although the CRISPR–Cas system of prokaryotes has an established role in defence, recent studies suggest that this system has other functional roles. Here, Westra and colleagues explore the more unconventional roles of CRISPR–Cas, such as endogenous gene regulation and genome remodelling, and consider their evolutionary implications.

PERSPECTIVES

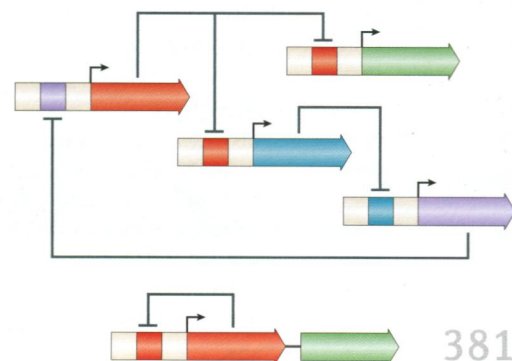
TIMELINE

- 381 **A brief history of synthetic biology**



D. Ewen Cameron, Caleb J. Bashor and James J. Collins

In this Timeline article, Collins and colleagues chart the history of synthetic biology since its inception just over a decade ago, with a focus on both the cultural and scientific progress that has been made as well as on key breakthroughs and areas for future development.



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Tel: +44 (0)20 7843 3620
Email: NatureReviews@nature.com
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EDITORS



SHEILAGH MOLLOY



CHRISTINA TOBIN KÄHRSTRÖM



URSULA HOFER



ANDREA DU TOIT