Bacterial Transformation I

An experiment in genetic engineering

E.coli – a model organism of the molecular biology lab

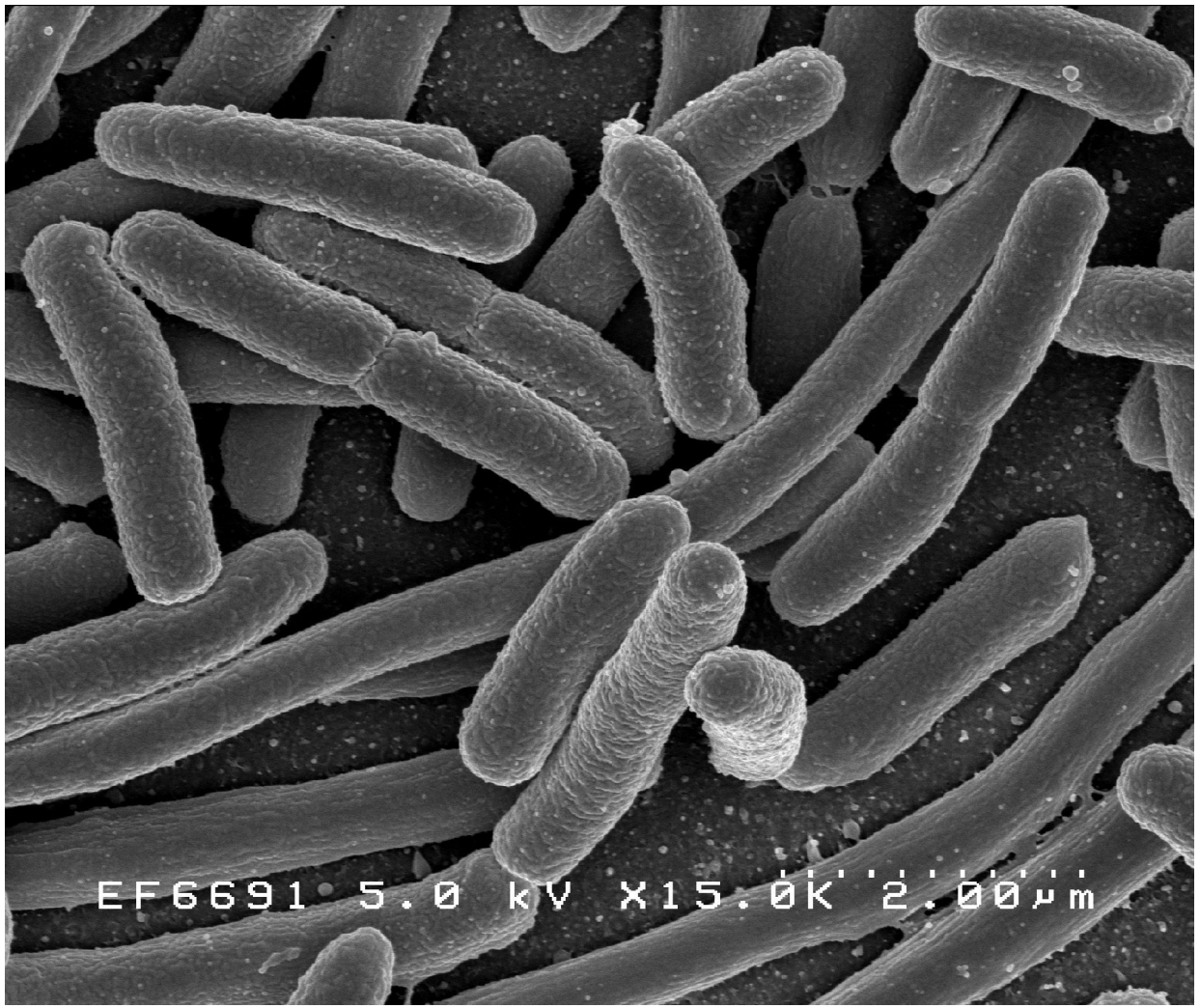
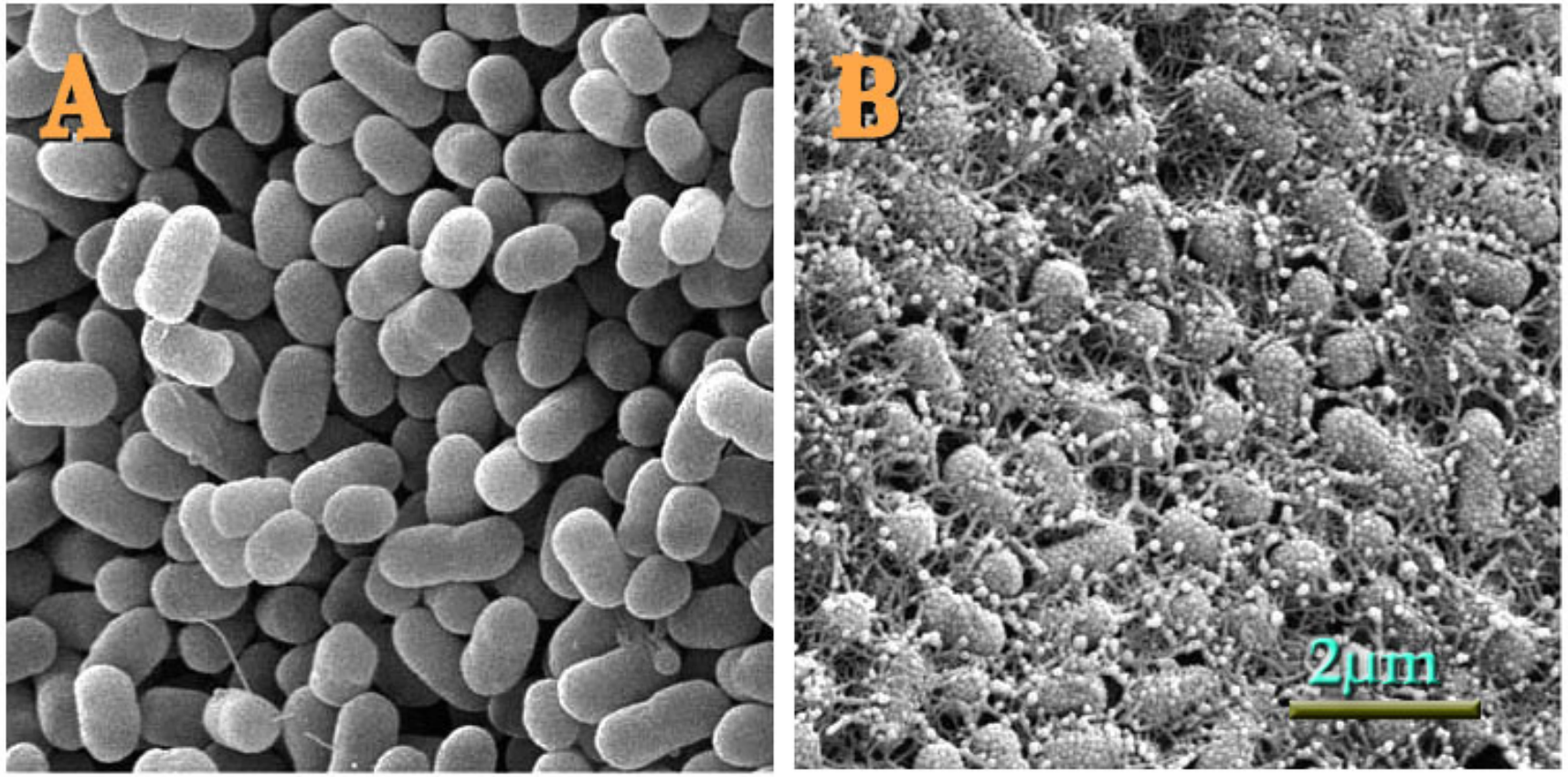


Image by NIAID

What do you know about E.coli ?

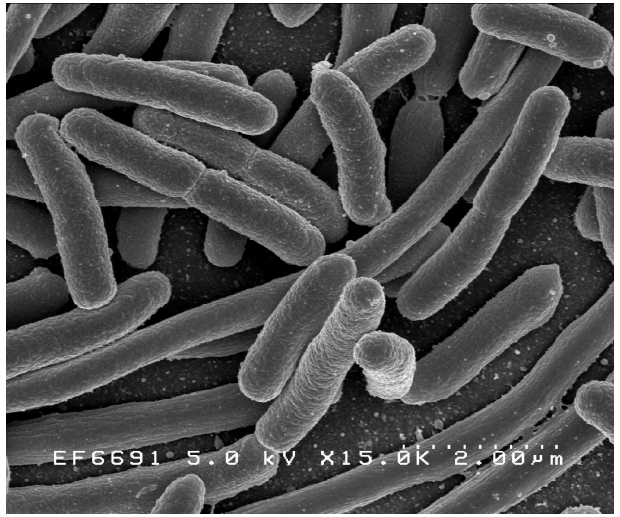
Some strains are harmful, but most are not



Topographical images of colonies of E. coli O157:H7 strains (A) 43895OW (curli non-producing) and (B) 43895OR (curli producing) grown on agar for 48 h at 28°C.

Image credit: USDA (Pina Fratamico Microbiologist/Lead Scientist)

Microorganisms dominate life on earth



Microbes on Earth

$9.2 \times 10^{29} – 31.7 \times 10^{29}$

Nature doi:10.1038/nature.2012.11275

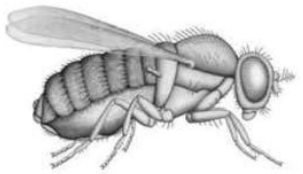
Stars in the Universe

10^{24}

https://www.space.com/26078-how-many-stars-are-there.html

What is a model organism?

Some MO characteristics and key players

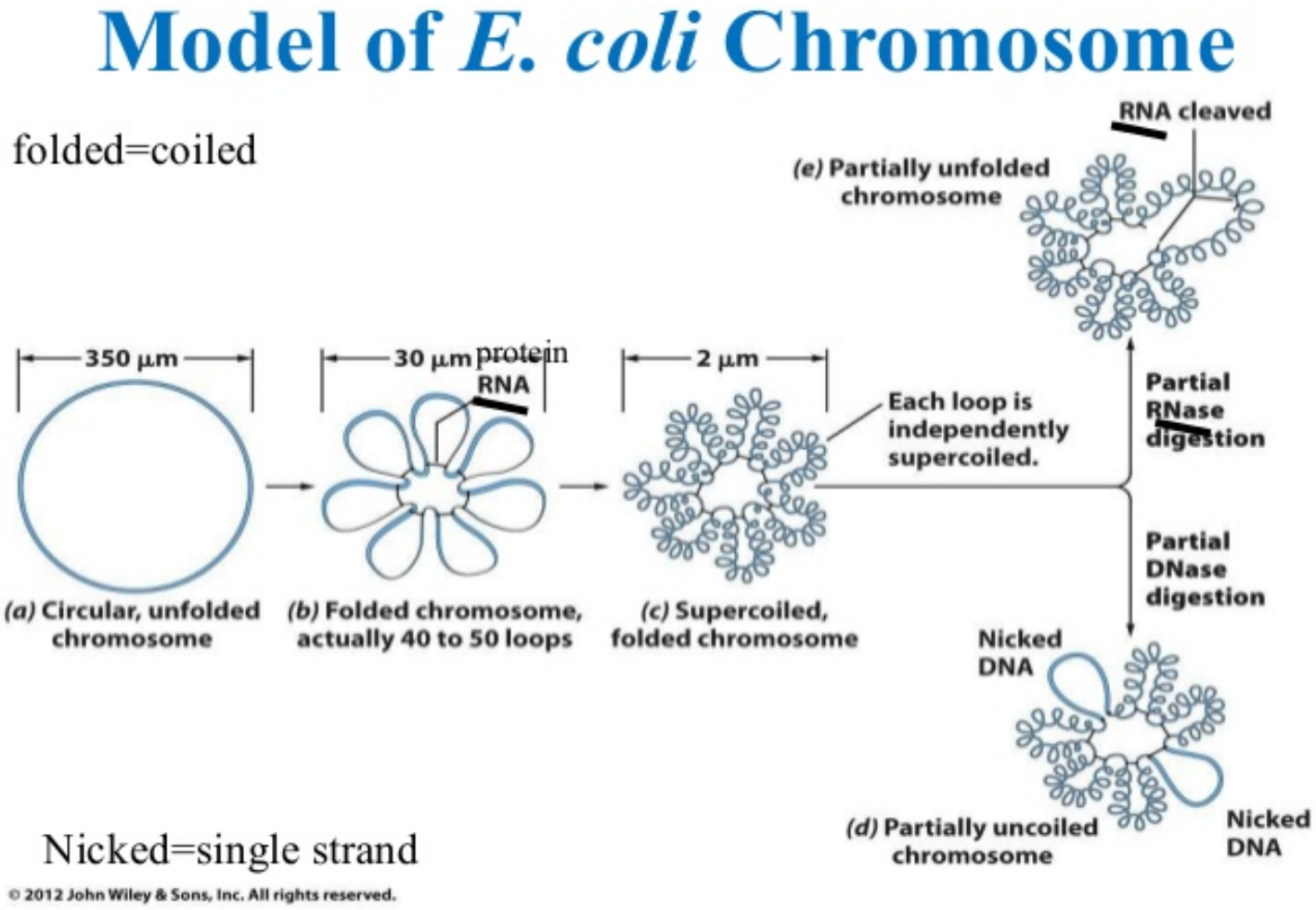
Yeasts	C. elegans	D. melanogaster	Rodents
			
-Simple growth requirements. -Rapid cell growth. -Ease of genetic manipulation. -Genome-wide screening.	-Short lifespan. -Rapid life cycle. -Small body size. -Transparent body. -Ease of genetic manipulation. -Knockout mutant libraries. -Behavior pattern.	-Excellent fertility. -Identical offsprings. -Distinct developmental stages. -Transgenic flies.	-Higher functional genetic. -Transplantation. -Gene-knockout or -knockin. -Tissue/organ-based proteomics. -Construction of disease model. -Proteomic conservation to human homolog.
Yeasts have been widely used in genetics and cell biology, largely because they are simple eukaryotic cells, serving as a model for all eukaryotes, including humans, for the study of fundamental cellular processes such as the cell cycle, DNA replication, recombination, cell division, and metabolism.	Most genes in the *C. elegans* genome have functional counterparts in humans which makes it an extremely useful model for human diseases. *C. elegans* mutants provide models for many human diseases including neurological disorders, congenital heart disease and kidney disease.	Fruit flies have a relatively small genome with only 4 pairs of chromosomes and approximately 15,500 genes (humans have 23 pairs of chromosomes and about 22,000 genes). Fruit flies display many of the behaviors seen in mammals, such as learning, sleeping, and mating.	Rodents are the most commonly used animal model for studying human disease. They are biologically very similar to humans and get many of the same diseases, for the same genetic reasons. They can be genetically manipulated to mimic virtually any human disease or condition.

https://blog.atlasantibodies.com/using-antibody-for-human-protein-in-model-organism

Through manipulation and study of model organisms we work to understand life

Manipulation at the genetic level

Image Credit
DR GOPAL MURTI / SCIENCE PHOTO LIBRARY



Plasmids – short circular DNAs

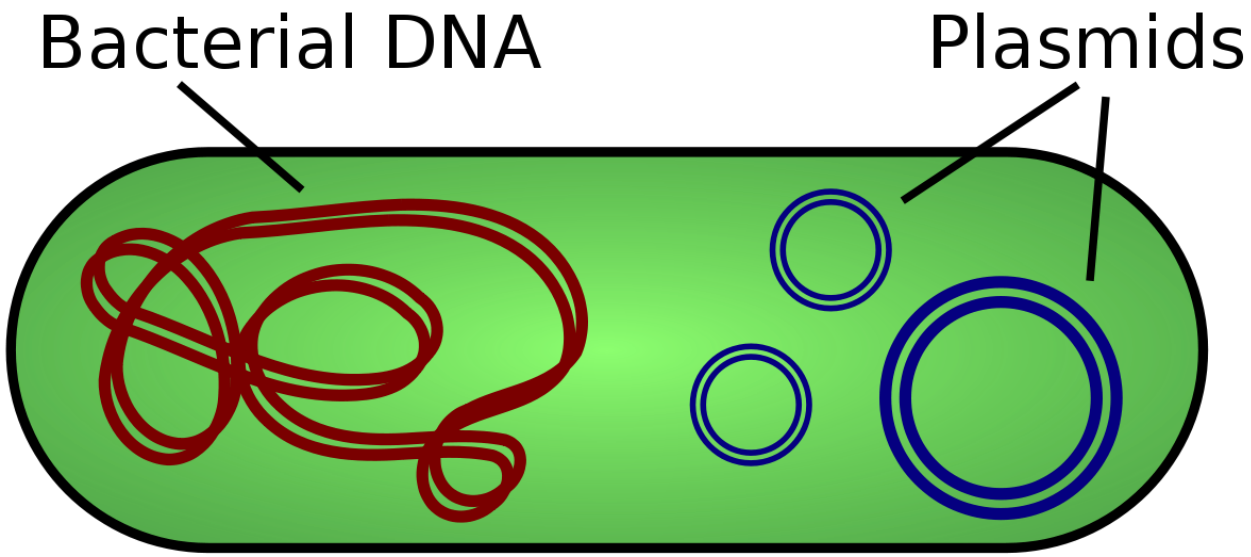
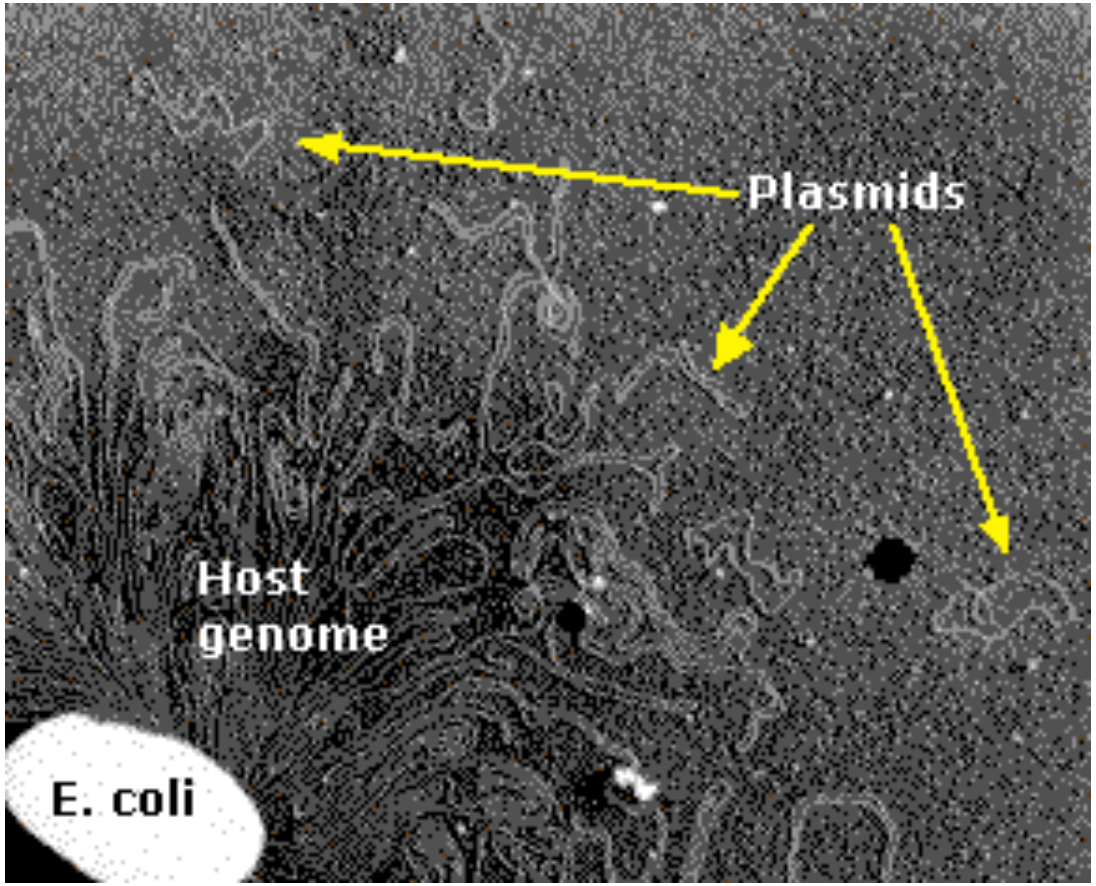


Image credit: https://en.wikipedia.org/wiki/Plasmid#/media/File:Plasmid_(english).svg

Plasmids – short circular DNAs



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Plasmid Manipulation

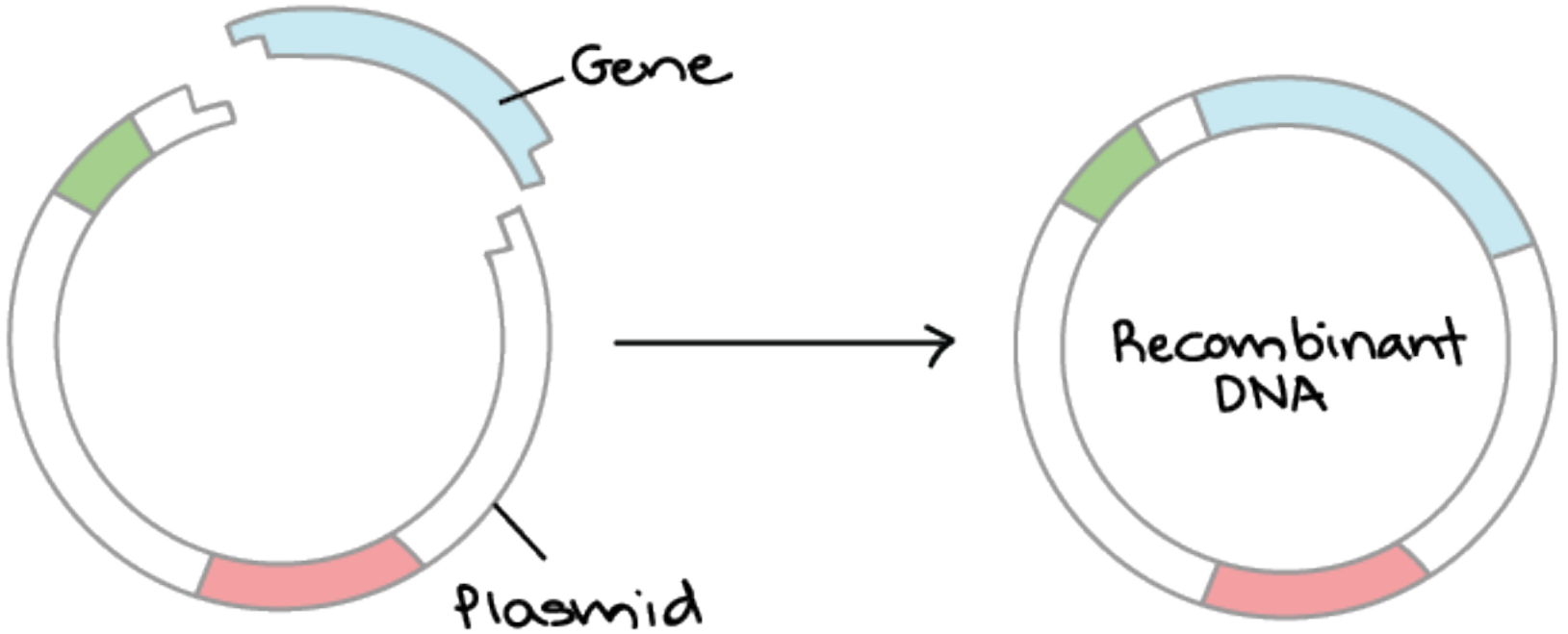
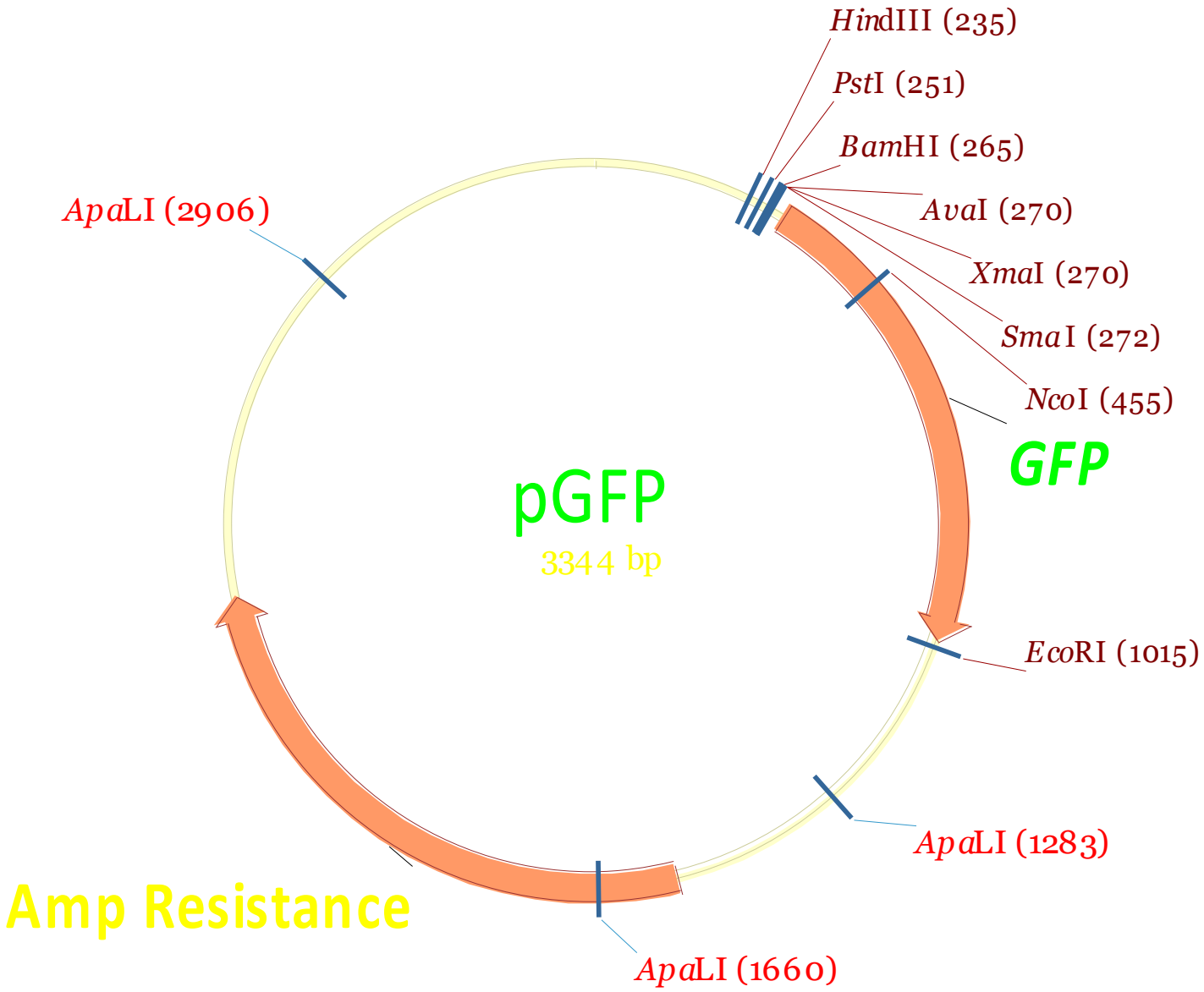
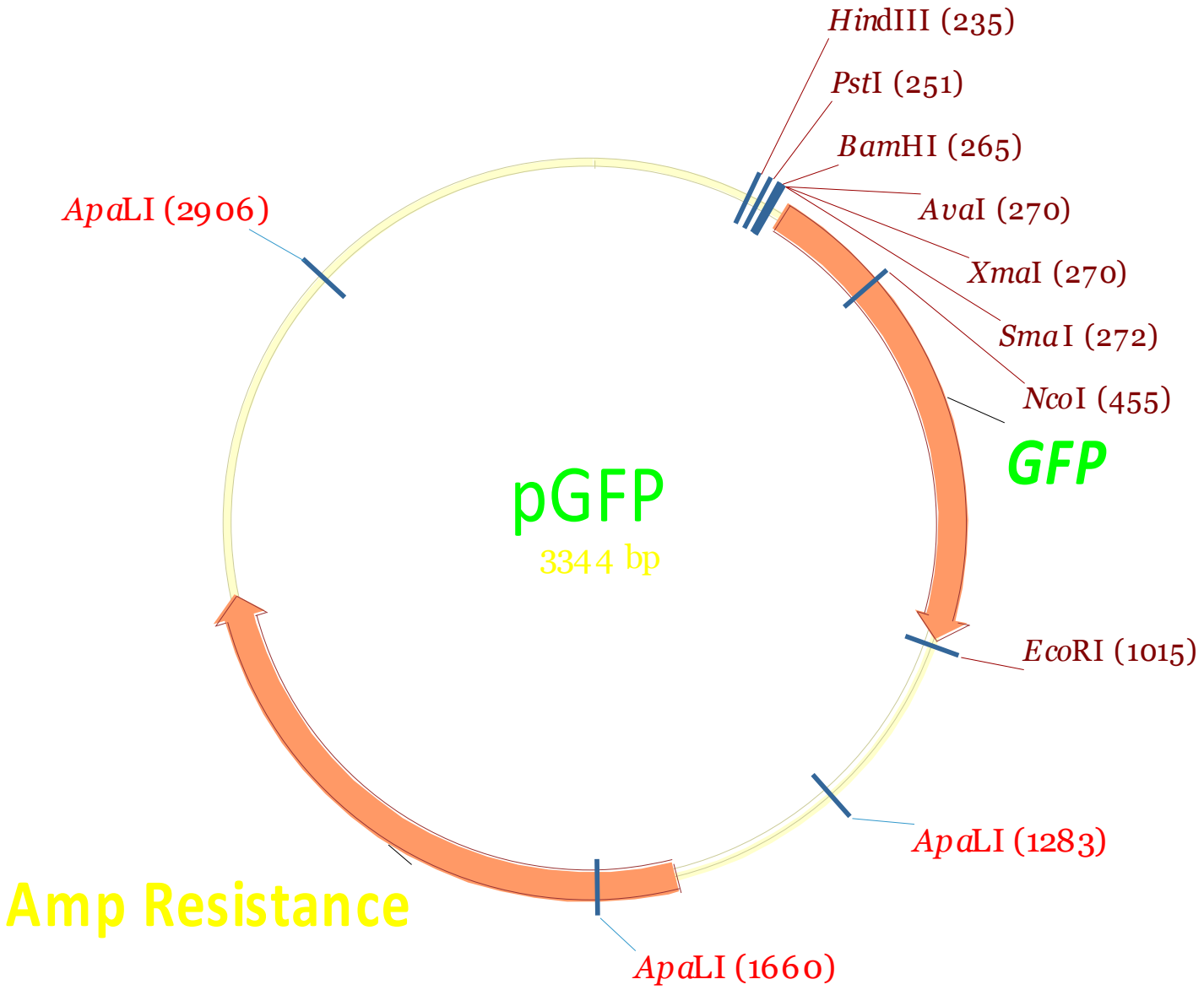


Image Credit: https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/a/overview-dna-cloning

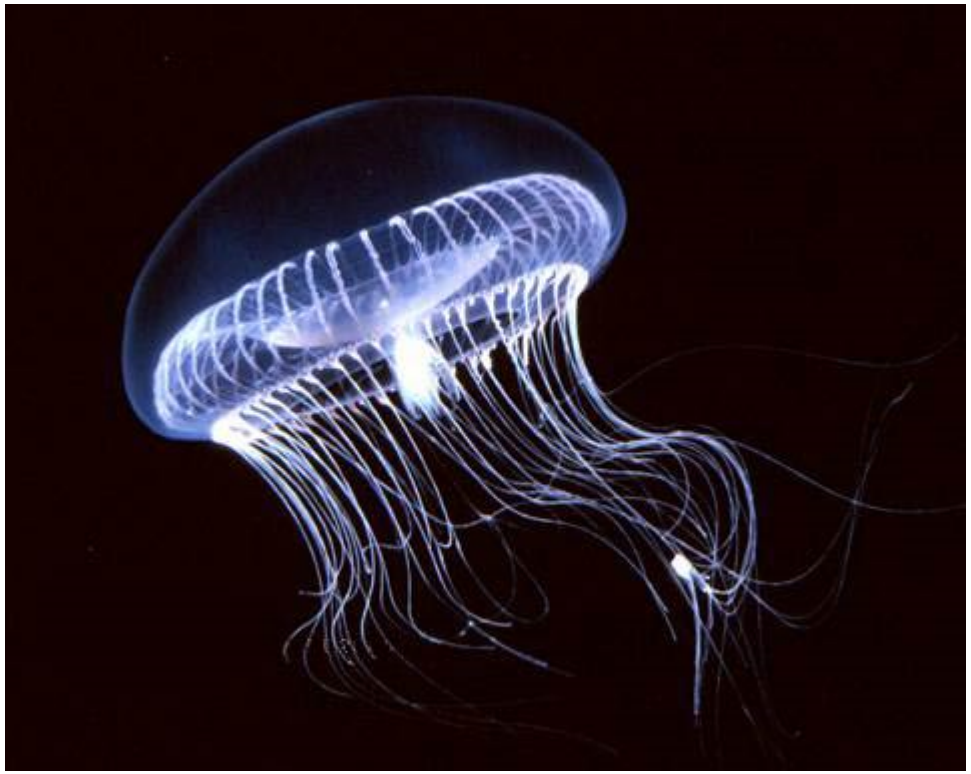
pGFP plasmid



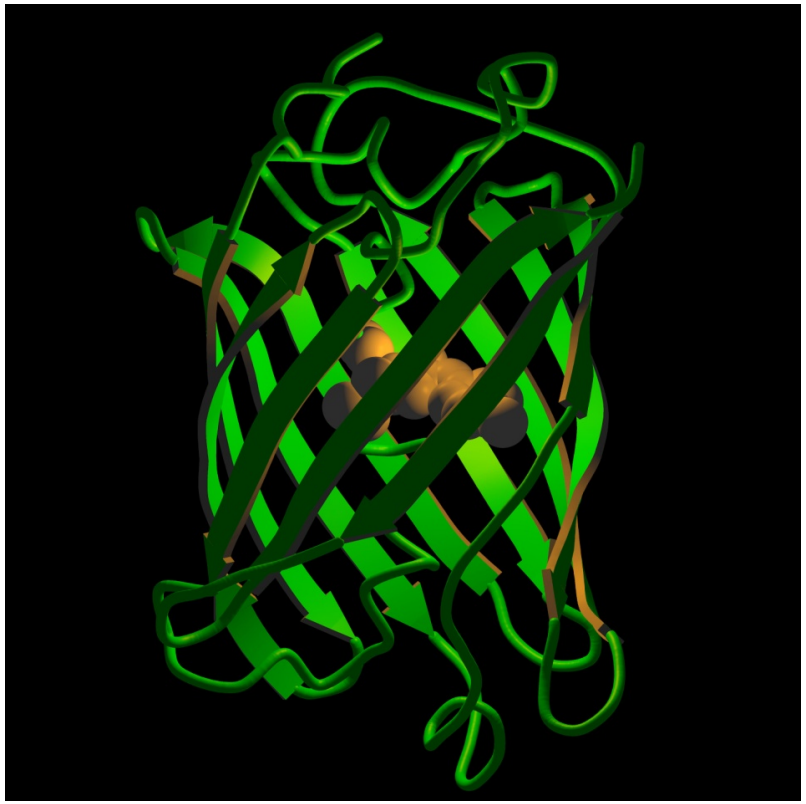
pGFP plasmid



Green Fluorescent Protein



A. Victoria



GFP Protein Structure

Bacterial Transformation

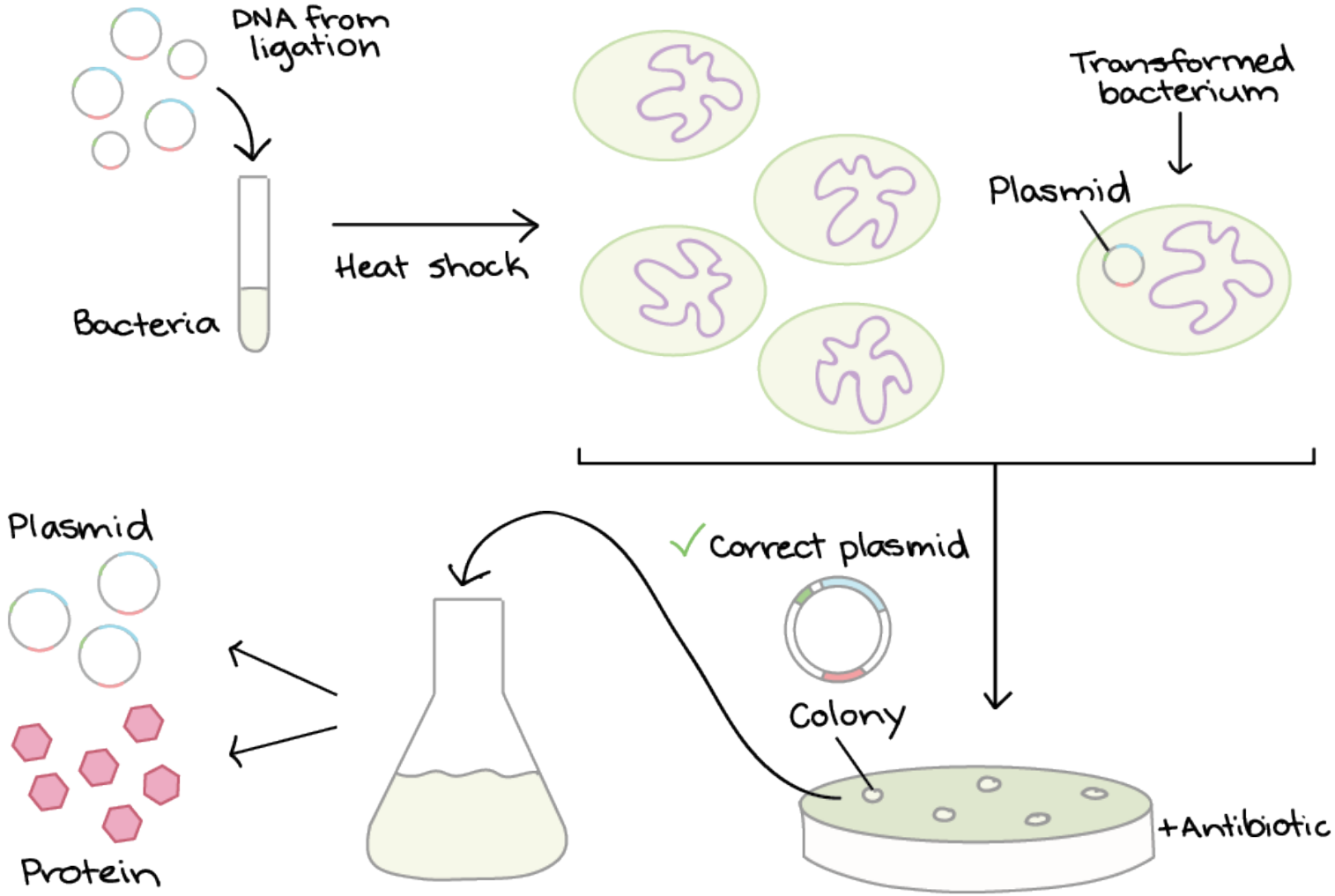


Image Credit: https://www.khanacademy.org/science/biology/biotech-dna-technology/dna-cloning-tutorial/a/bacterial-transformation-selection