

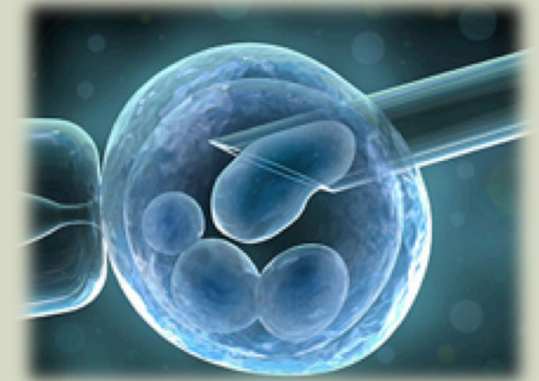
INTRODUCTION TO SYNTHETIC BIOLOGY

Given by
Sabrina Lee

What is Genetic Modification

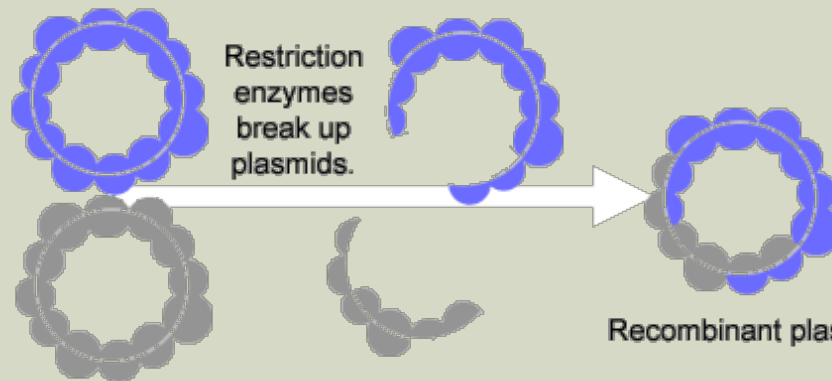
GENETIC MODIFICATION

- GM provides a way of expressing desirable characteristics in an organism that otherwise would not display them



Genetic Engineering

Selective Breeding



Synthetic Biology

SELECTIVE BREEDING

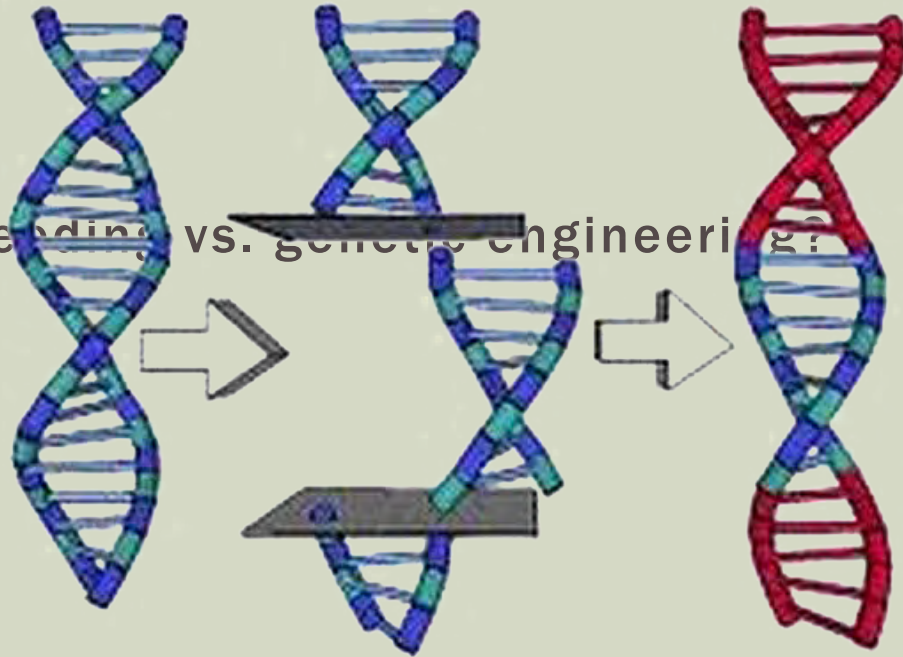
- Conscious selection for desirable traits
- A form of genetic modification which doesn't involve the addition of any foreign genetic material (DNA) into the organism



GENETIC ENGINEERING

- Direct manipulation of an organism's genome using biotechnology.
- The gene may come from the same organism, or it can be transferred from an unrelated organism

- Selective breeding vs. genetic engineering?

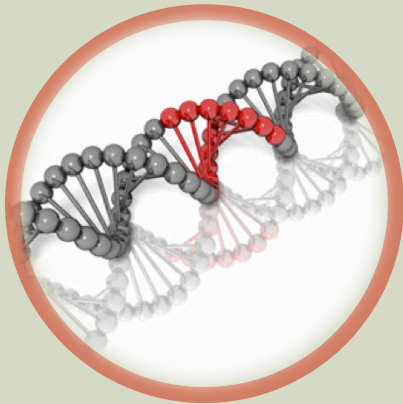


GENETIC ENGINEERING

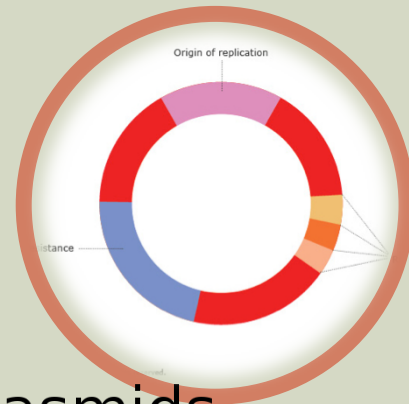


GENETIC ENGINEERING

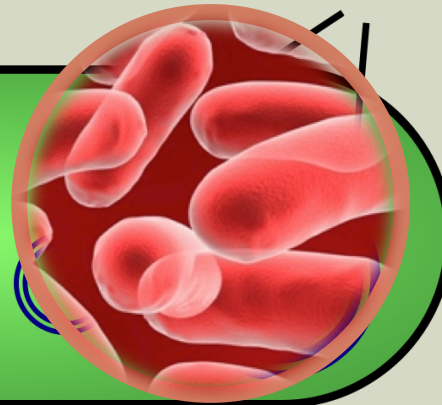
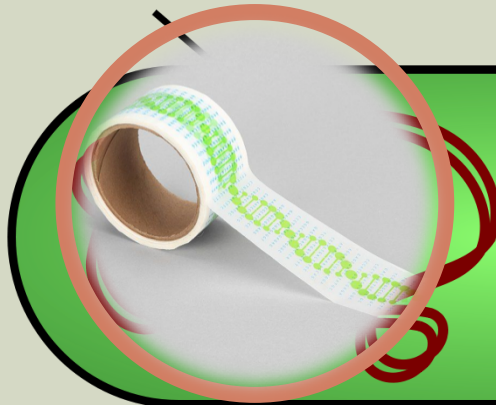
■ Components



Bacterial DNA



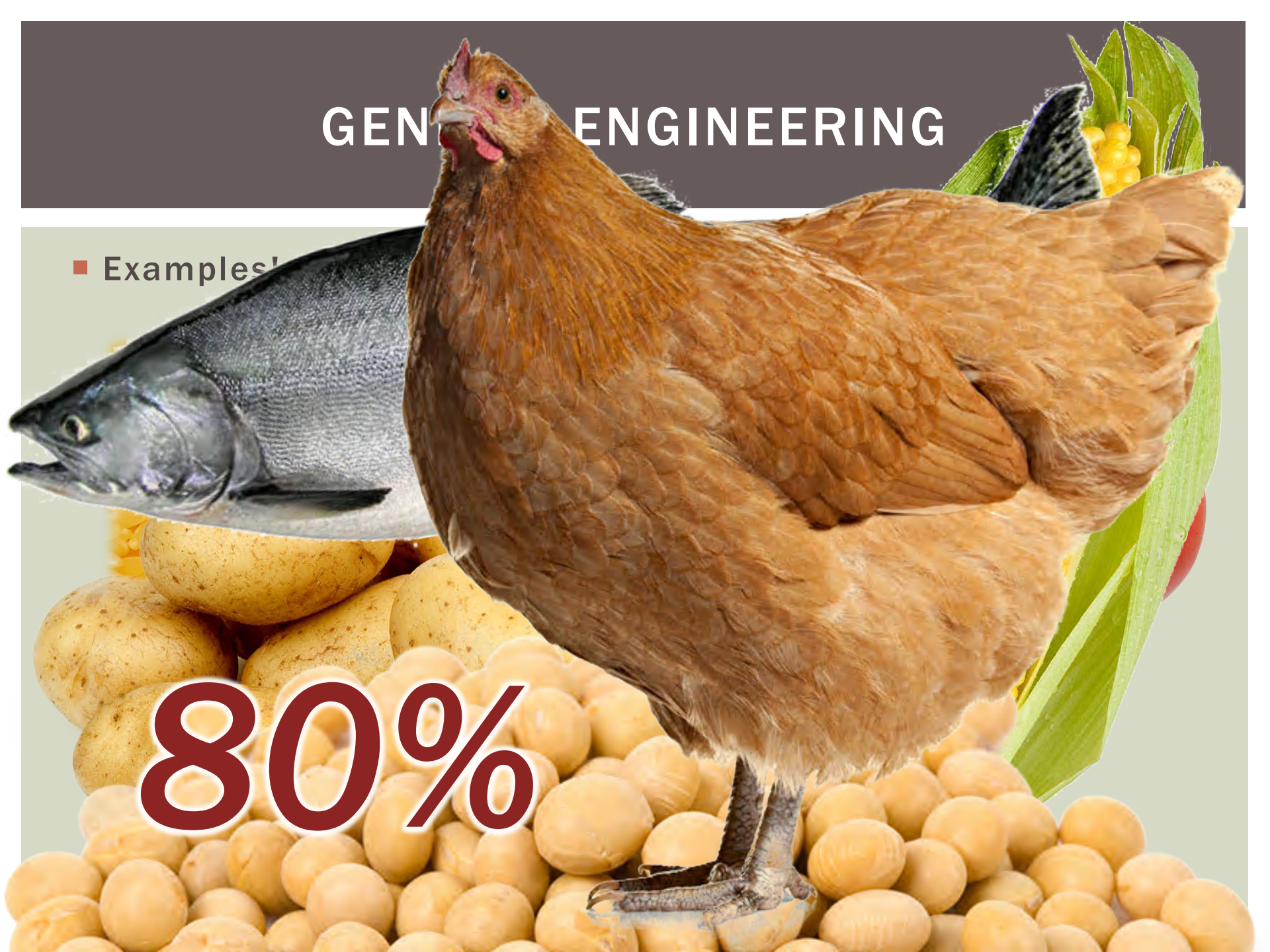
Plasmids



GENE ENGINEERING

■ Examples!

80%



What is Synthetic Biology?

SYNTHETIC BIOLOGY

- A term first used in 1970s

Biotechnology

System
Biology

Molecular
Biology

Computer
Engineering

Genetic
Engineering

SYNTHETIC BIOLOGY



SYNTHETIC BIOLOGY



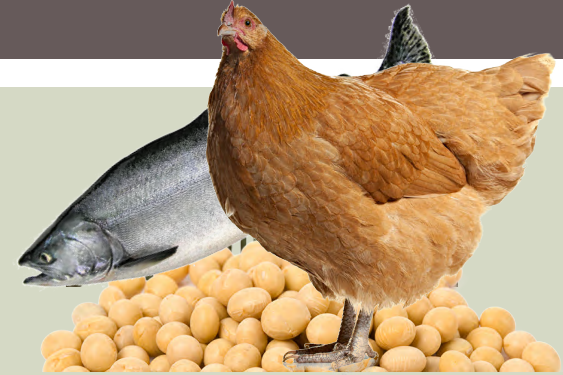
SYNTHETIC BIOLOGY

Genetic Engineering vs. Synthetic Biology?

SYNTHETIC BIOLOGY

Genetic Engineering =

*Cut the “existing” genes
from living organisms*



Synthetic Biology =

*Engineered
Redesigned
Reconstructed
Synthetic* ^{new} *Gene
Genome*

A C G T T G C G C C

THE POSSIBILITIES!



SYNTHETIC BIOLOGY

CTAGCTGAC

ATGAATTGC
CTACCGGAC
GGTCGATCG
GATTCGCGG



BIOBRICKS?

- Registry of Standard Biological Parts
- Part: A piece of DNA that encodes information and performs a function

Promoter

Repressor

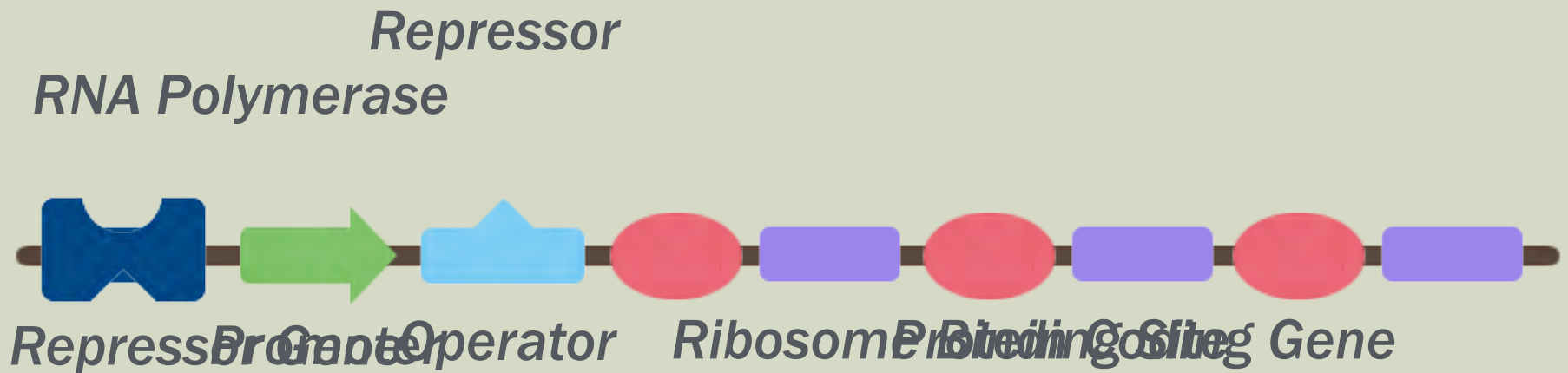
Operator

Ribosome
Binding
Site

Gene

Terminator

BIOBRICKS



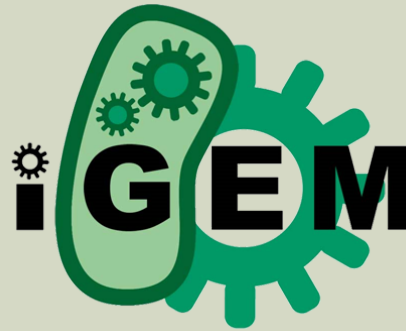
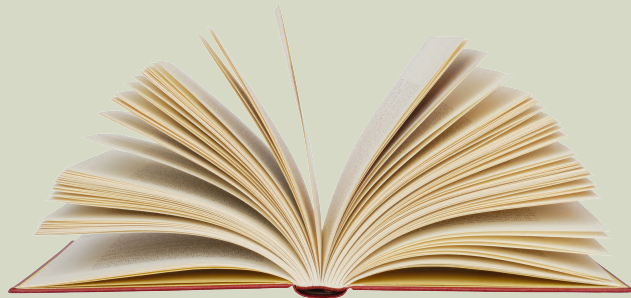
Lactase synthesis in *E. coli*

THE DEVELOPMENT

Synthetic
Biology

1974

2002



2003

2010



OTHER APPLICATION

- In 2011, Artemisinin, an anti-malarial drug, was first synthesized in lab, using yeast.
- 1st FDA-approved drug developed from synthetic biology



Annua



OTHER APPLICATION

- 2013, Plant egg
- 2013, Test-tube beef



The world's first laboratory-grown beef burger was flipped out of a petri dish and into a frying pan on Monday, with food tasters declaring it tasted "close to meat".



**What Other Possibilities
You Can Think Of?**