Writing DNA code = forward engineering

(Synthetic Biology)

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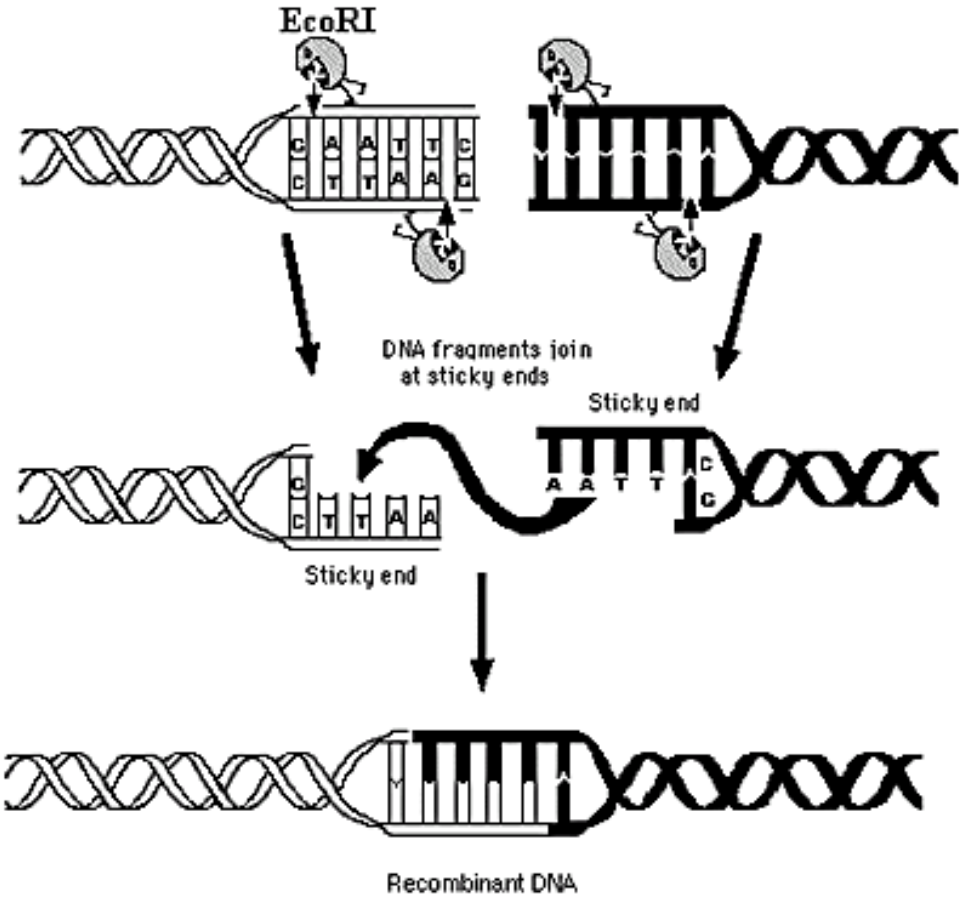
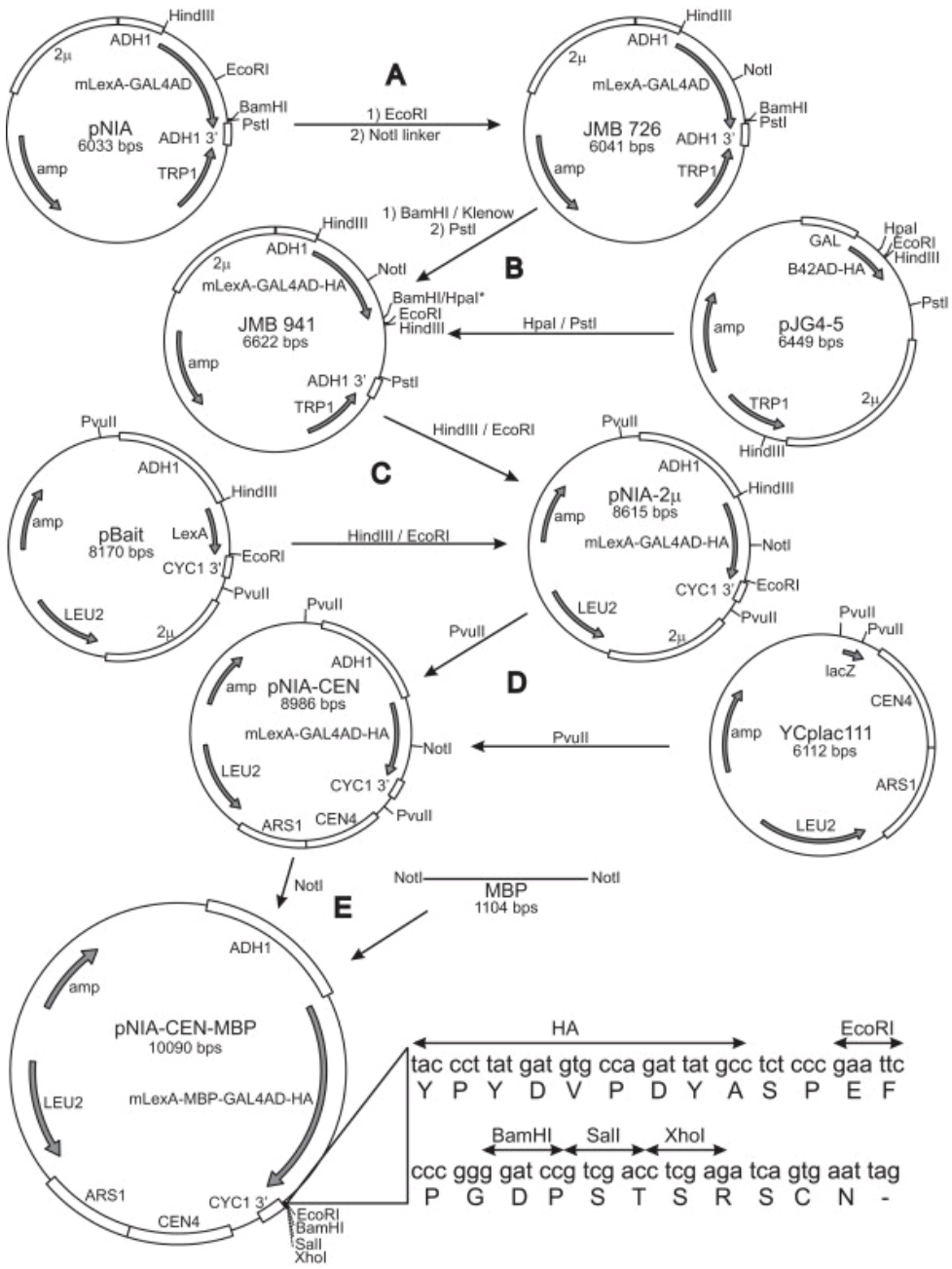
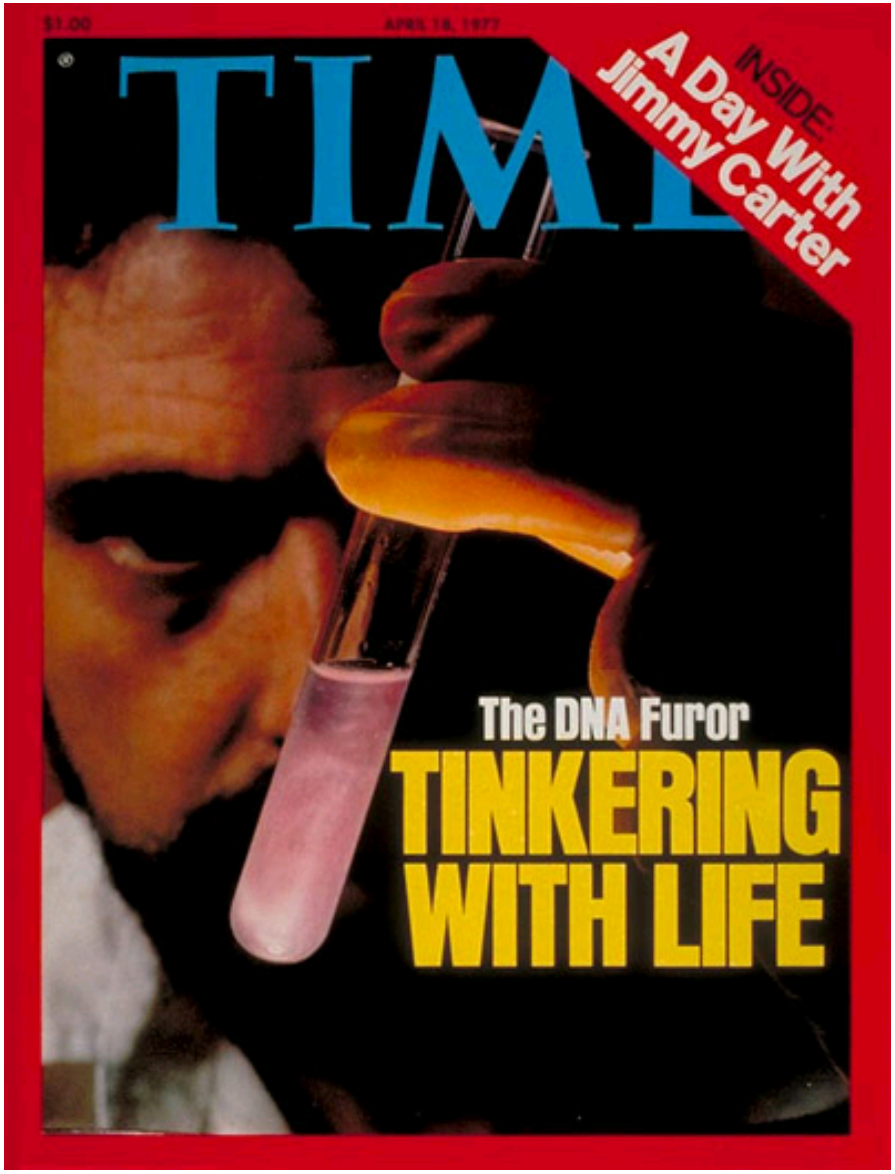
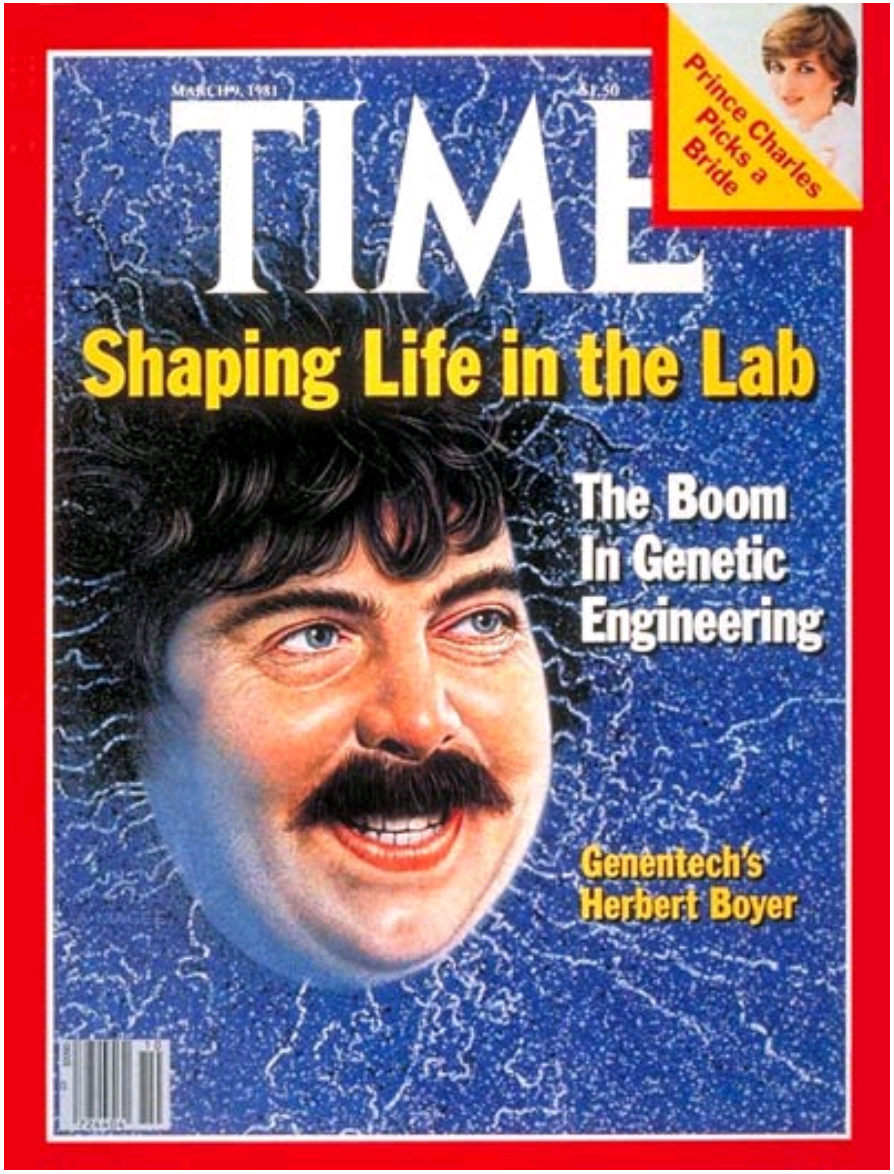


Restriction Enzyme Action of EcoRI



http://www.biomedcentral.com/content/figures/1471-2199-8-6-1.jpg


$1.00
APRIL 18, 1977
TIME
INSIDE:
A Day With
Jimmy Carter
The DNA Furor
TINKERING
WITH LIFE


MARCH 9, 1981
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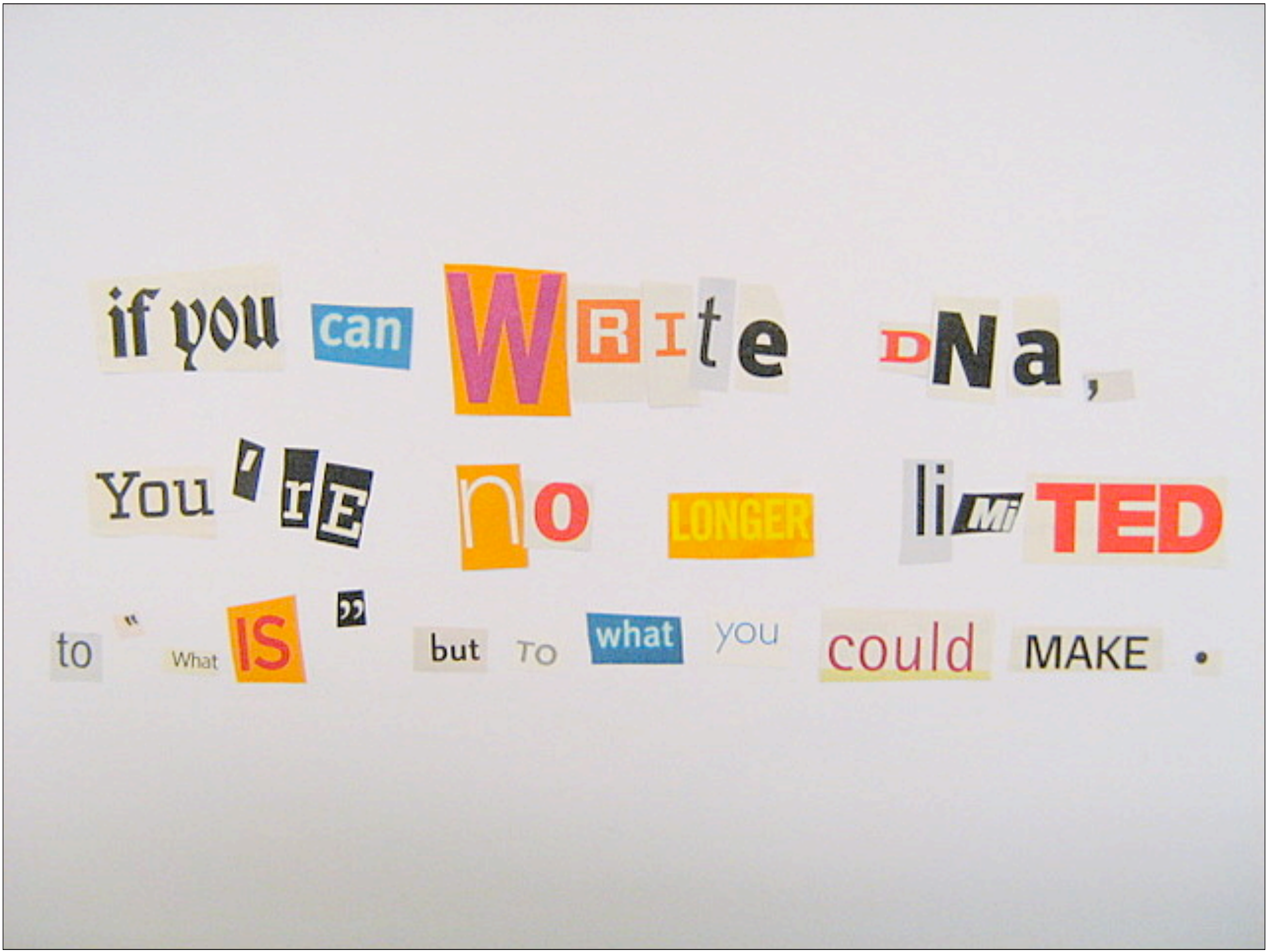
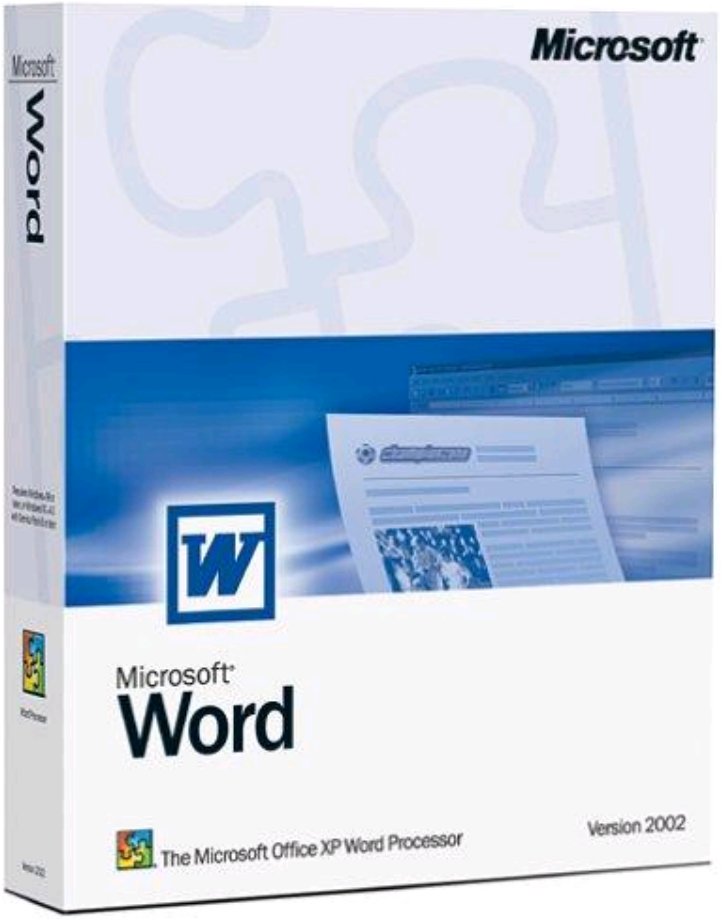
TIME
Prince Charles
Picks a
Bride
Shaping Life in the Lab
The Boom
In Genetic
Engineering
Genentech's
Herbert Boyer

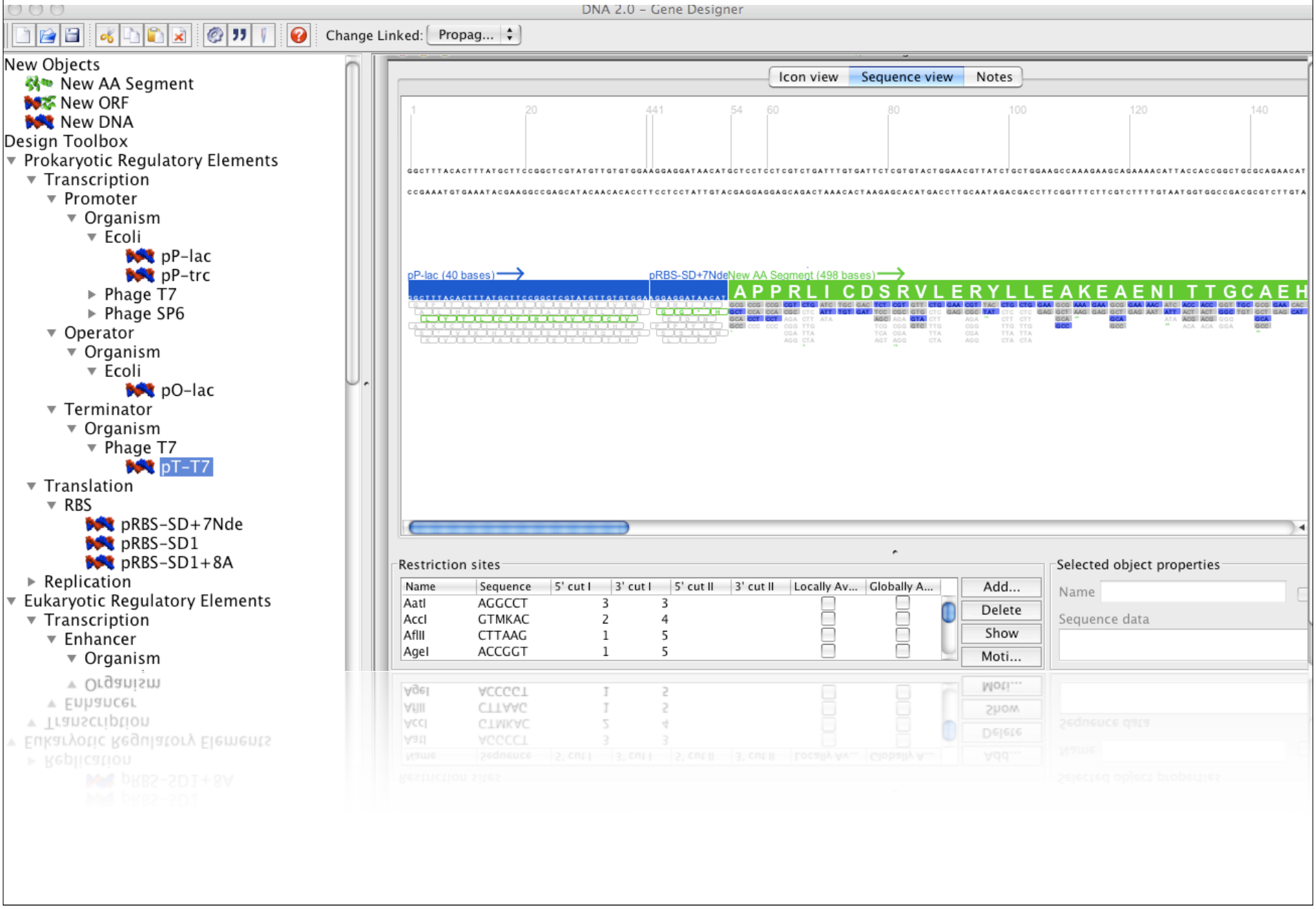

WARNING


if you can WRITe DNa,
You 're no LONGER limiTED
to " What IS " but TO what you could MAKE .

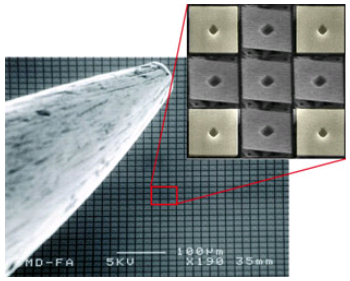


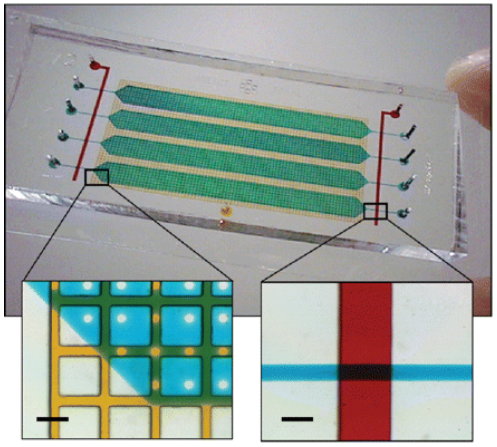
http://www.ssos.com/word.jpg

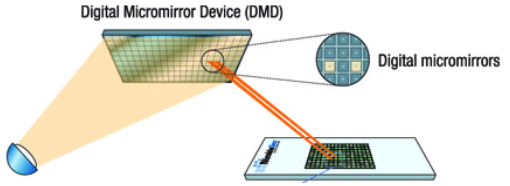
http://www.epson.com

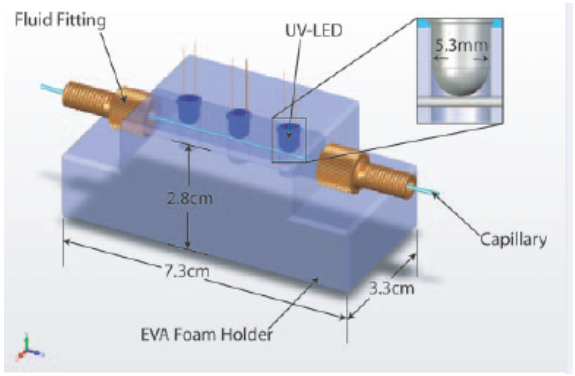

DNA 2.0 – Gene Designer
Change Linked:
Propag...
New Objects
New AA Segment
New ORF
New DNA
Design Toolbox
Prokaryotic Regulatory Elements
Transcription
Promoter
Organism
Ecoli
pP-lac
pP-trc
Phage T7
Phage SP6
Operator
Organism
Ecoli
pO-lac
Terminator
Organism
Phage T7
pT-T7
Translation
RBS
pRBS-SD+7Nde
pRBS-SD1
pRBS-SD1+8A
Replication
Eukaryotic Regulatory Elements
Transcription
Enhancer
Organism
Icon view
Sequence view
Notes
pP-lac (40 bases)
pRBS-SD+7Nde
New AA Segment (498 bases)
Restriction sites
Name
Sequence
5' cut I
3' cut I
5' cut II
3' cut II
Locally Av...
Globally A...
AatI AGGCCT 3 3
AccI GTMKAC 2 4
AflII CTTAAG 1 5
AgeI ACCGGT 1 5
Add...
Delete
Show
Moti...
Selected object properties
Name
Sequence data


BECKMAN
Oligo 1000M






Digital Micromirror Device (DMD)
Digital micromirrors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7.3cm
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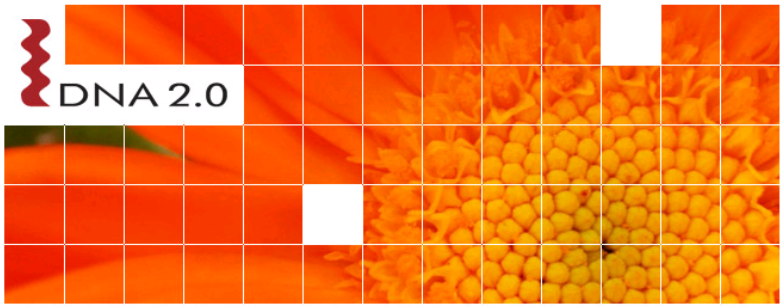

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Cost per Base of DNA Sequencing and Synthesis

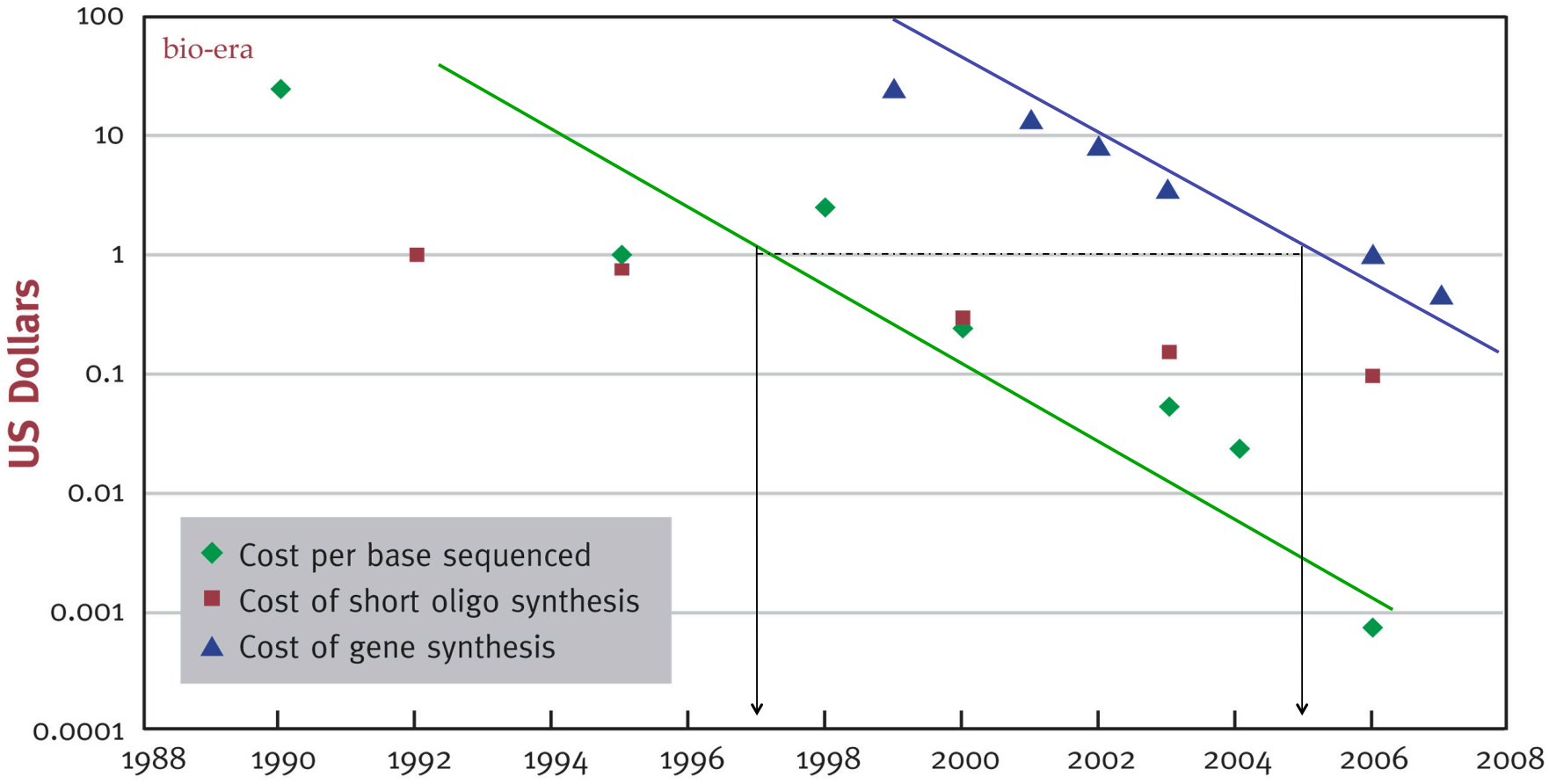
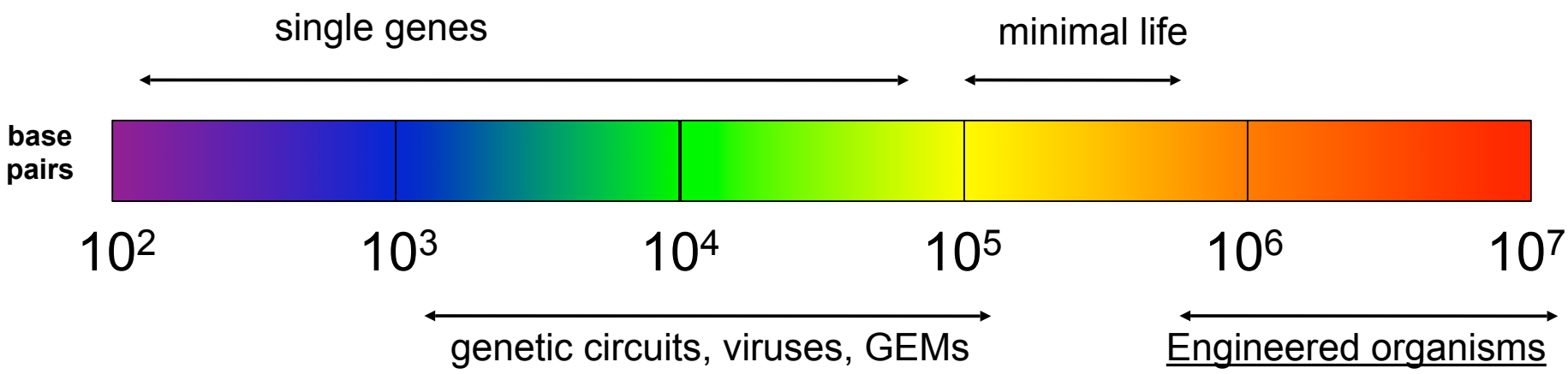


Figure from *Genome Synthesis and Design Futures*, Bio Economic Research Associates, © 2007. www.bio-era.net

Synthetic trend lags by about 8 years

Today, if you can type, you can do genetic engineering


single genes
minimal life
base pairs
10^2
10^3
10^4
10^5
10^6
10^7
genetic circuits, viruses, GEMs
Engineered organisms

(CBCD) CENTER FOR BIOLOGICAL CIRCUIT DESIGN

INFORMATION SCIENCE AND TECHNOLOGY

CBCD: THE CIRCUITRY OF LIFE

The CBCD is developing new ways to design, build and analyze biological circuits. Biological circuits control information flow in biological systems, and as such are a core area of Information Science and Technology. The study of circuits cuts across vast areas of biology, from biochemistry, biophysics and genetics, to cell and developmental biology, to neurobiology and ecology. Understanding how to design and build circuits is crucial for the next generation of bioengineering. The study of biological circuits also opens up new areas for theory in computation. We combine the experimental biologist's desire to abstract the key principles from the richness and diversity of biological circuits, the physicist's sense of measurement and of simple underlying mechanisms, and the engineer's aesthetic of "to build is to understand," The CBCD is an interdisciplinary group of biologists and engineers from a broad range of engineering and biology disciplines.

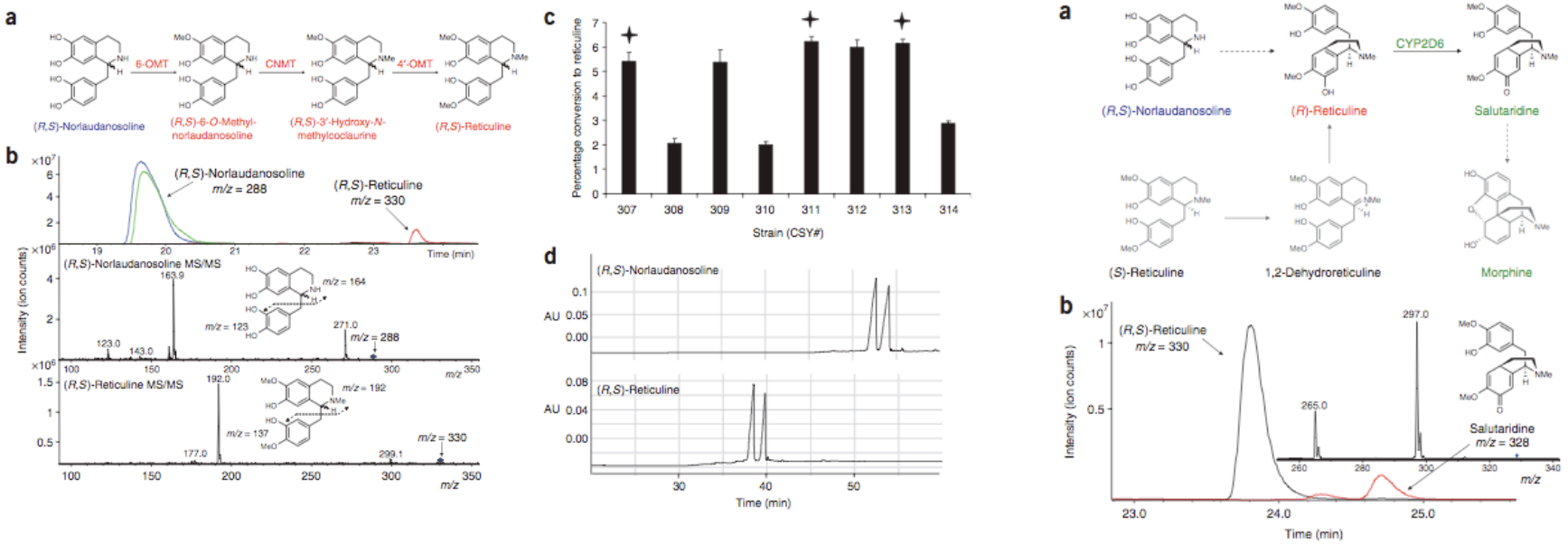
Goals: We will deduce simple rules about biological circuits and understand how they act in circuits at the levels of molecules, cells, organisms and ecosystems. We will learn how to model, design, build and analyze biological circuits. We will forge effective interdisciplinary research teams and train interdisciplinary researchers, with fundamental connections between engineering and circuit biology, systems and molecular neuroscience.

nature chemical biology

Production of benzylisoquinoline alkaloids in *Saccharomyces cerevisiae*

Kristy M Hawkins & Christina D Smolke

The benzylisoquinoline alkaloids (BIAs) are a diverse class of metabolites that exhibit a broad range of pharmacological activities and are synthesized through plant biosynthetic pathways comprised of complex enzyme activities and regulatory strategies. We have engineered yeast to produce the key intermediate reticuline and downstream BIA metabolites from a commercially available substrate. An enzyme tuning strategy was implemented that identified activity differences between variants from different plants and determined optimal expression levels. By synthesizing both stereoisomer forms of reticuline and integrating enzyme activities from three plant sources and humans, we demonstrated the synthesis of metabolites in the sanguinarine/berberine and morphinan branches. We also demonstrated that a human P450 enzyme exhibits a novel activity in the conversion of (*R*)-reticuline to the morphinan alkaloid salutaridine. Our engineered microbial hosts offer access to a rich group of BIA molecules and associated activities that will be further expanded through synthetic chemistry and biology approaches.



CHEMICAL SYNTHESIS OF THE MYCOPLASMA GENITALIUM GENOME

Overview

We have developed methods for assembly of the complete synthetic 582,970 bp *Mycoplasma genitalium* JCVI 1.0 genome. This synthetic genome contains all the genes of wild type *M. genitalium* G37 except MG408, which is disrupted to block pathogenicity. The genome also contains added "watermark" sequences located at intergenic sites known to tolerate transposon insertions, for identification of the genome as synthetic and also antibiotic resistance markers to allow its selection.

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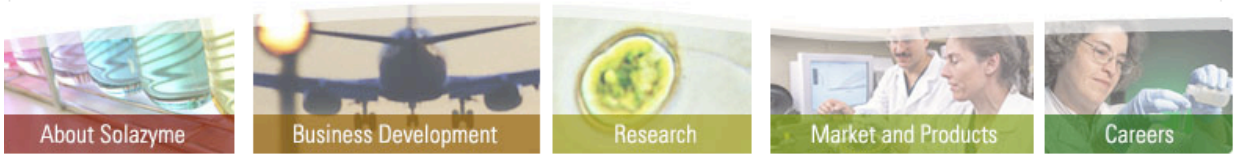
"Nothing is too wonderful to be true if it be consistent with the laws of nature." - Michael Faraday



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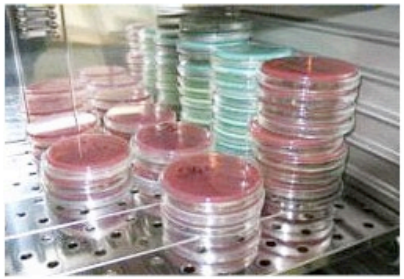
Solazyme is a synthetic biology company that unleashes the power of marine microbes to create clean and scalable solutions for the renewable en
and specialty



Methods

Solazyme's technology platform consists of several integrated methods and techniques:

- Directed Evolution
- High-Throughput Robotic Screening
- Metabolic Engineering