



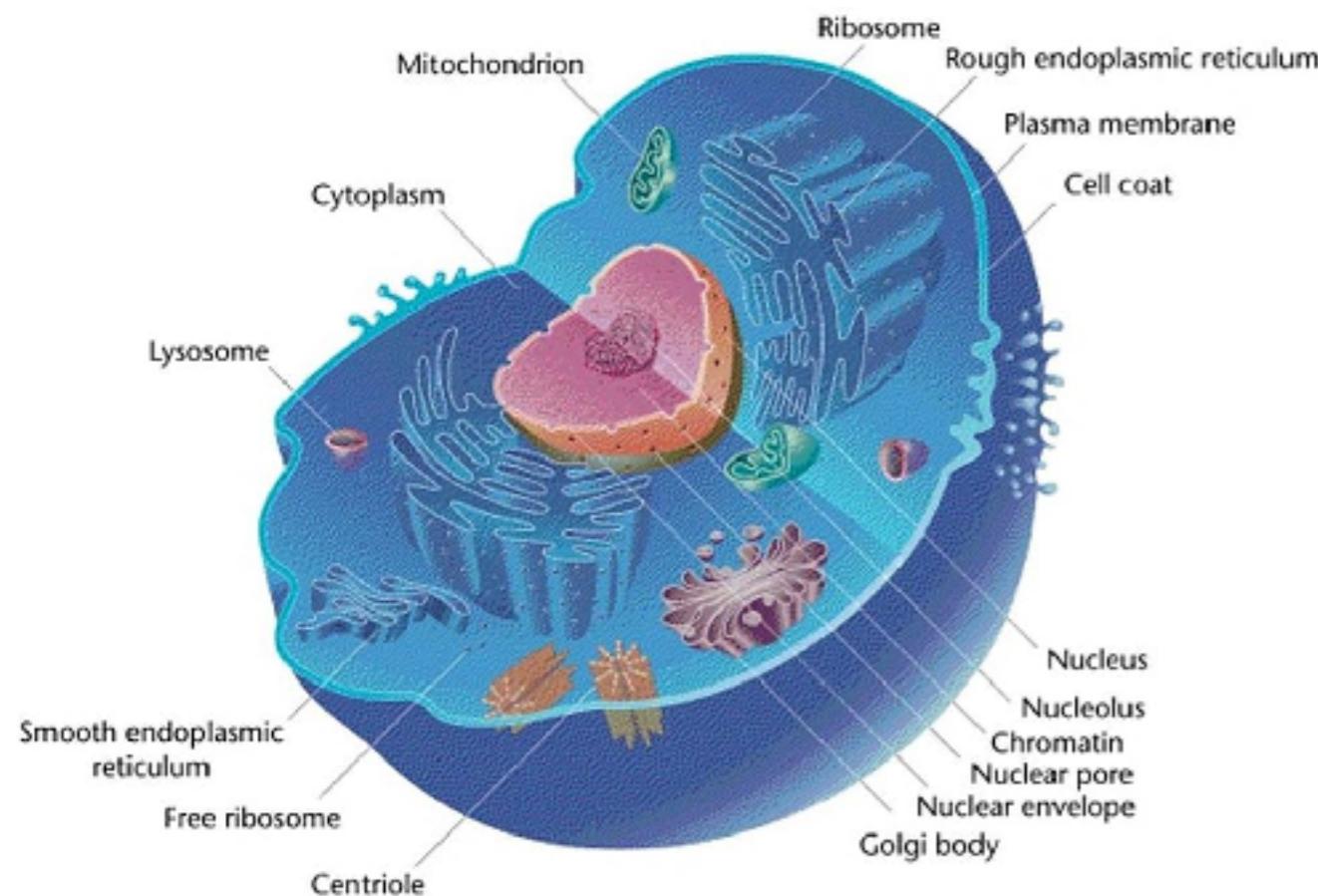
waag
wetlab amsterdam

BioHack Academy
Genetics

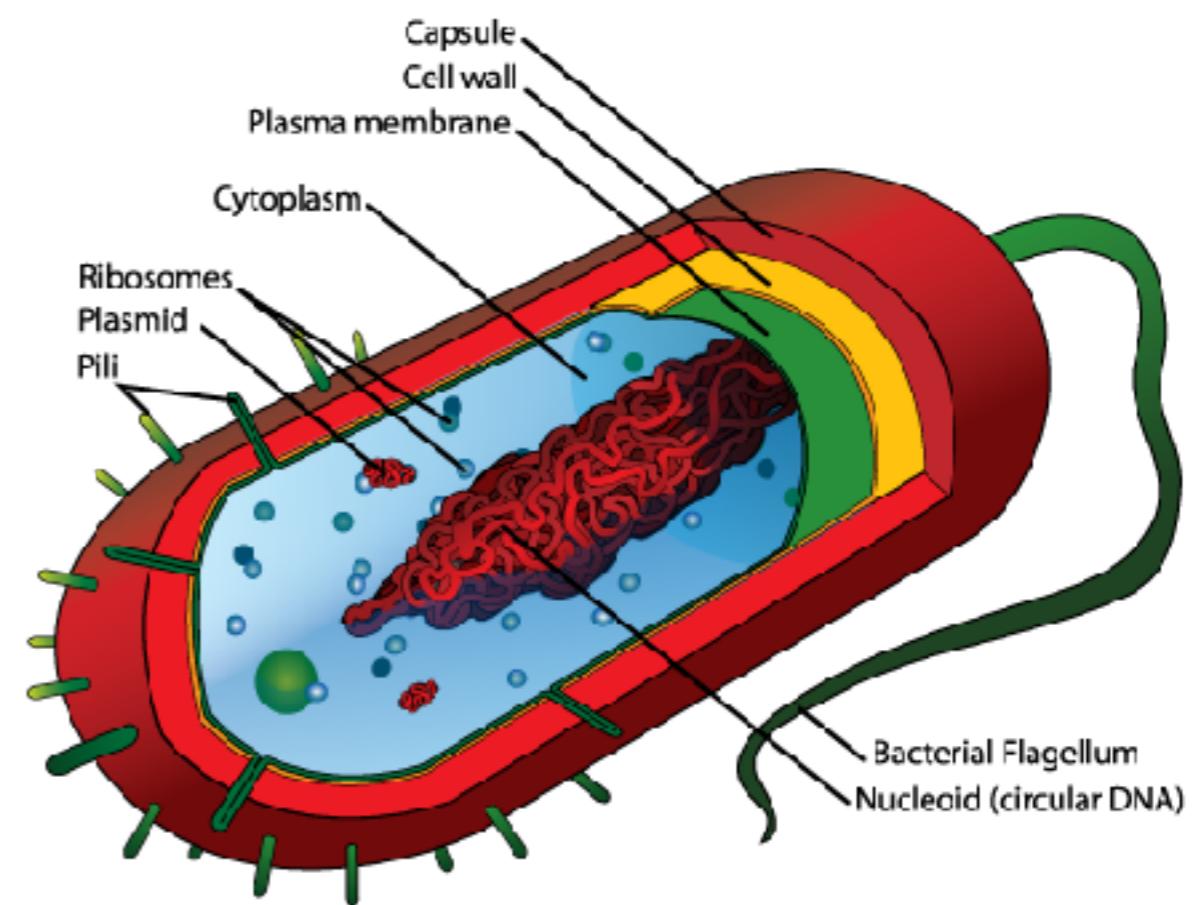


DNA in cells

Eukaryotic cell

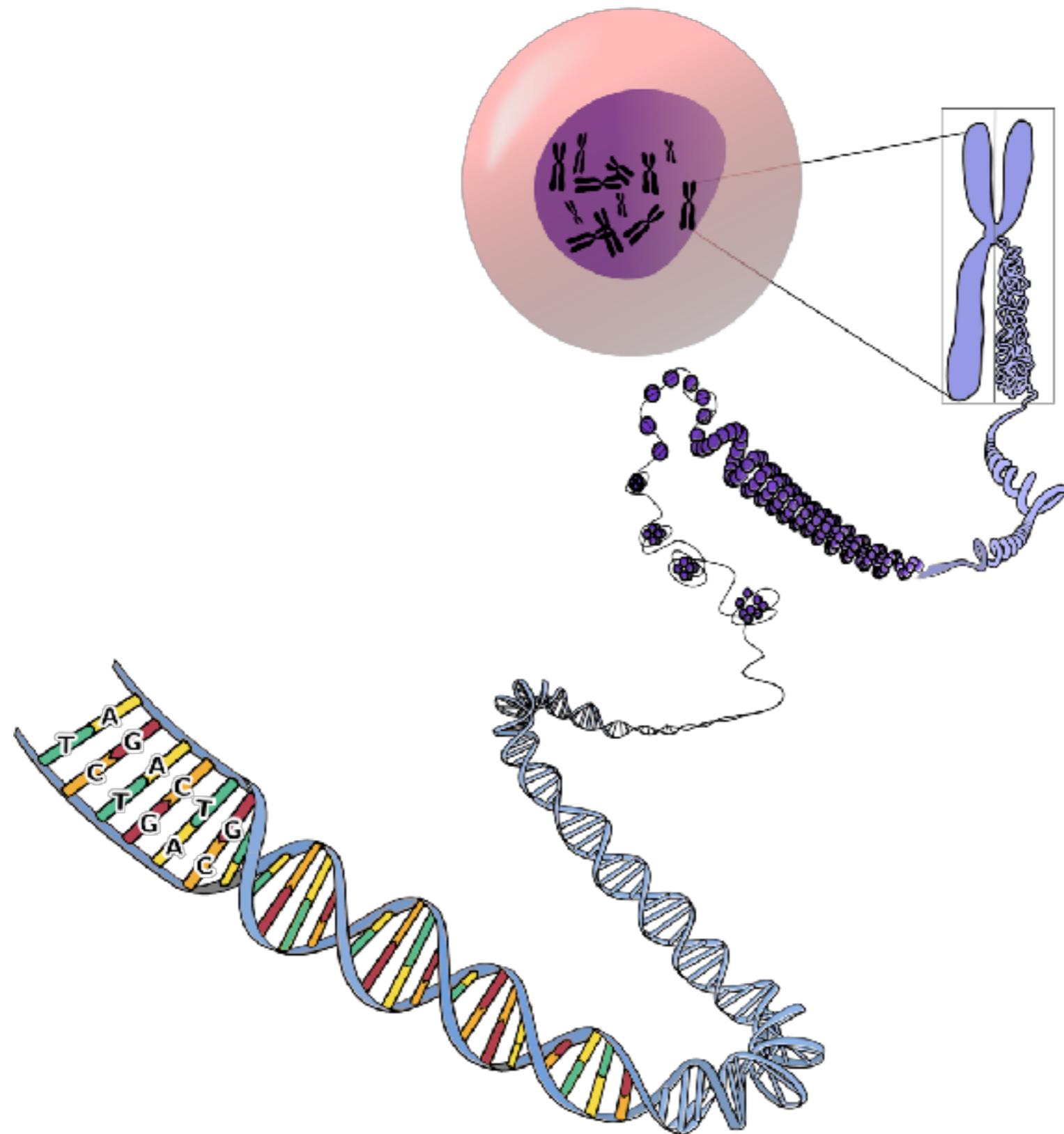


Prokaryotic cell





DNA in the cell





10^1 meter





10^0 meter





10^{-1} meter





10^{-2} meter





10^{-3} meter



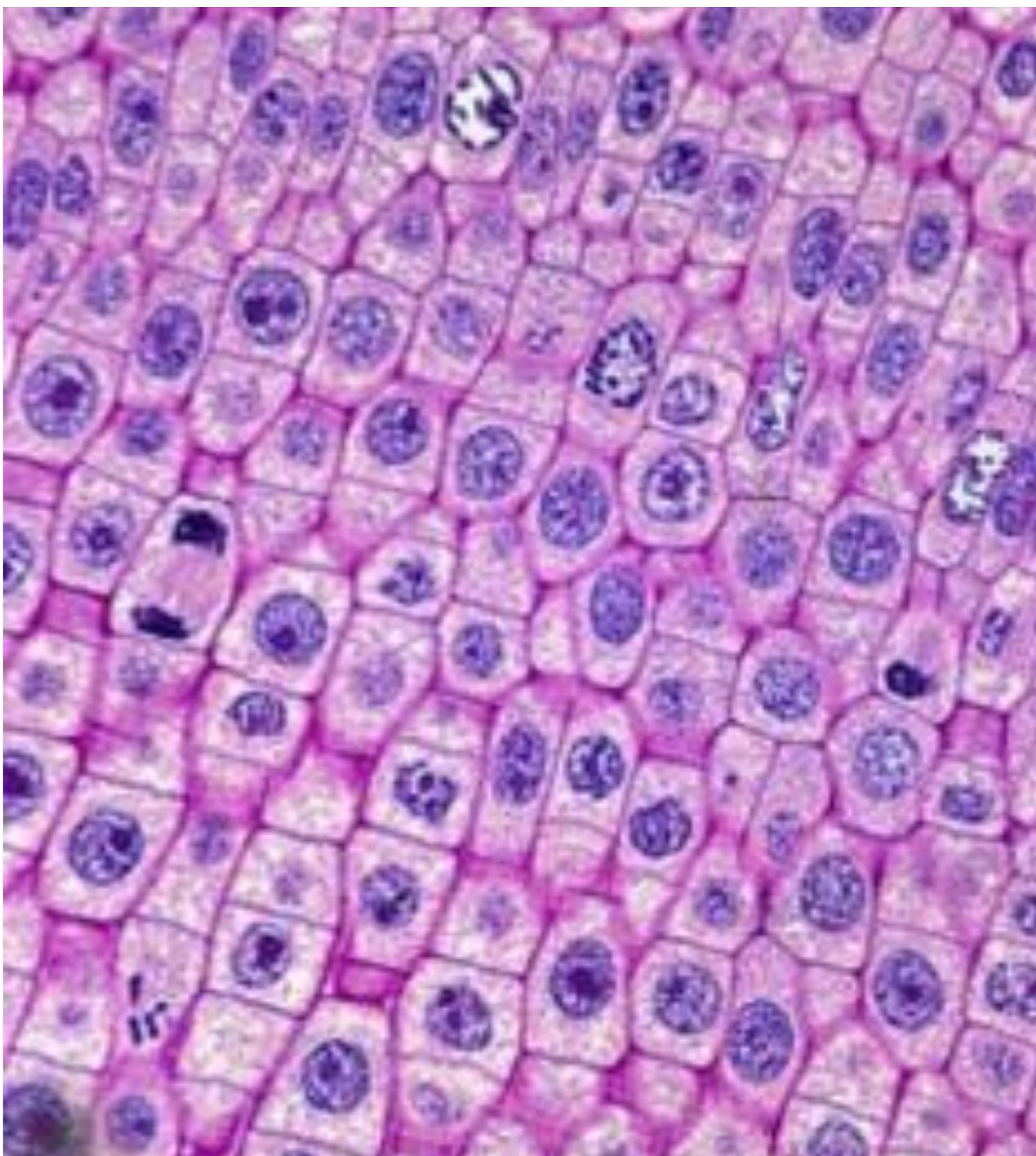


10^{-4} meter



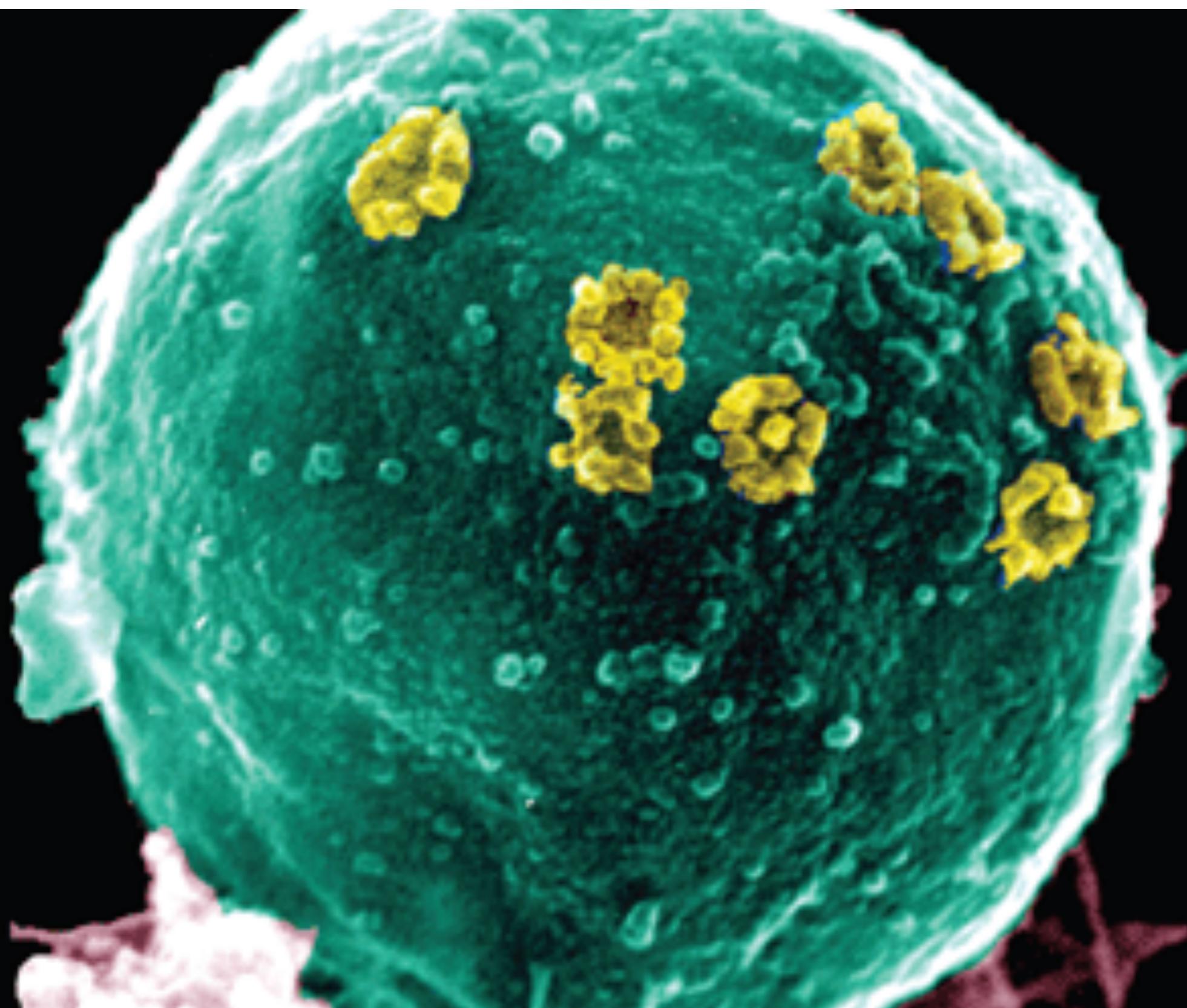


10^{-5} meter



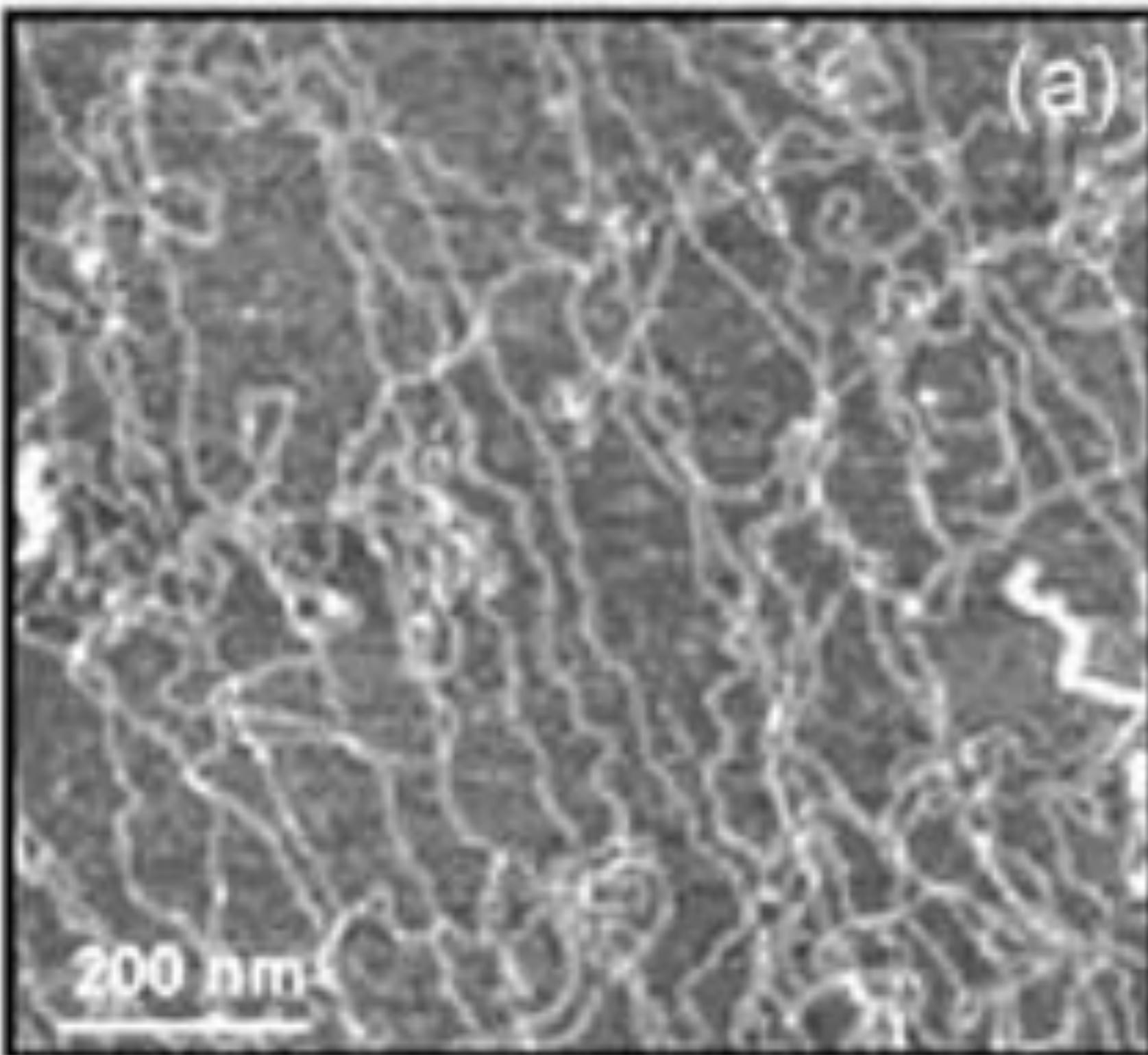


10^{-6} meter





10^{-7} meter

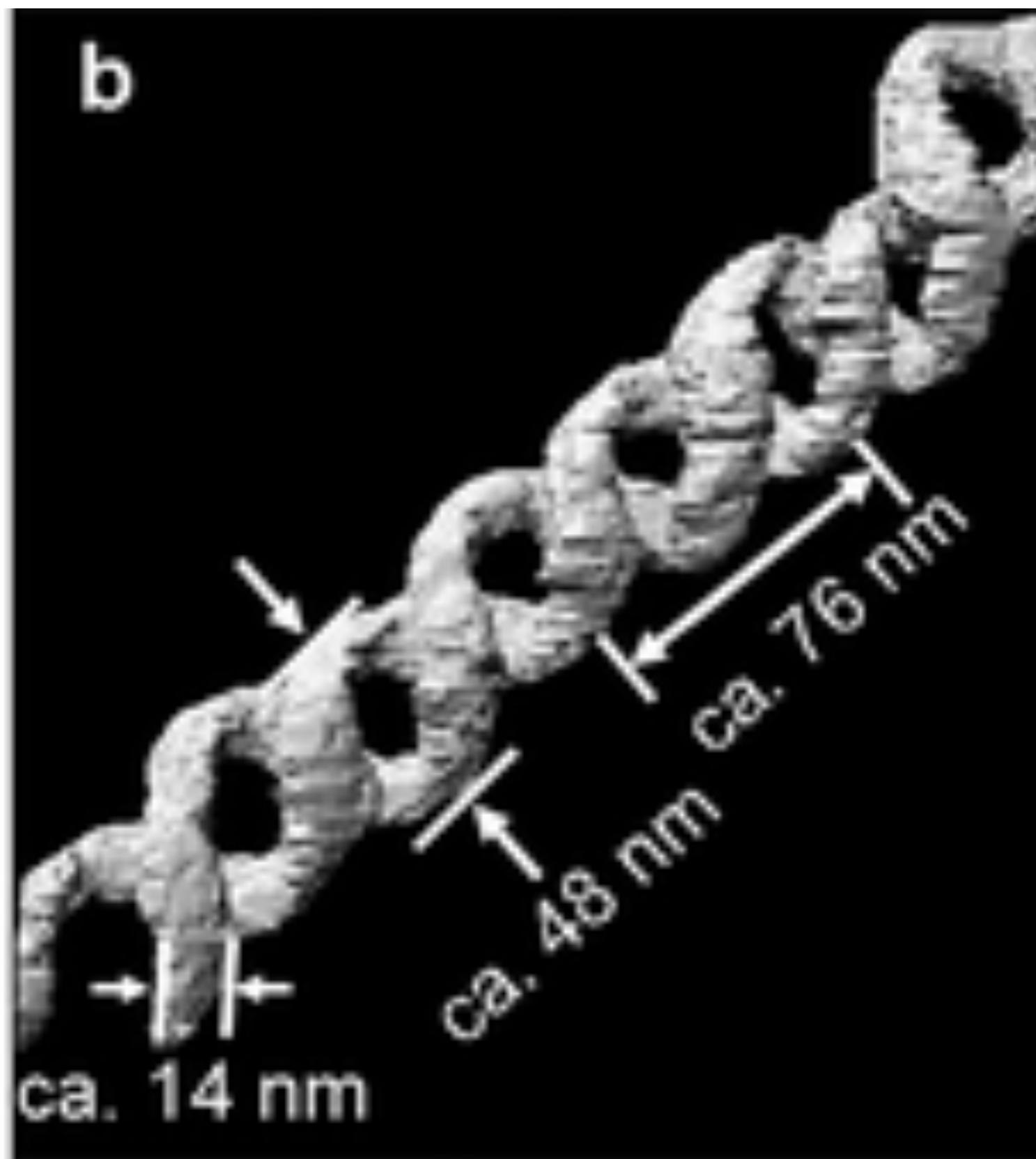




10⁻⁸ meter



a

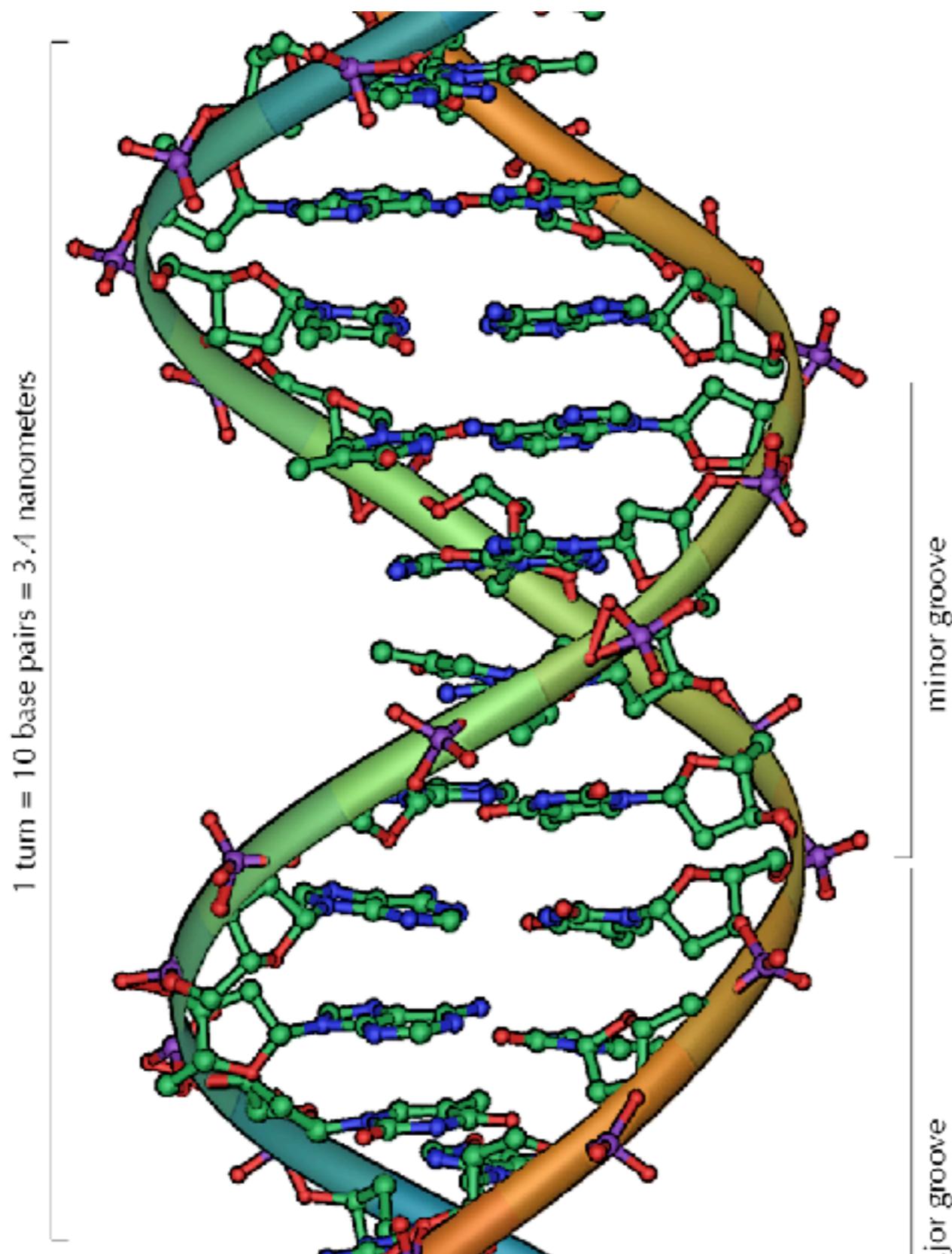


b



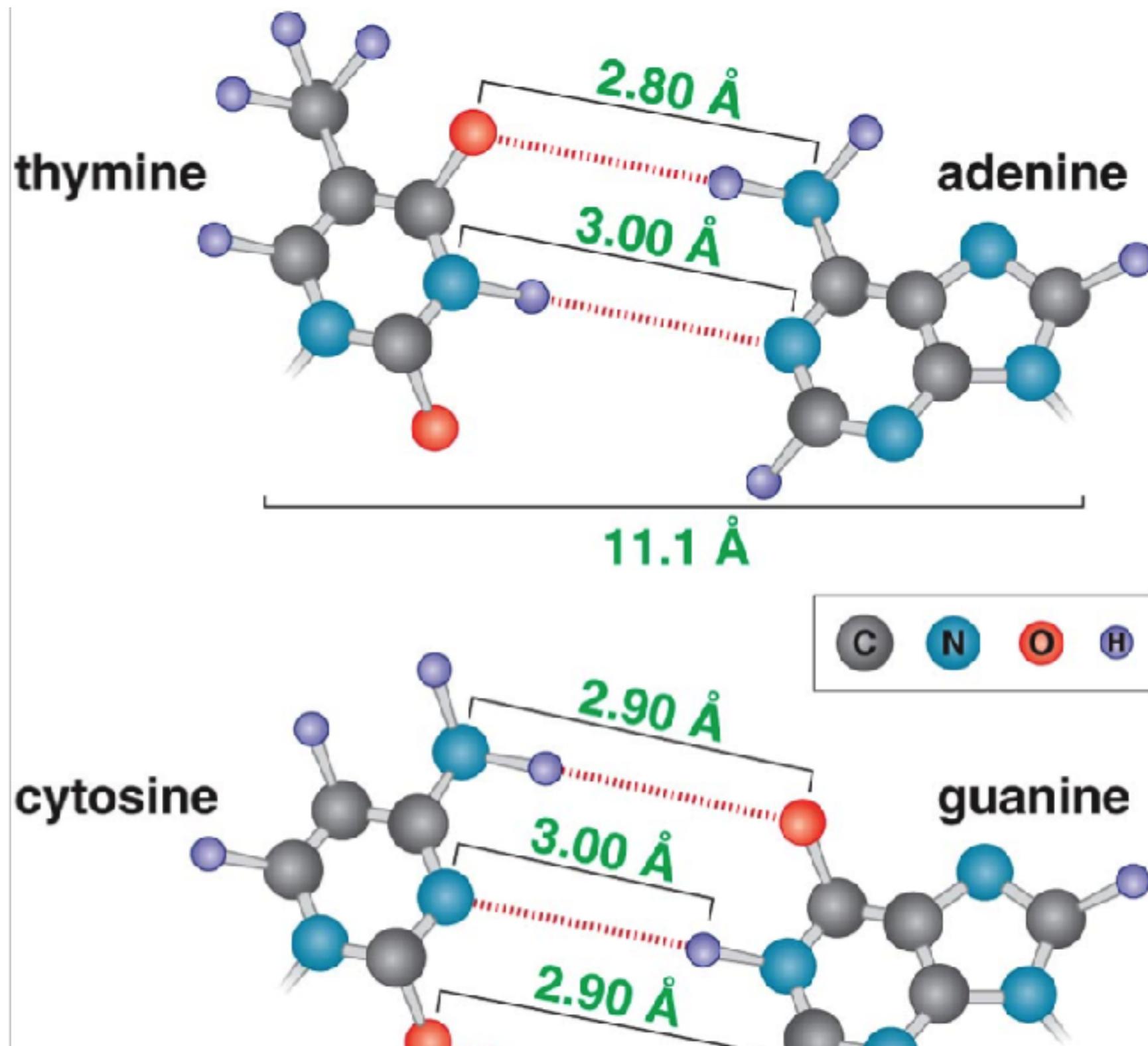


10^{-9} meter





10^{-10} meter





DNA Replication

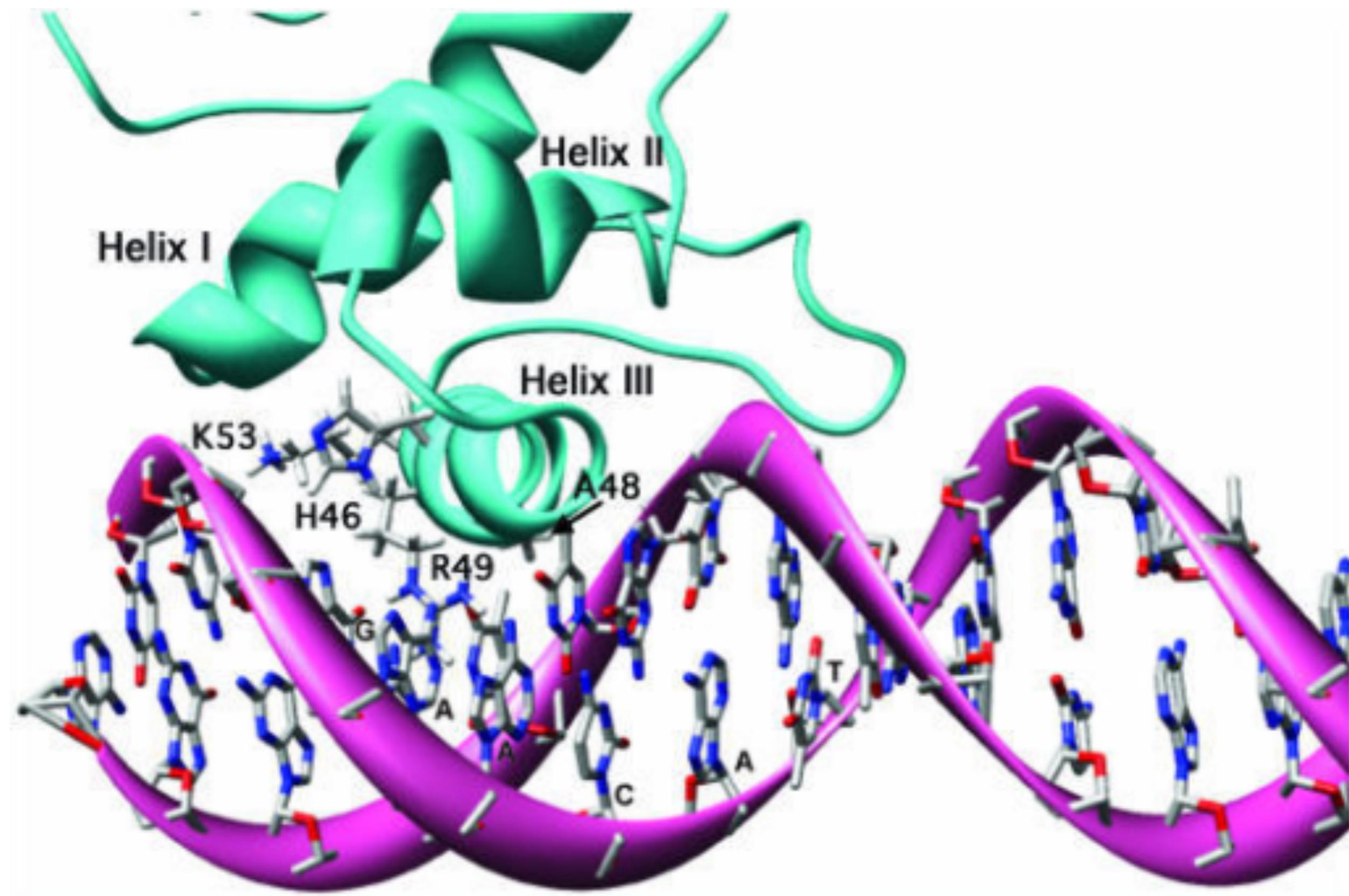


OpenStax College - CC-BY-SA 3.0

- Adenine
- Thymine
- Cytosine
- Guanine



DNA docking





DNA probe

DNA or RNA fragment with a radioactive or fluorescent marker attached

When placed in the right conditions the probe will bind to a complementary DNA sequence locating a target gene

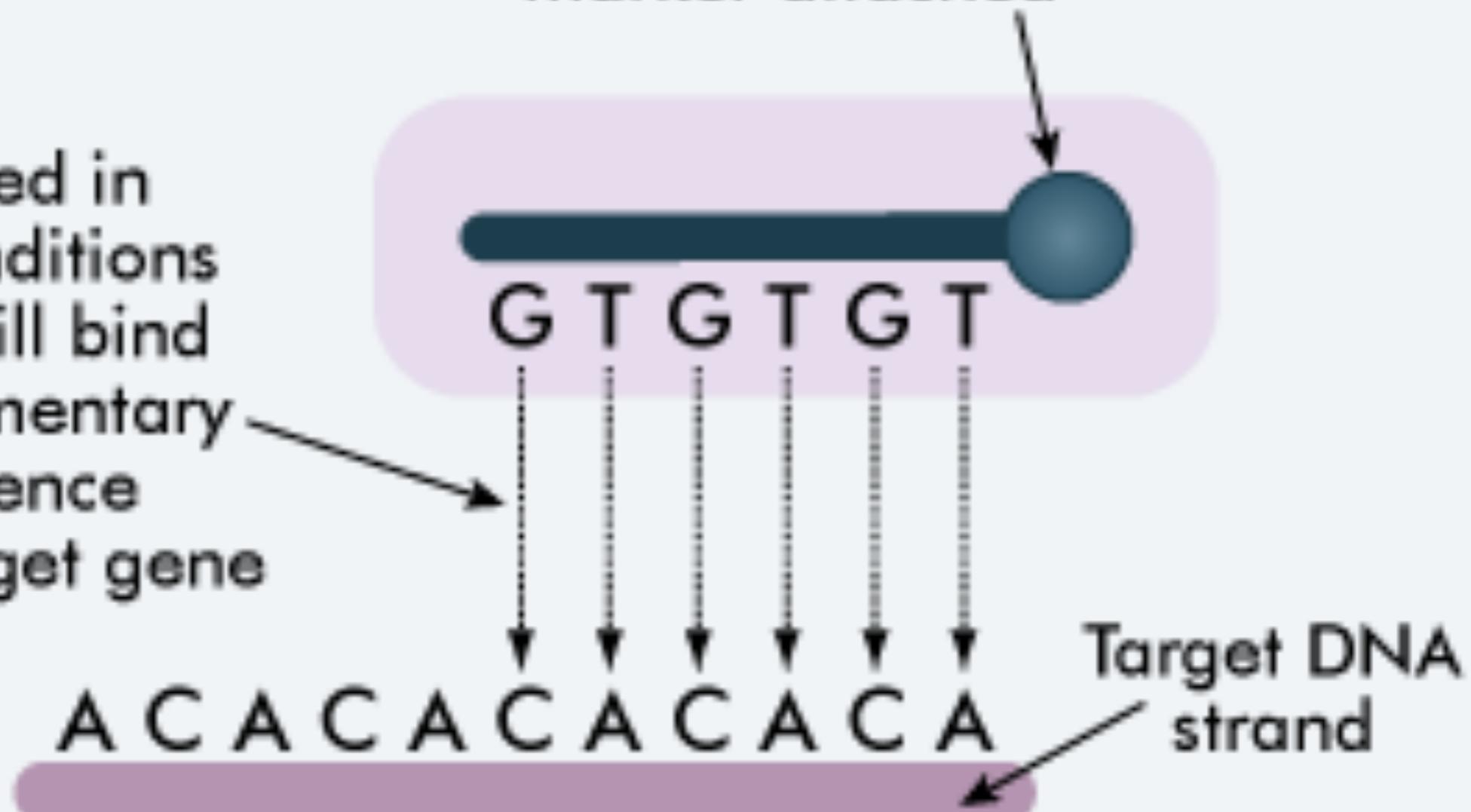
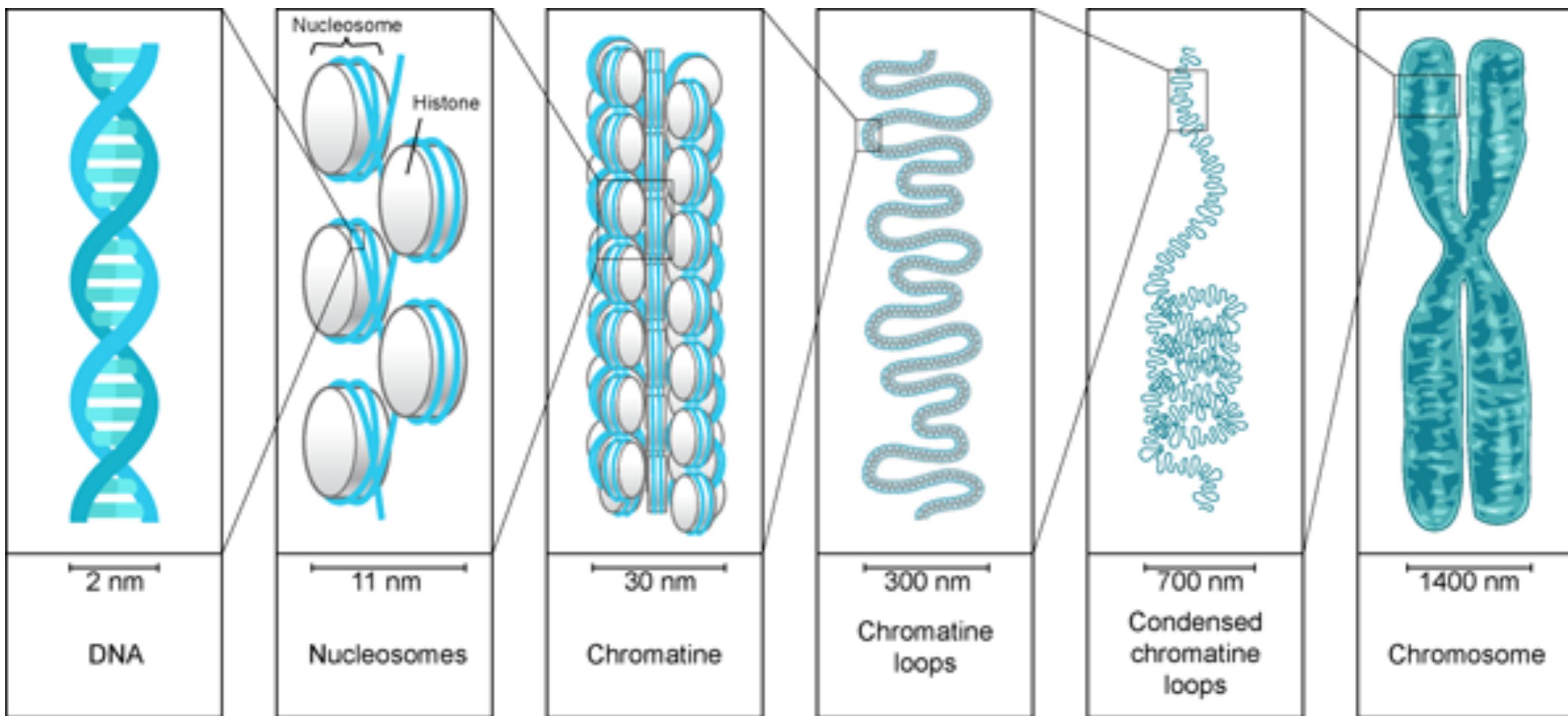


Diagram of a gene probe

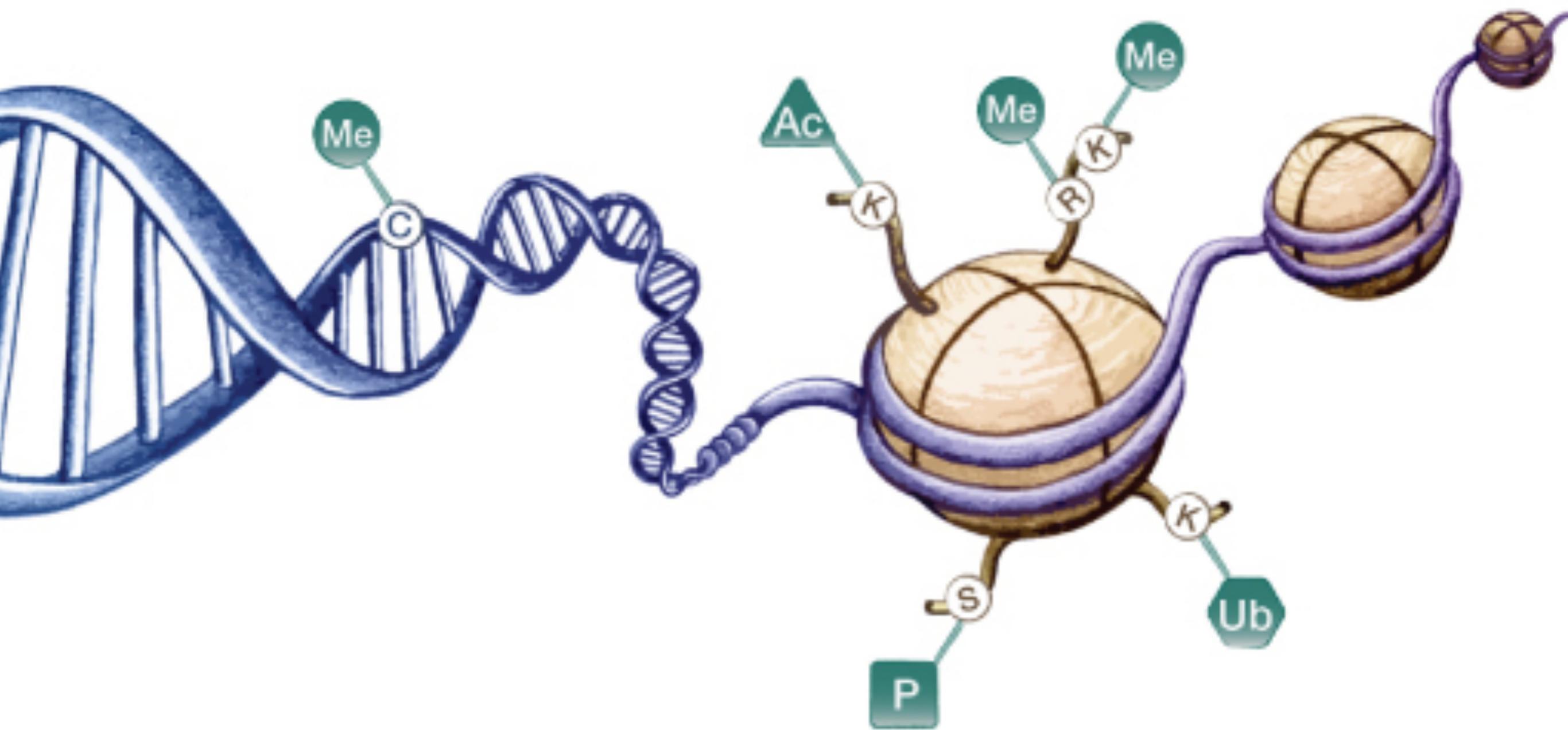


DNA condensation



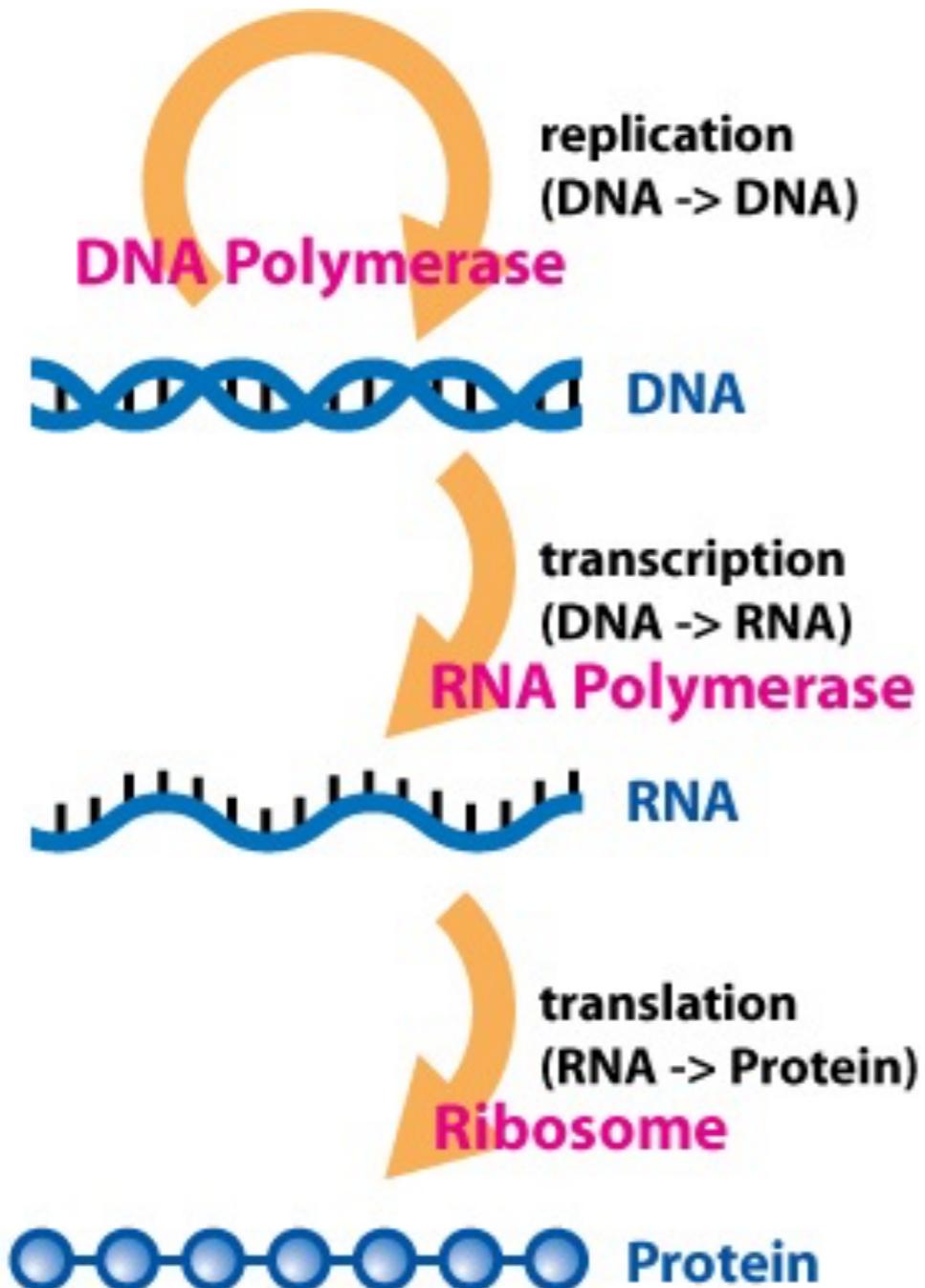


Epigenetics



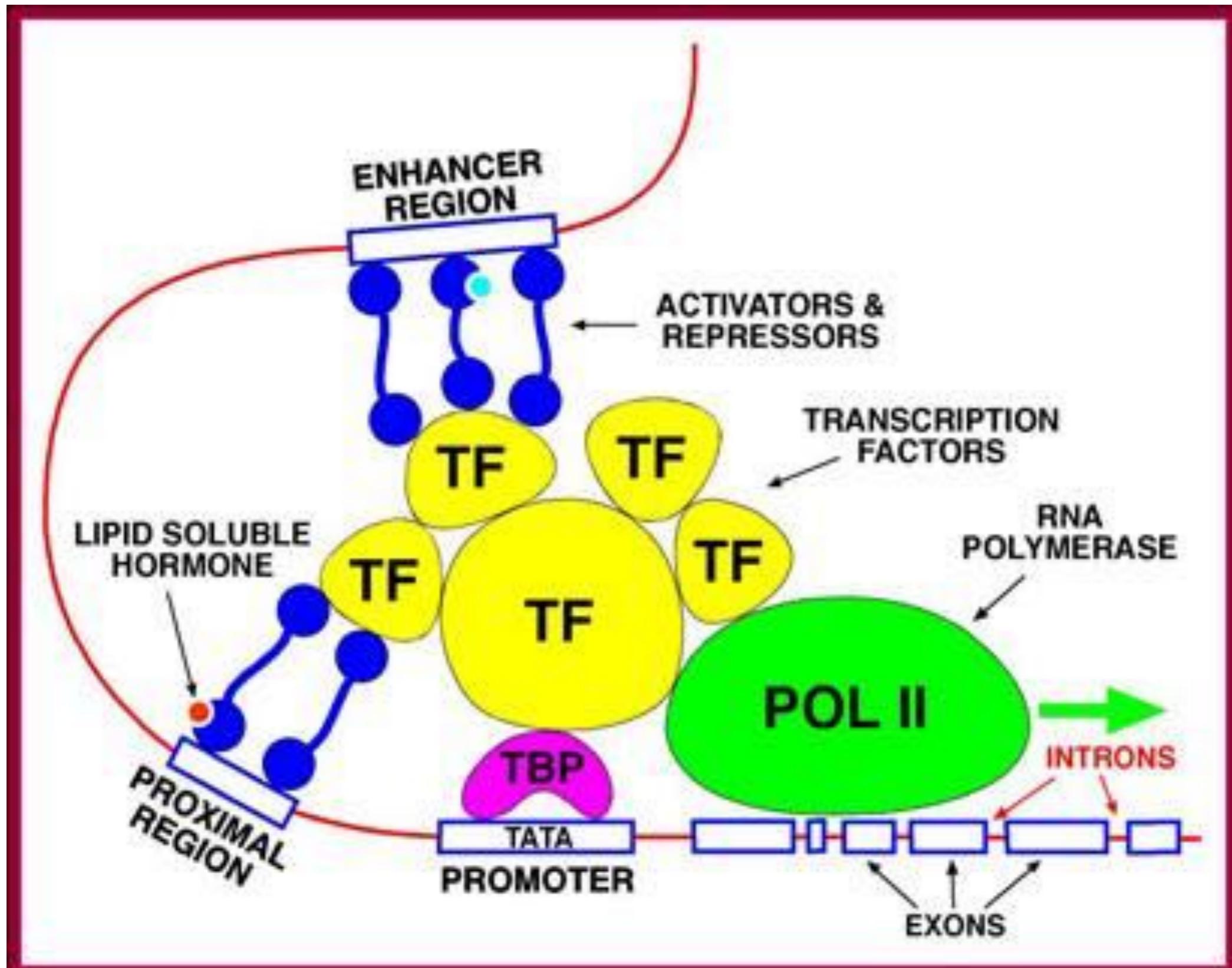


Central Dogma





DNA expression – RNA polymerase





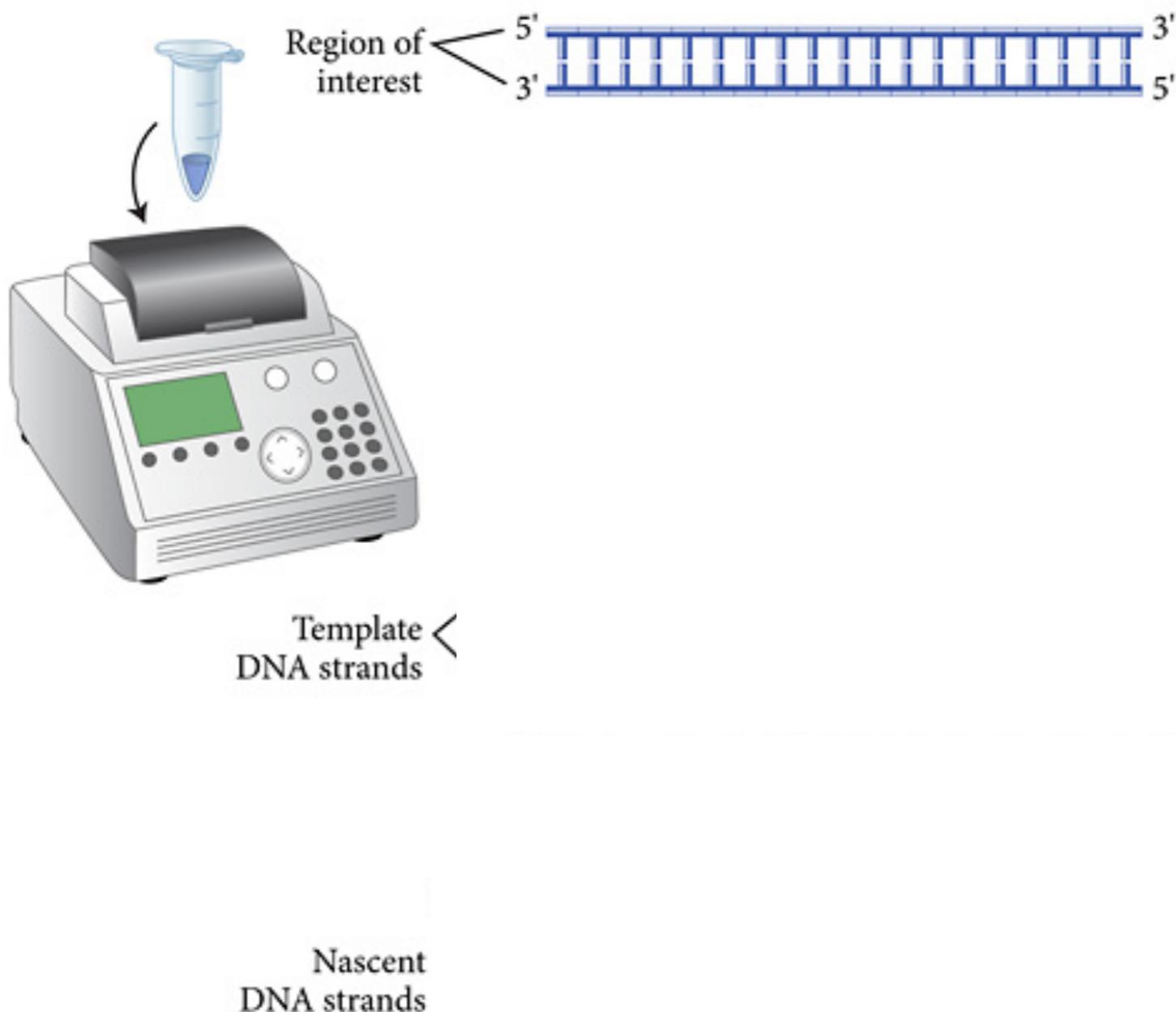
Polymerase Chain Reaction, 1983



Kary Mullis



Polymerase Chain Reaction





Polymerase Chain Reaction

1st cycle →



$$2^2 = 4 \text{ copies}$$



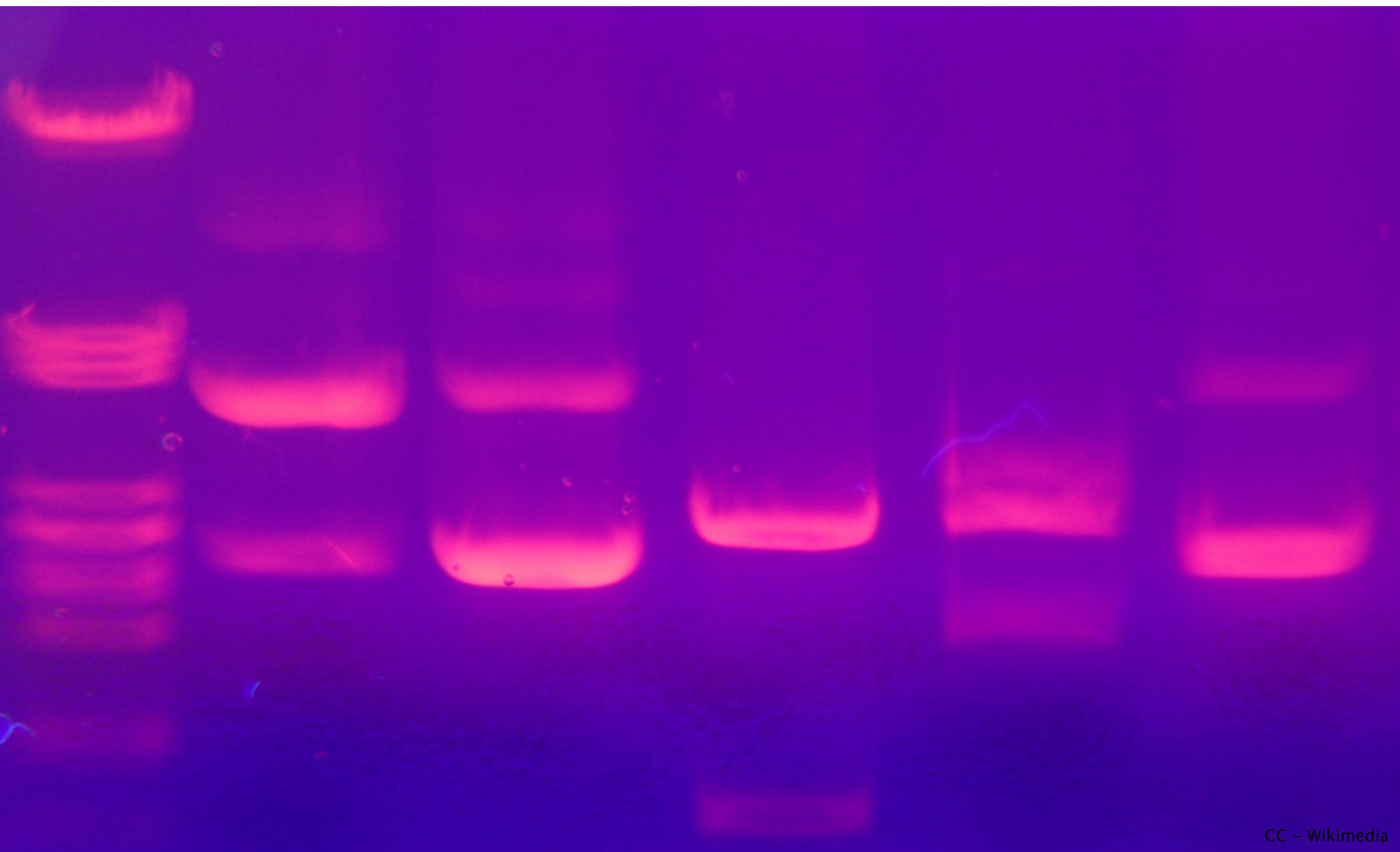
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DNA fingerprinting

a.k.a. DNA profiling, DNA typing, etc.



DNA fingerprint





Sushi test





PooPrints

PooPrints™

Match The Mess Through DNA

DNA Collection Kit

www.pooprints.com

BioPet Vet Lab

1-866-883-7589

DNA PC110
DNA PC102
DNA PC101
1-866-883-7589

Affix barcode sticker OR write dog's name here

Affix barcode sticker OR write dog's name here

Customer Information Card

Required information

Account Information

*Country: _____

*Email: _____

*Your Name: _____

*Address: _____

*City, State, Zip: _____

Phone: _____

Pet Information

Apply Barcode Sticker Here

Pet's Name: _____

Pet's Species: Dog _____ Cat _____

Where did you purchase your DNA Pet ID Kit?

Company: _____

DNA World Pet Registry

BioPet Vet Lab

A DIVISION OF BIOCIS BIOTECH CORPORATION

BioPet Vet Lab

A DIVISION OF BIOCIS BIOTECH CORPORATION

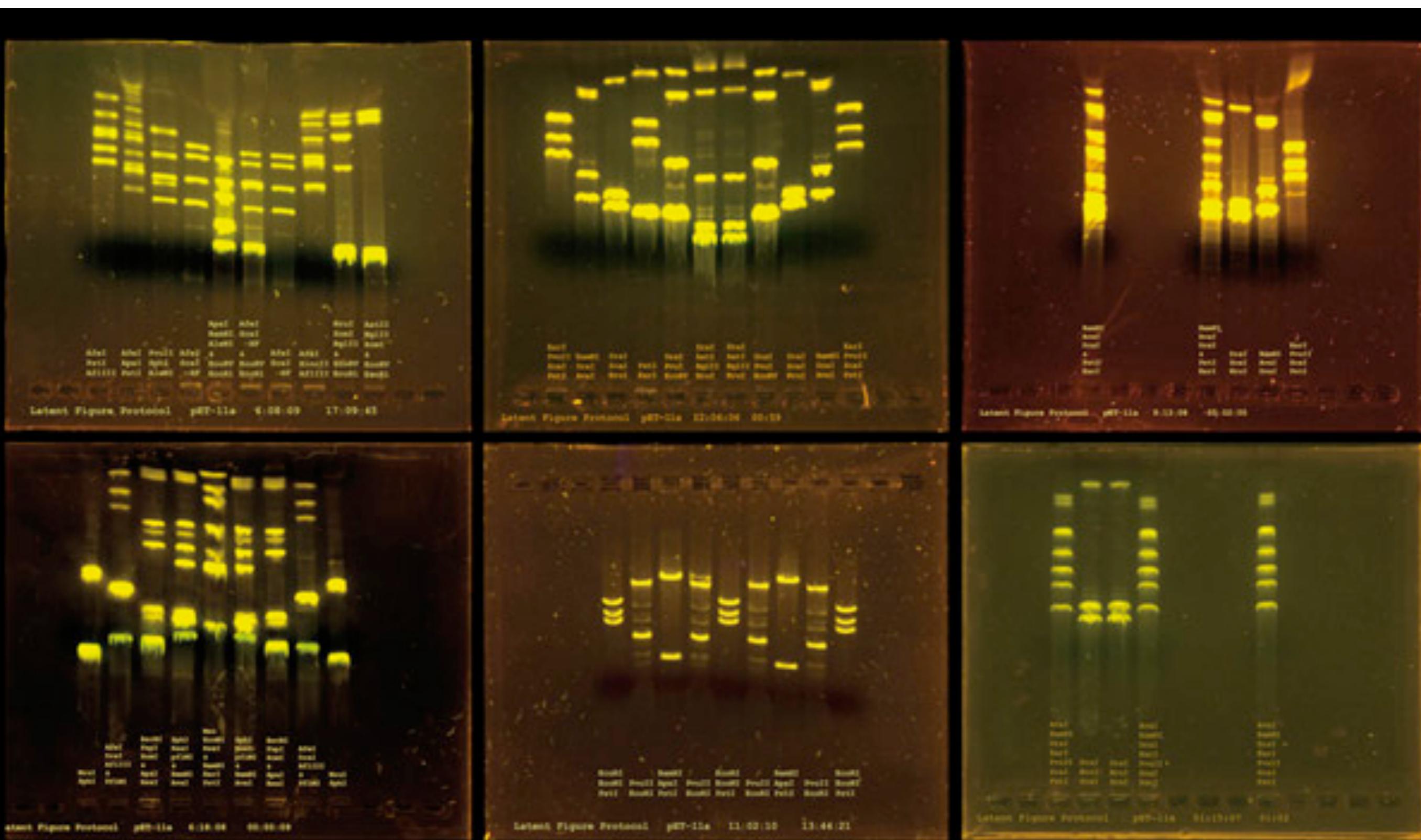


Barcode





Paul Vanouse





Paul Vanouse





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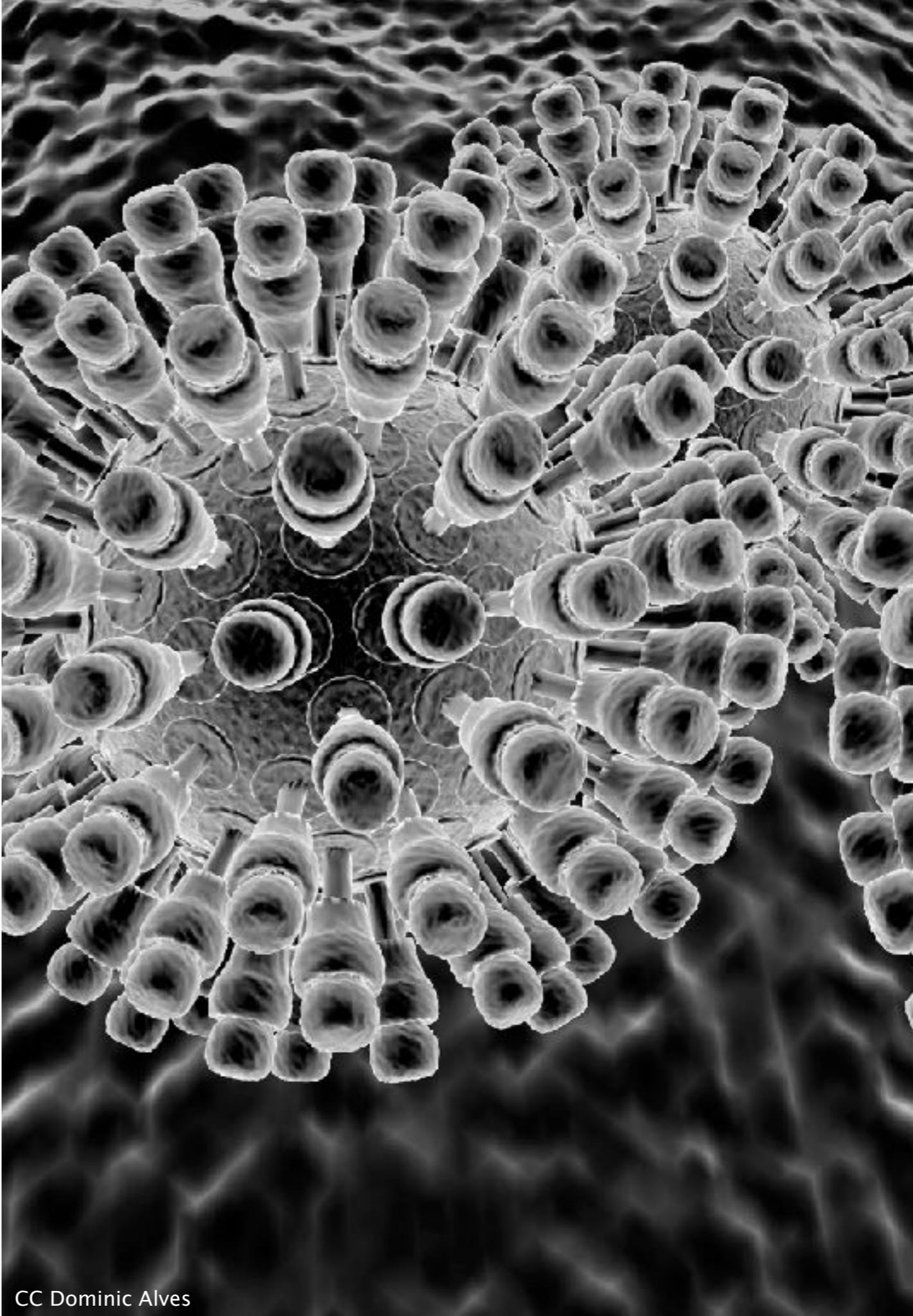
DNA restriction

a.k.a cutting DNA



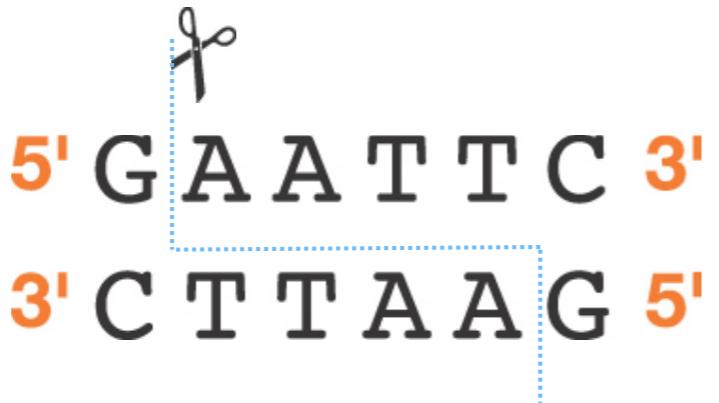
DNA restriction enzymes

- Protect against viral infections
- Over 3000 types known





EcoRI en PstI



EcoRI

- Escherichia coli
- 5 prime overlap



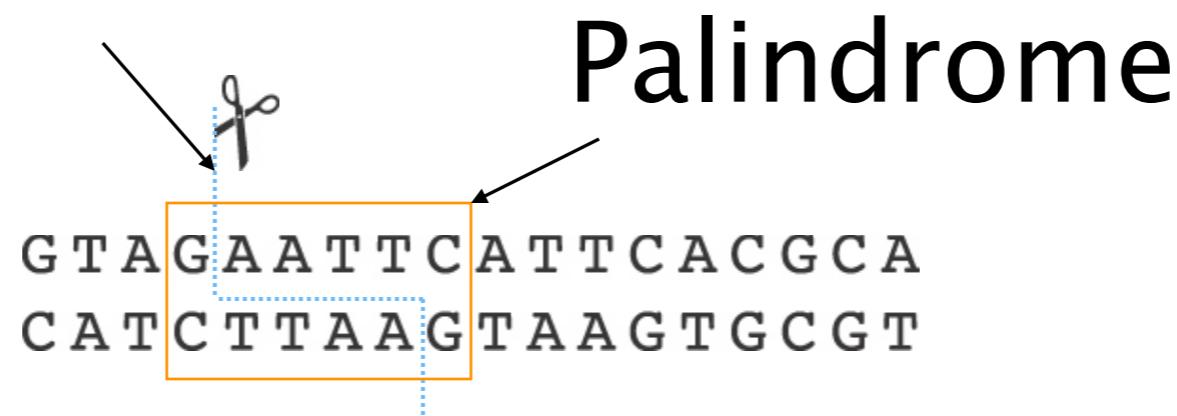
PstI

- Providencia stuartii
- 3 prime overlap



Sequence specific cuts

Restrictie site



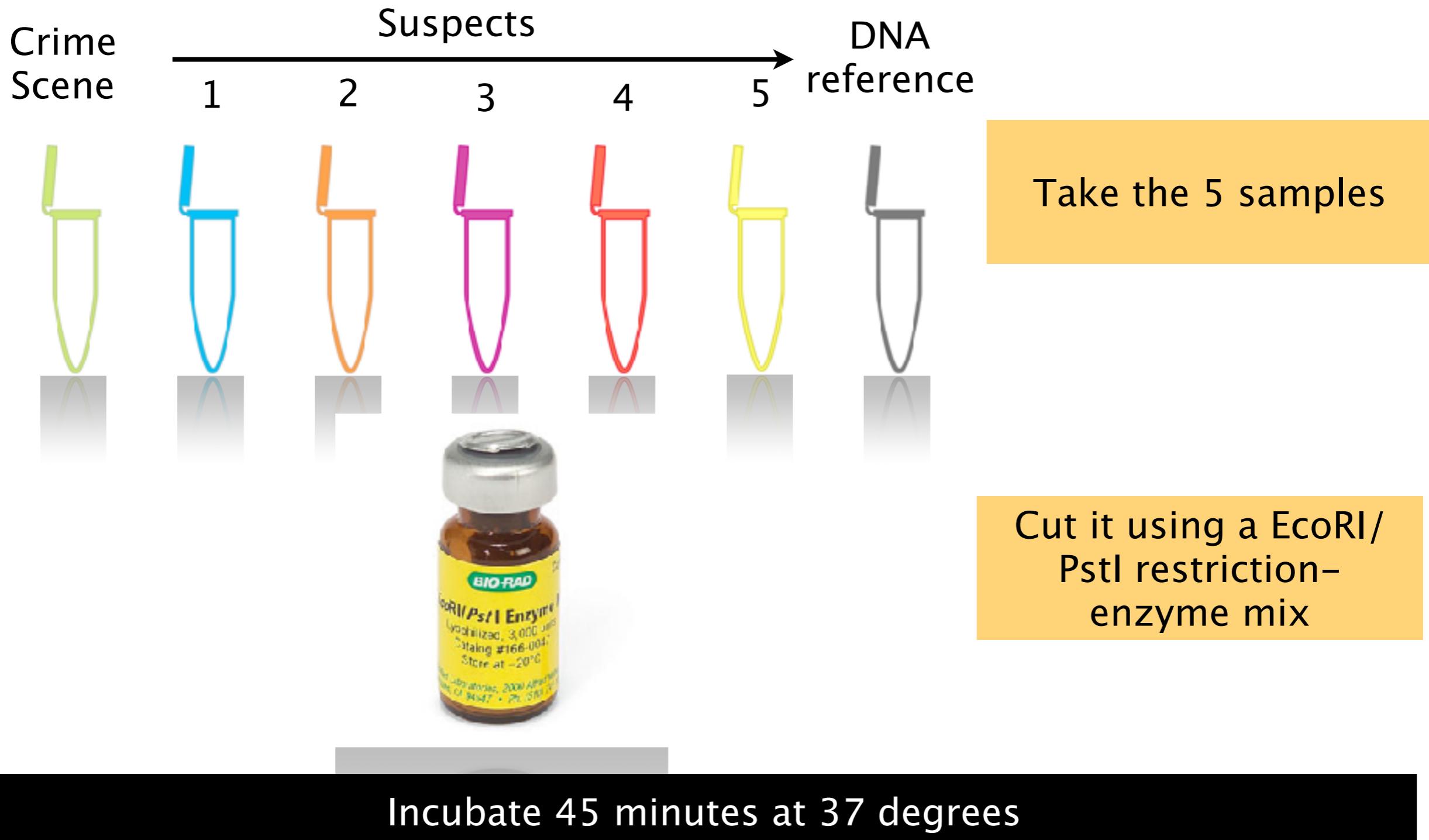
Fragment 1



Fragment 2



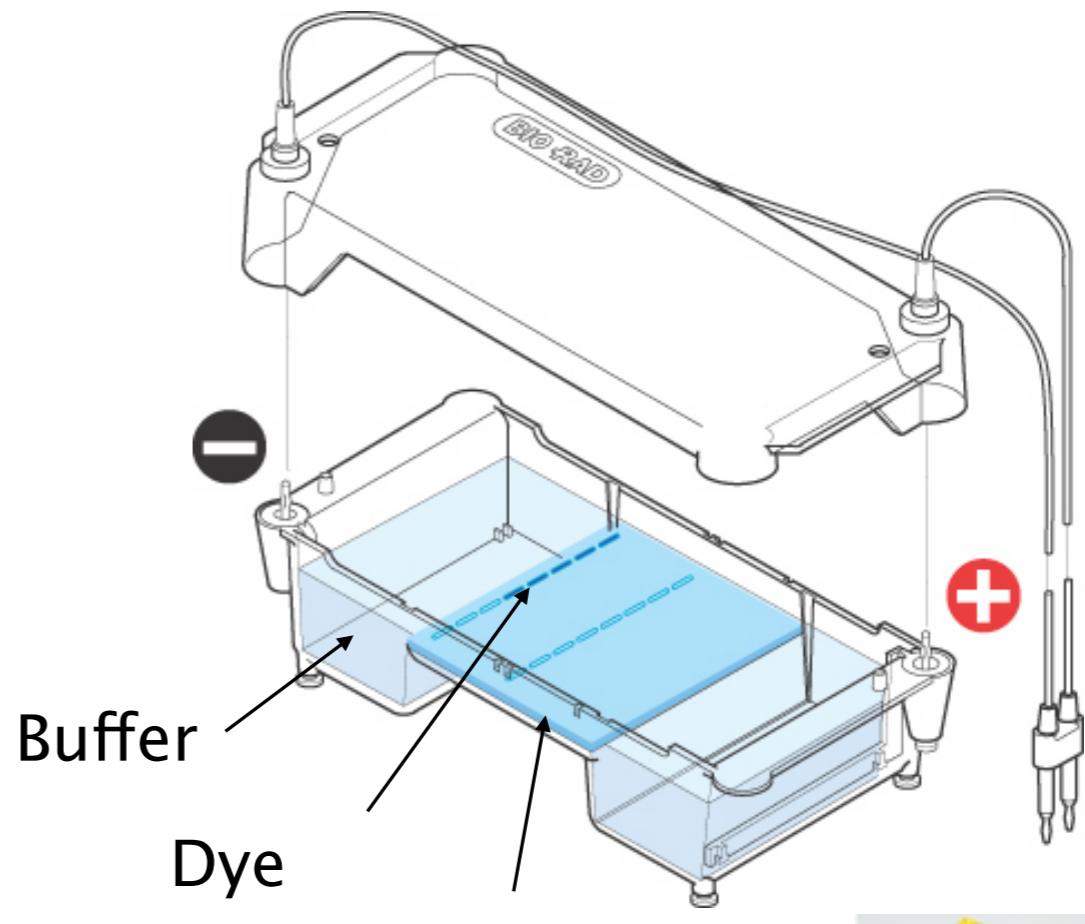
Step 1: samples and enzymes



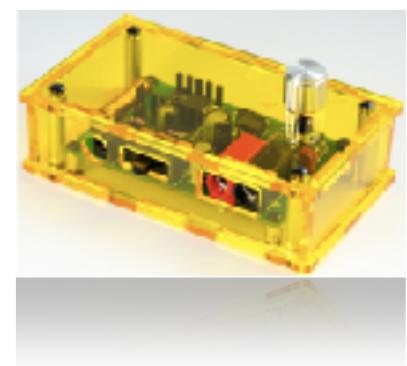


Step 2: Gel electrophoreses

DNA is attracted by the cathode (+)



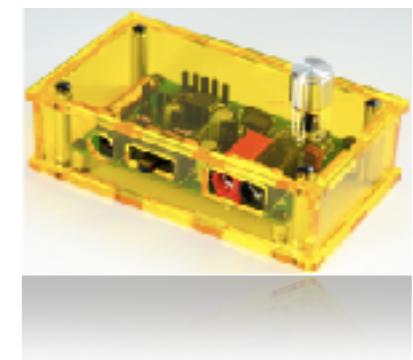
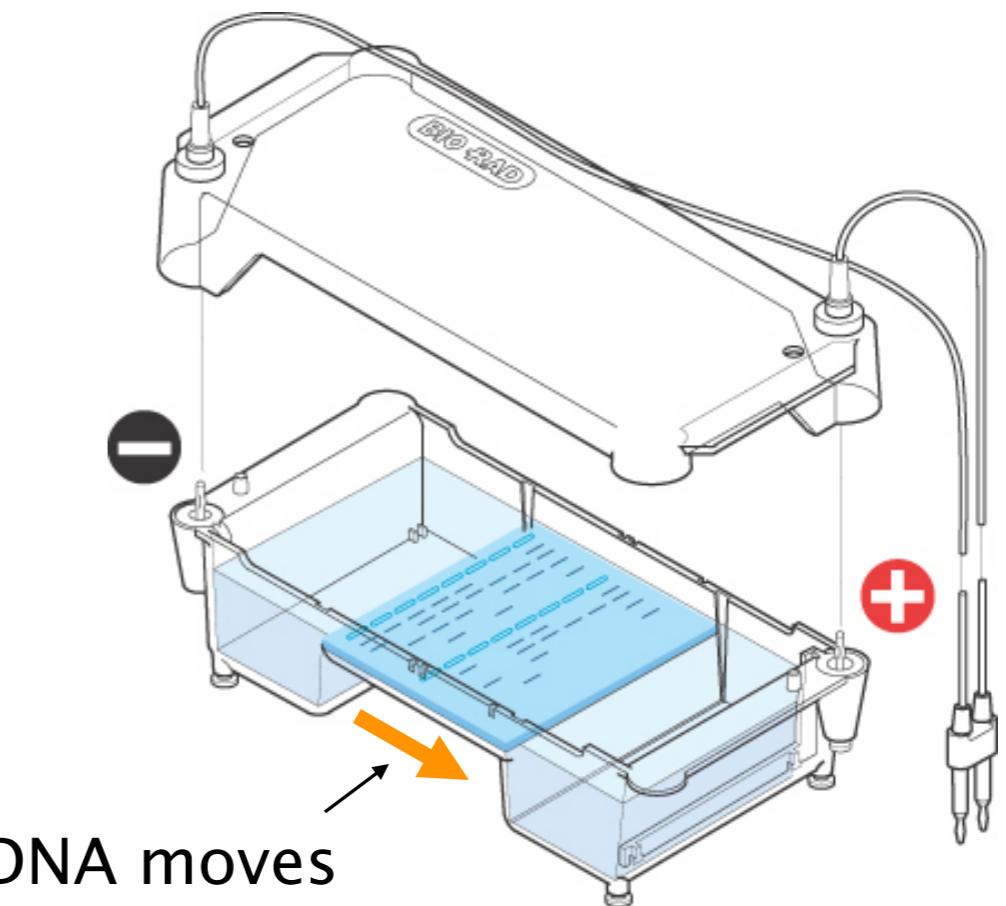
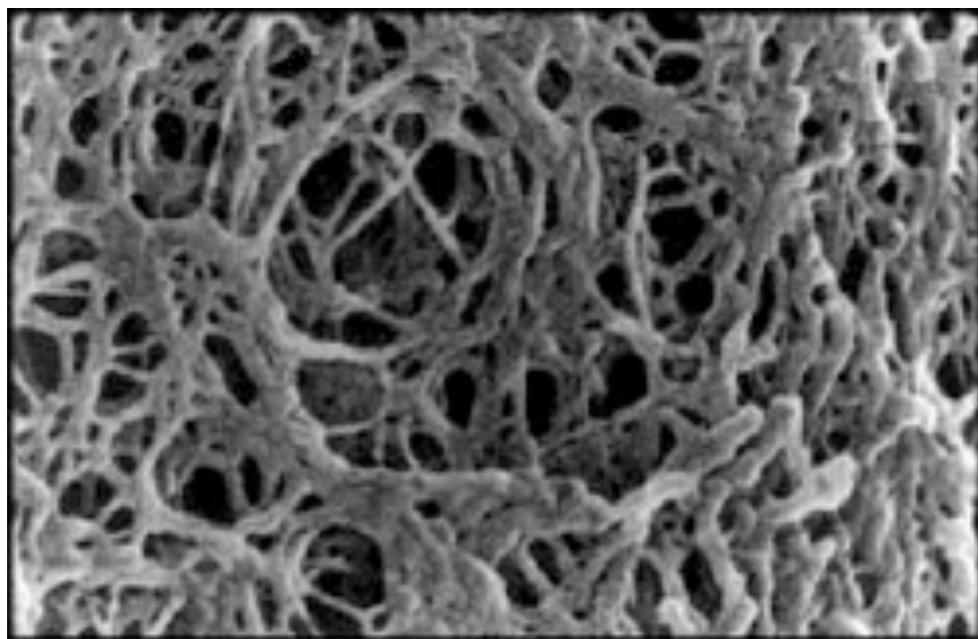
Agarose gel





Step 2: Gel electrophoreses

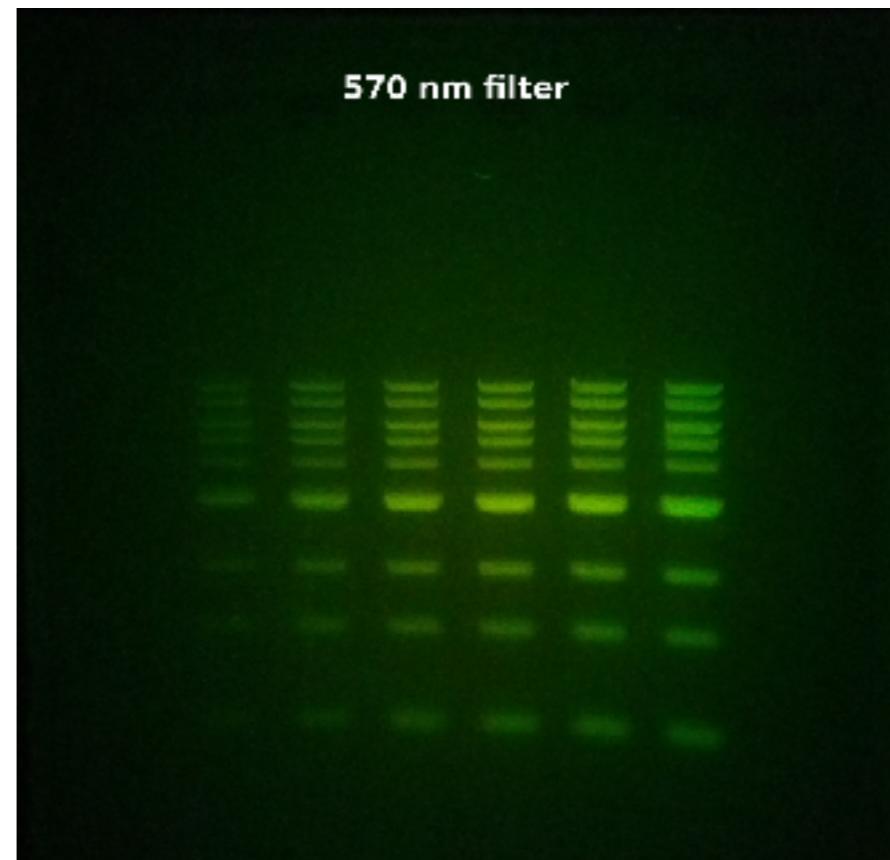
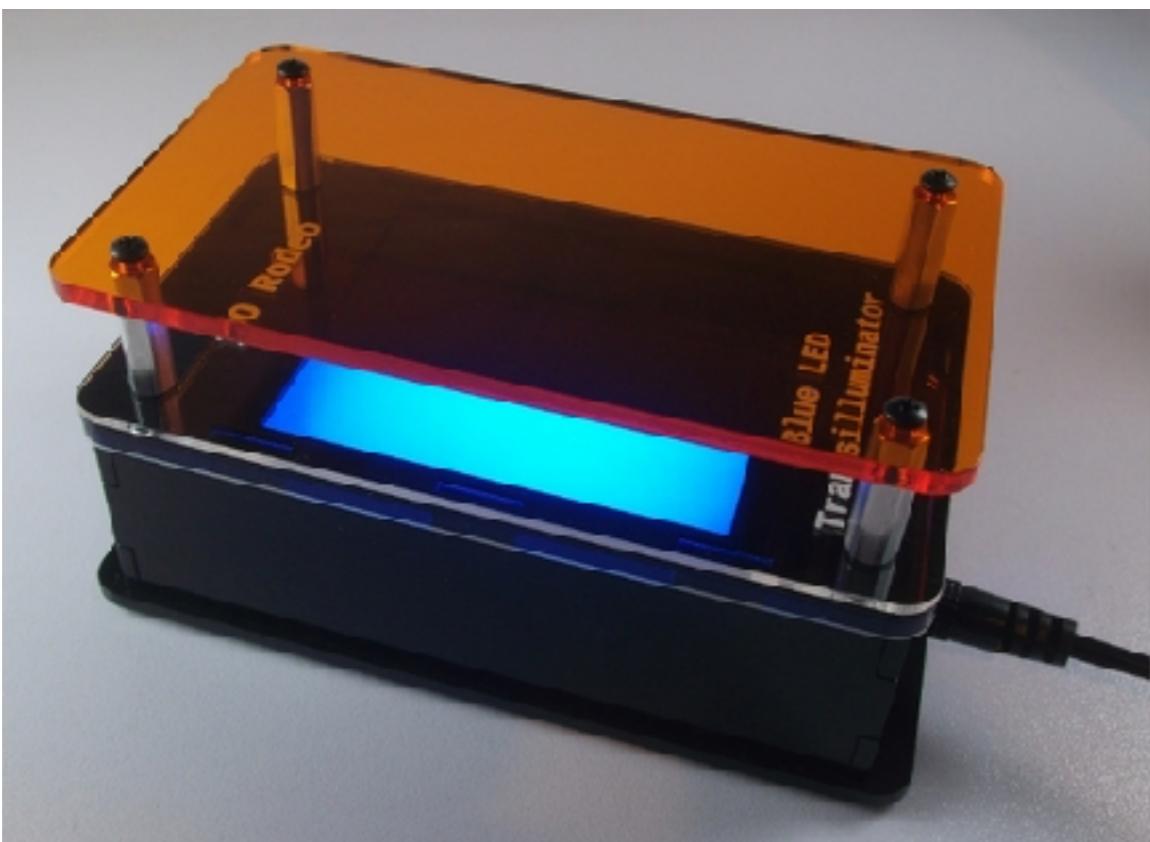
Short pieces move faster
than long pieces





Transillumination

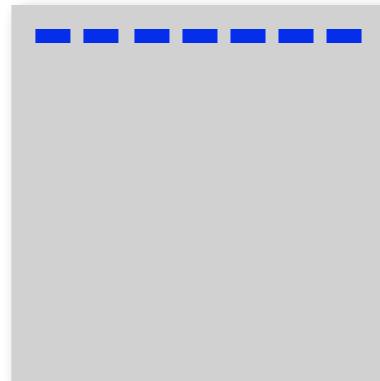
- Fluorescent DNA dye
- Sensitive to blue light
- Emits green light
- Orange filter blocks blue light



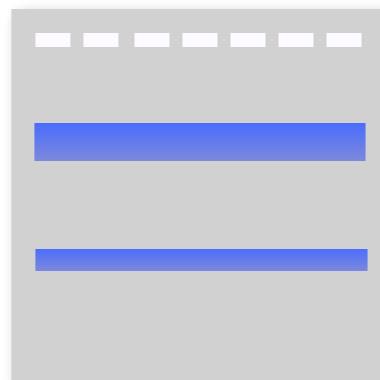


Step 2: Gel electrophoreses

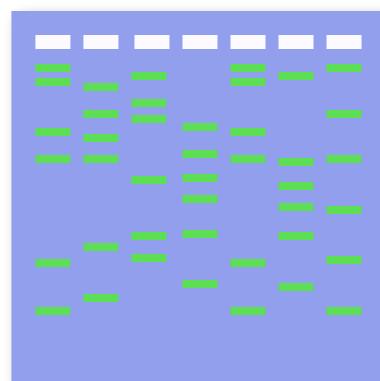
C 12345 Ladder



Load the samples in a gel



Apply current

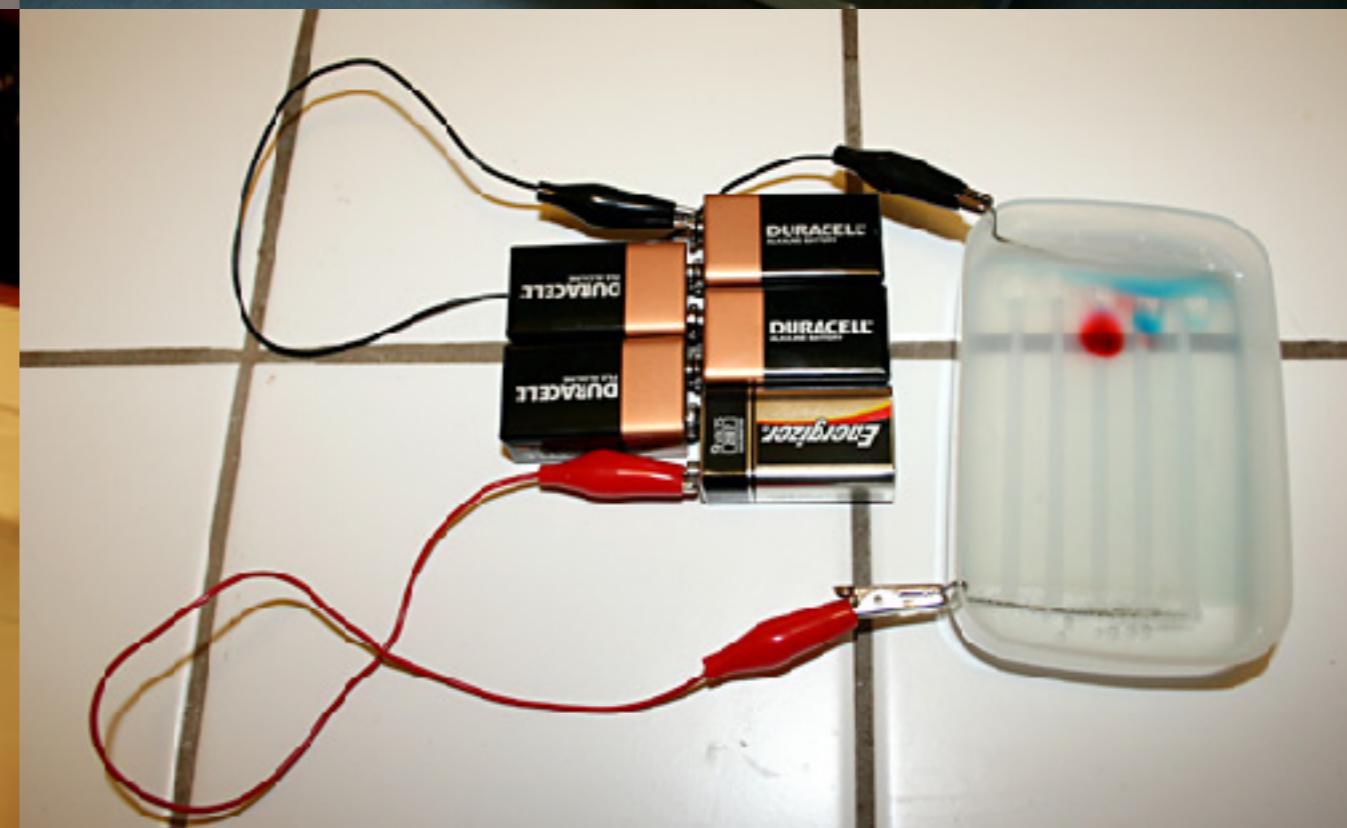
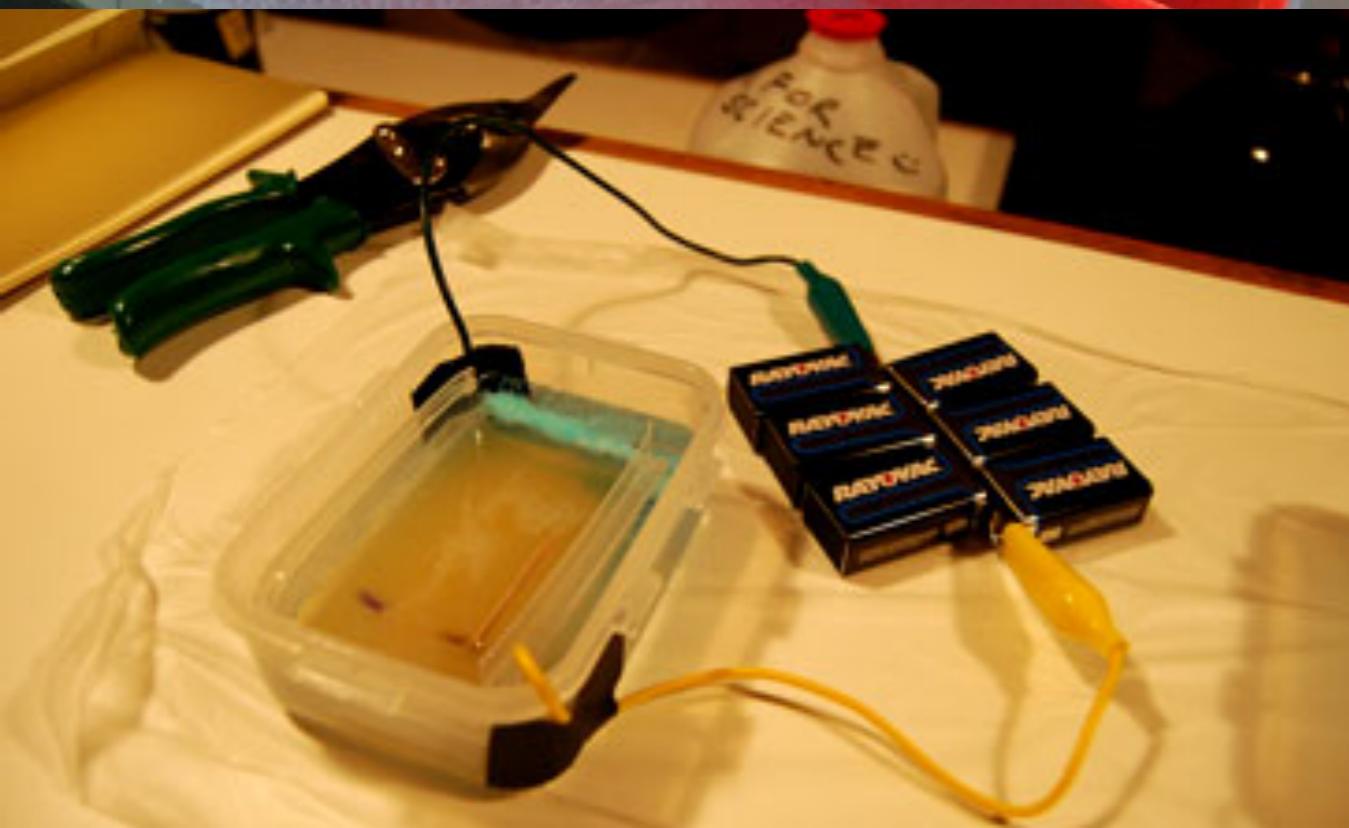
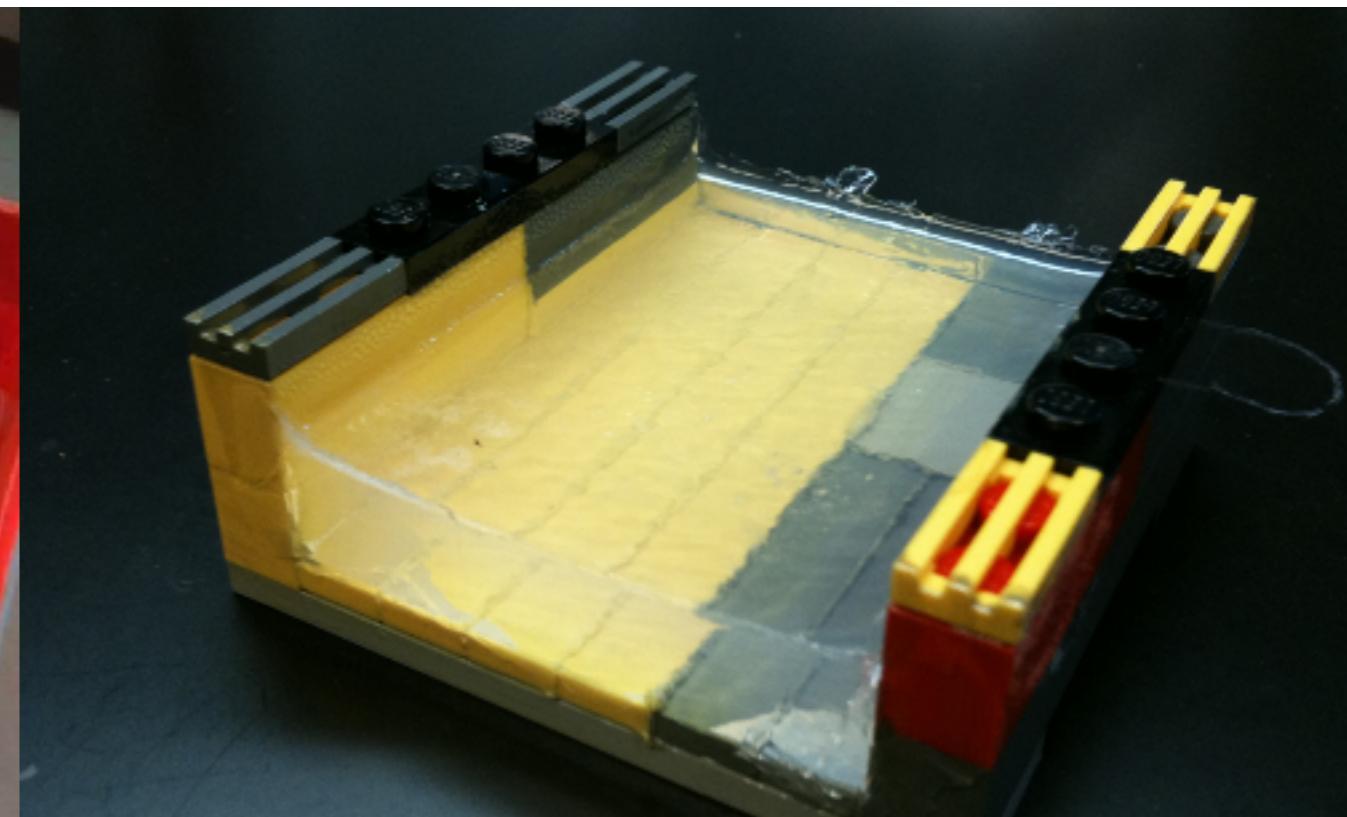


Read the pattern



DIY Electrophoresis

<http://fablab.waag.org/project/ow-dna-gel-electrophoresis-box>





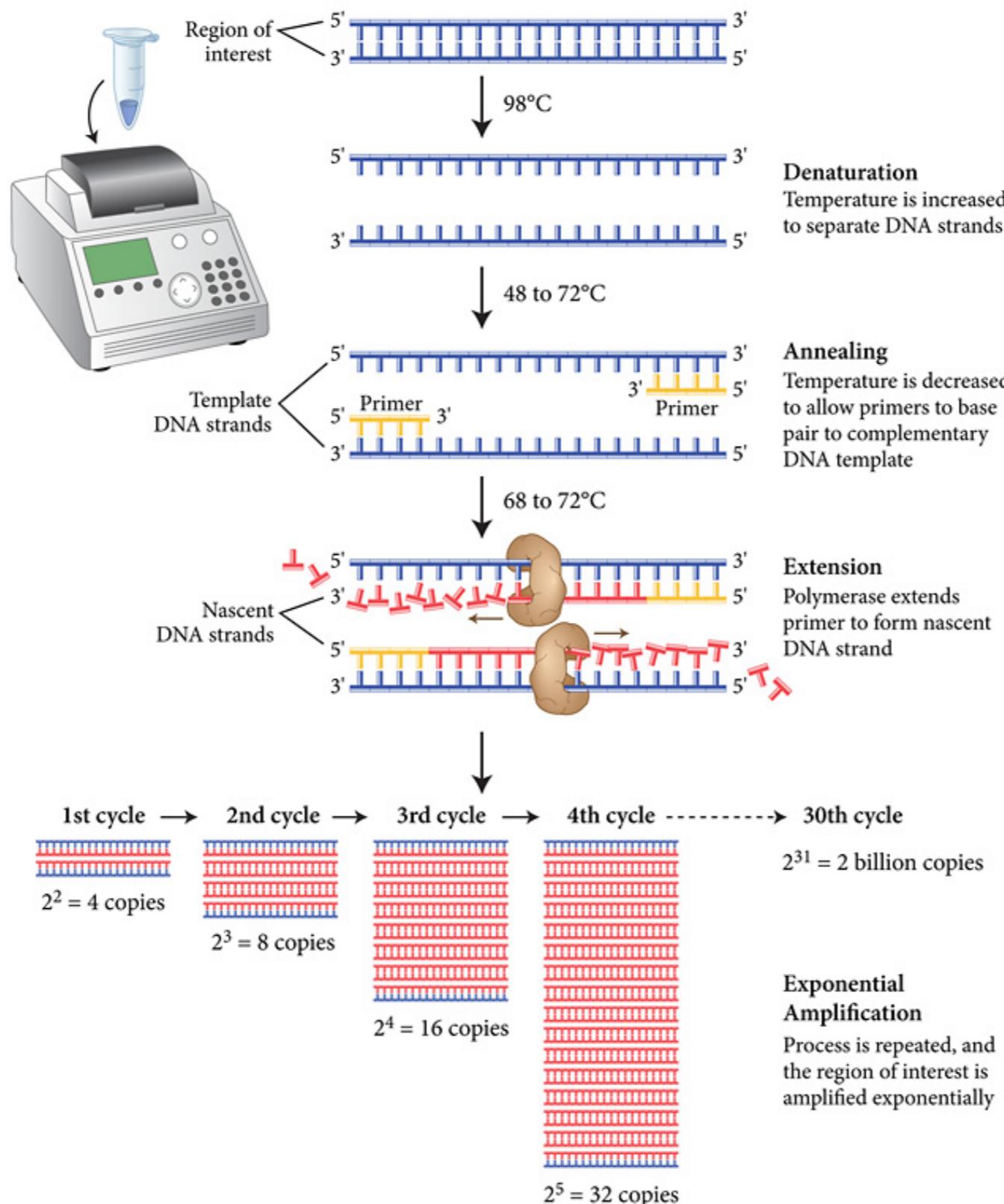
waag society

institute for art, science and technology

DNA analytics

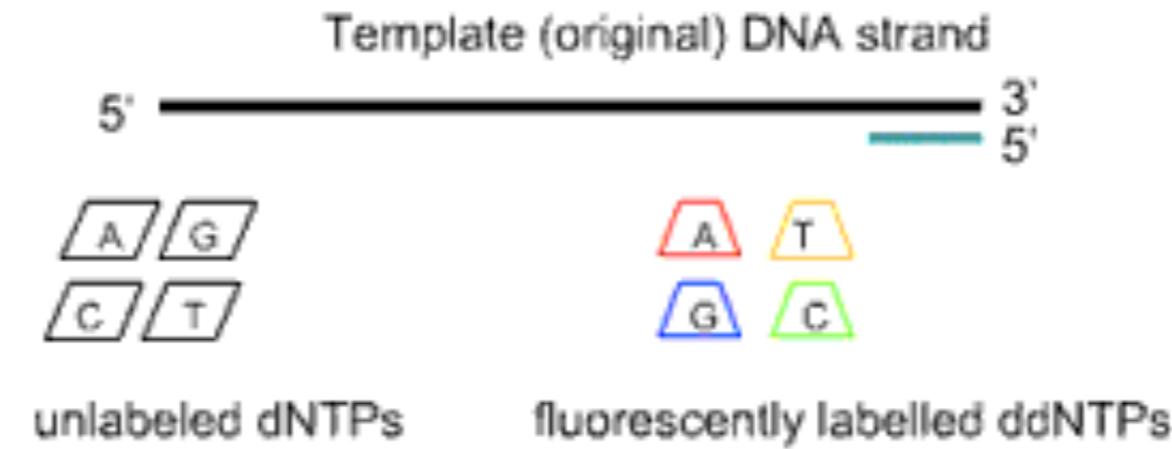


Polymerase Chain Reaction



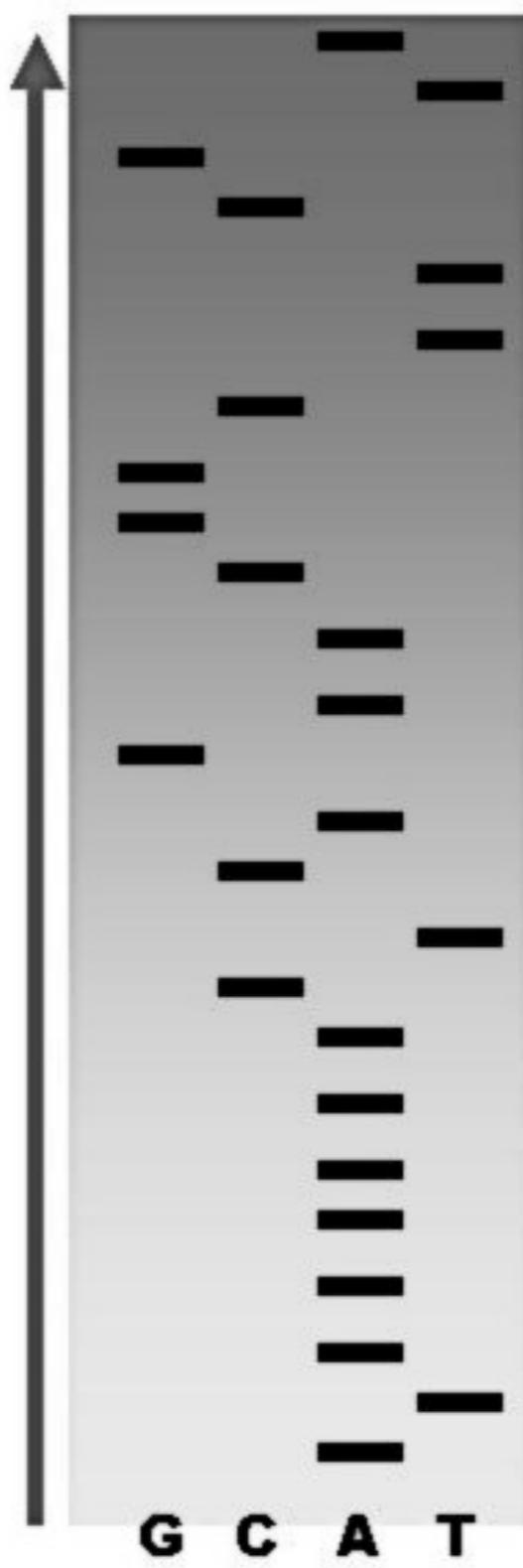


Sanger Sequencing – chain termination



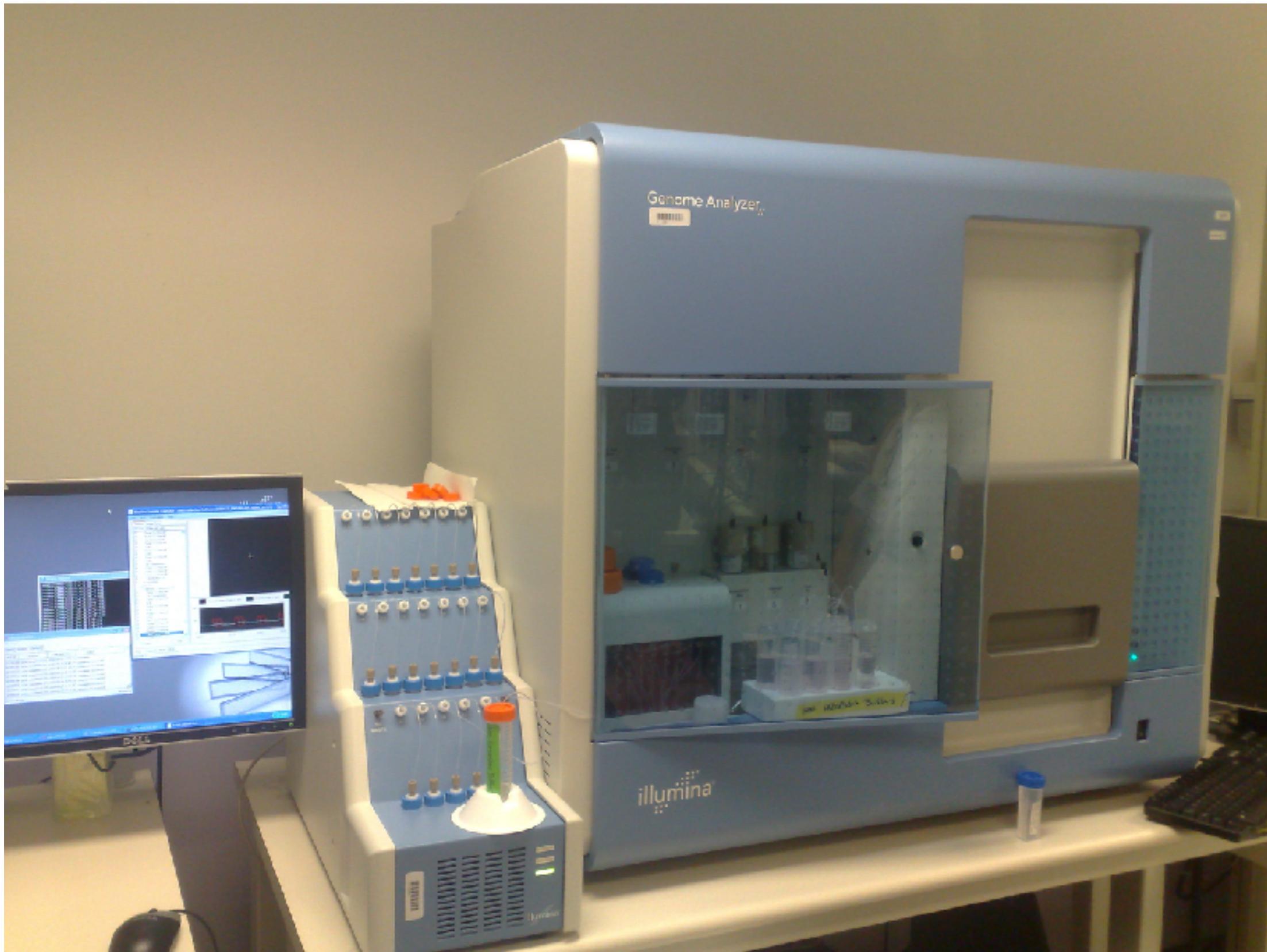


Sanger sequencing





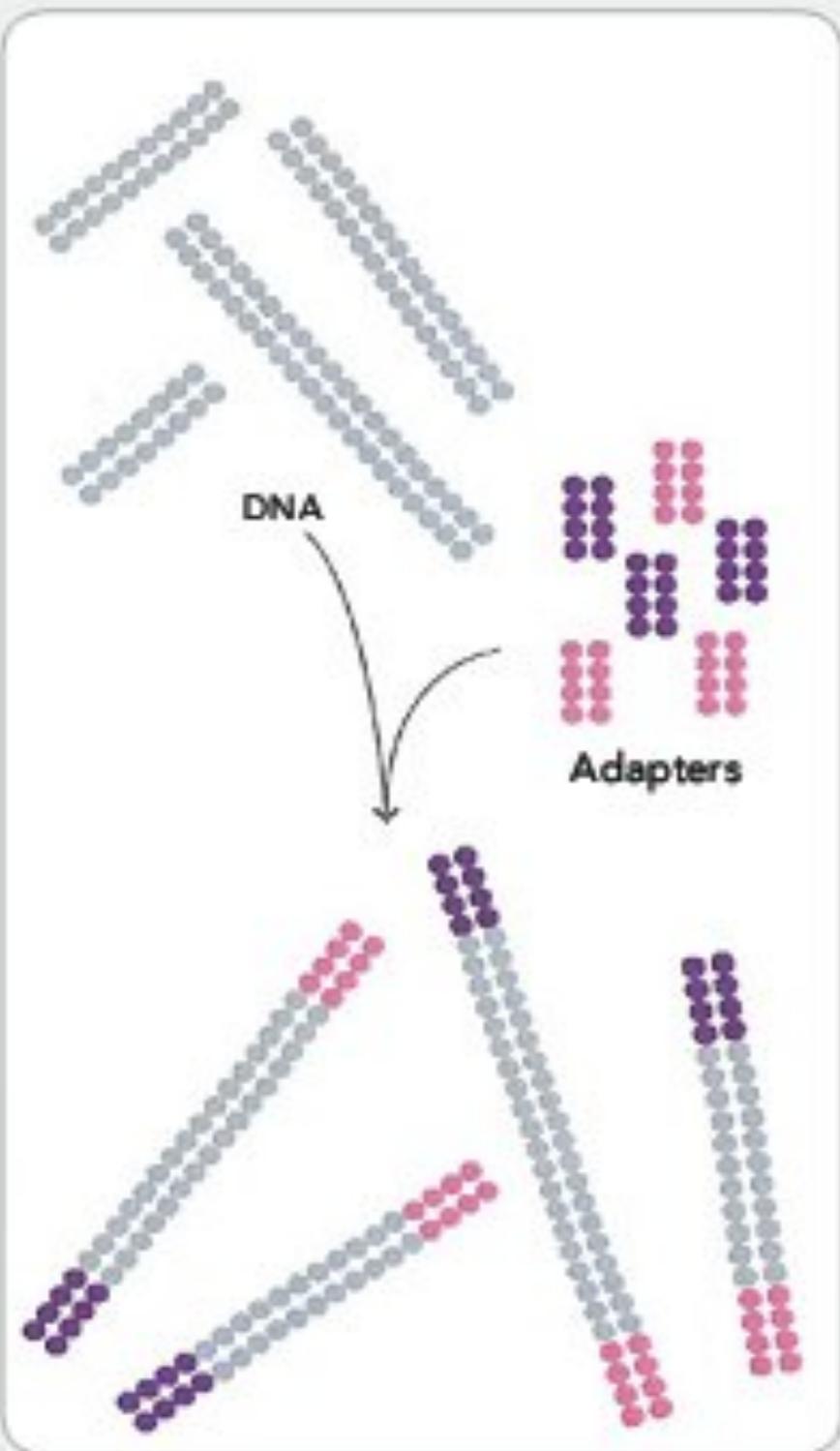
Illumina - Solexa





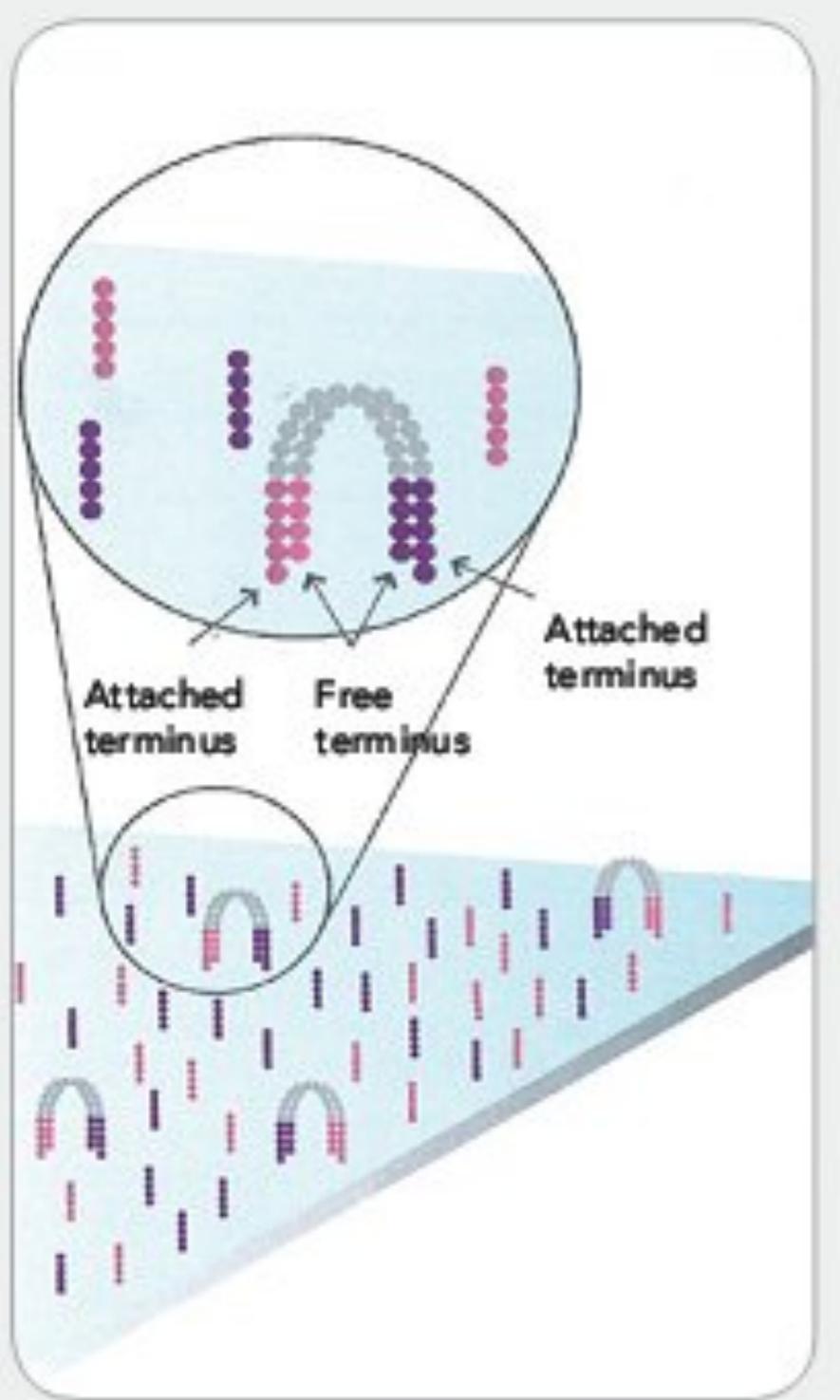
Solexa - Illumina sequencing

1. PREPARE GENOMIC DNA SAMPLE



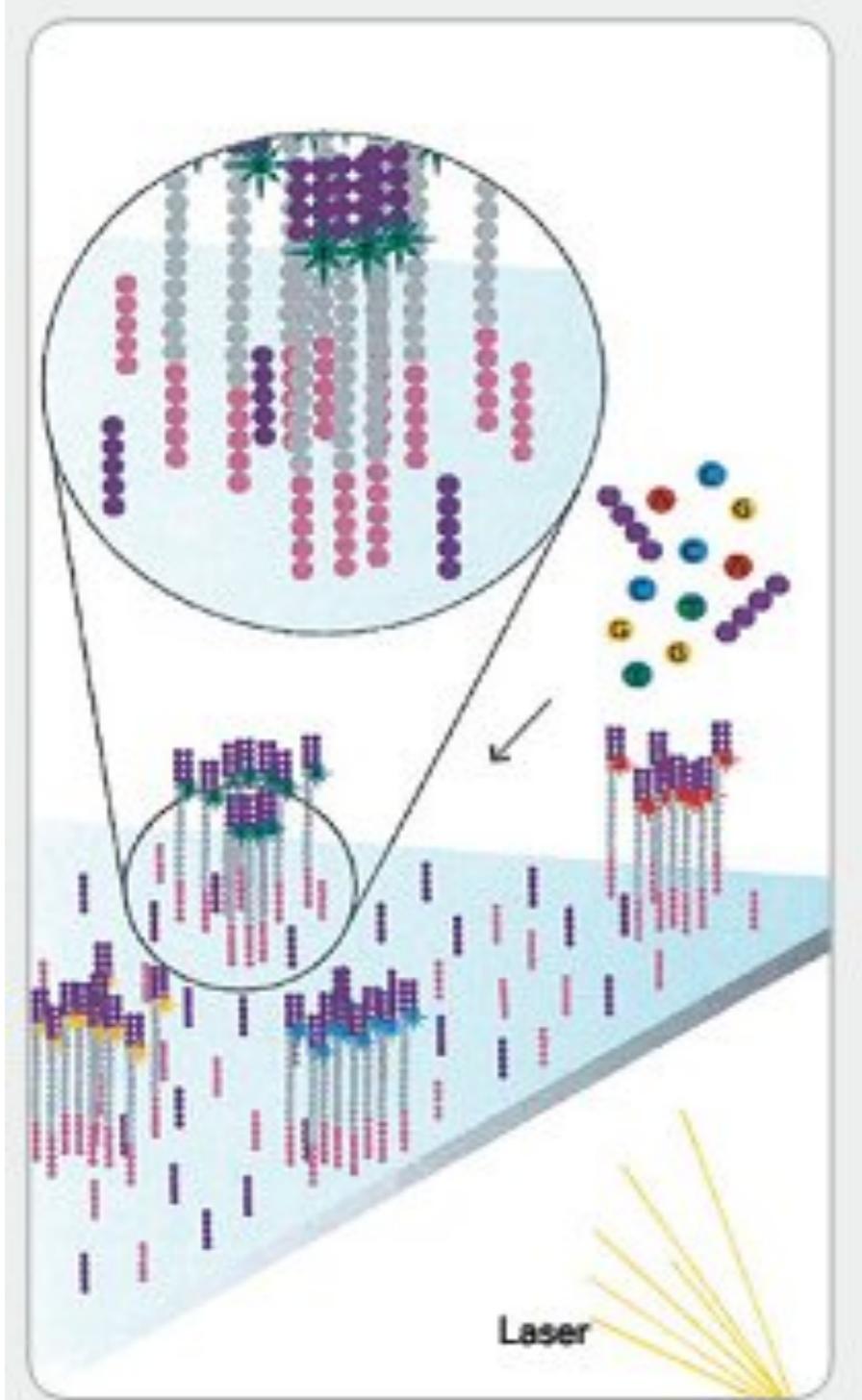


4. FRAGMENTS BECOME DOUBLE STRANDED



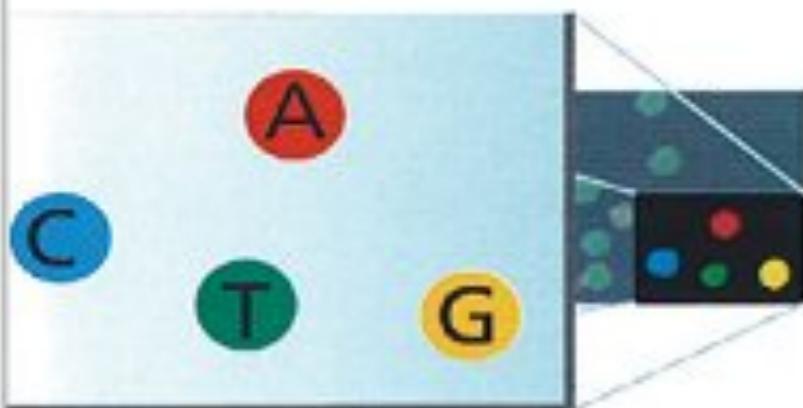


7. DETERMINE FIRST BASE





10. IMAGE SECOND CHEMISTRY CYCLE

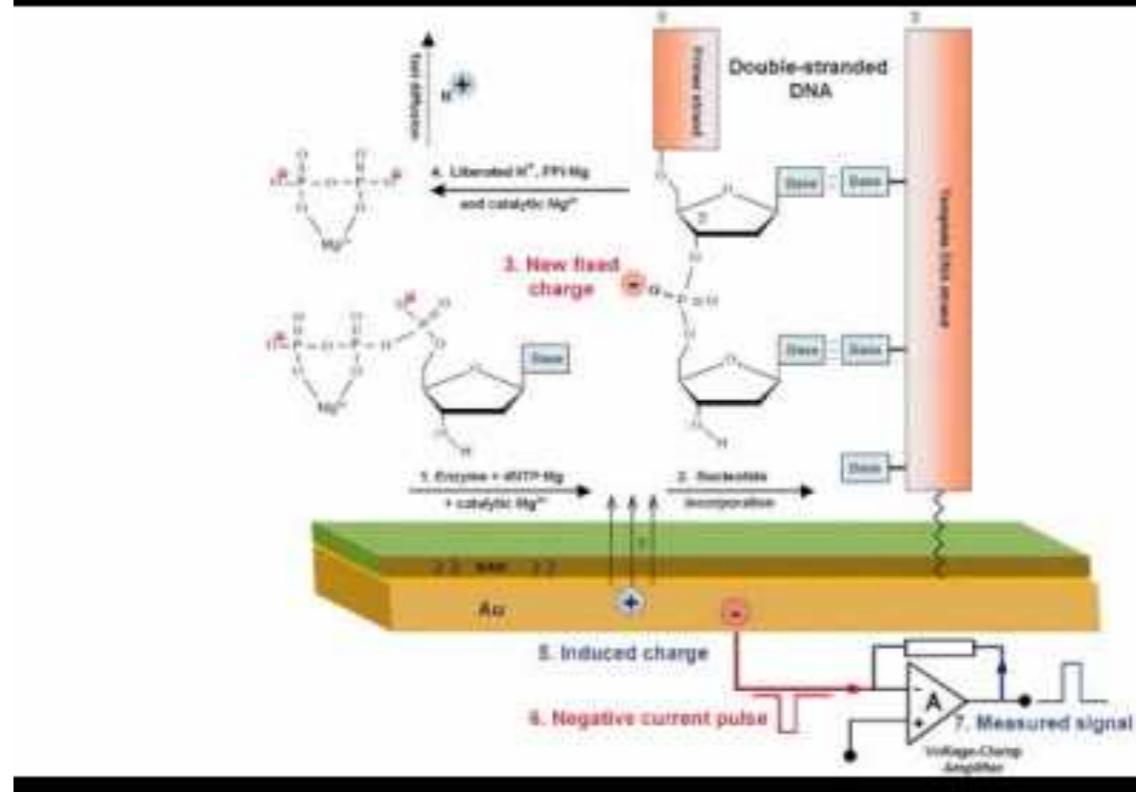
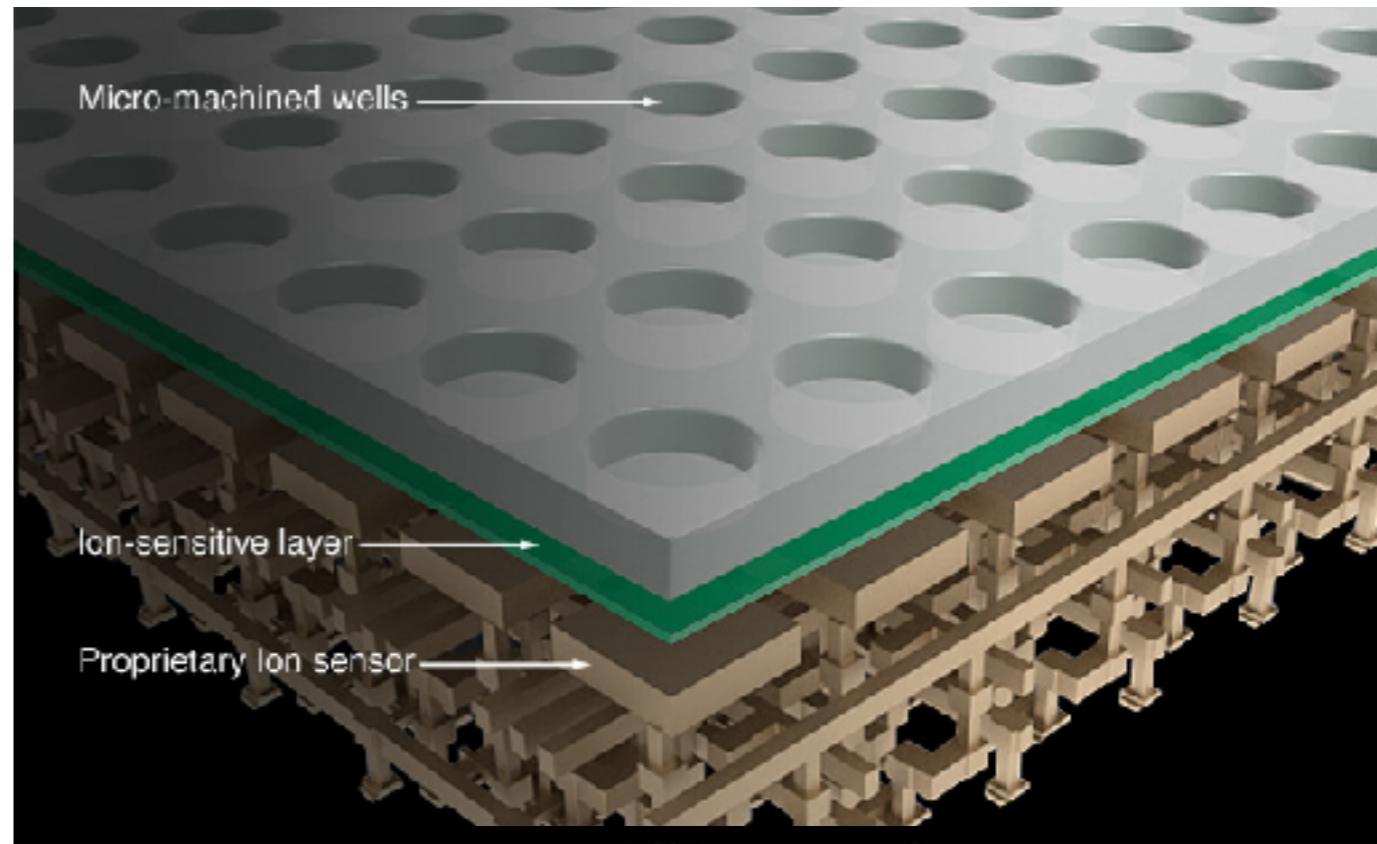
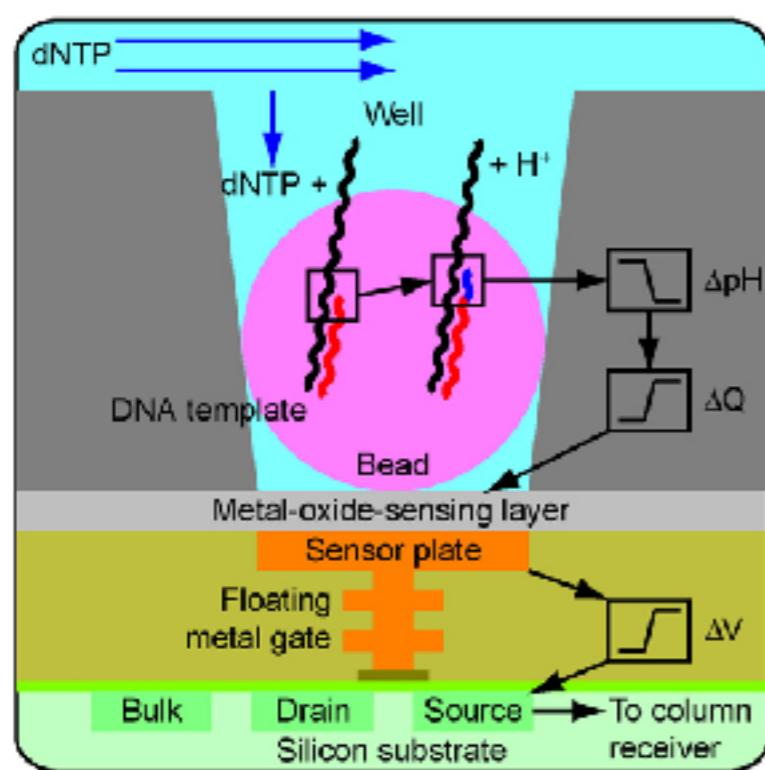




IonTorrent sequencing

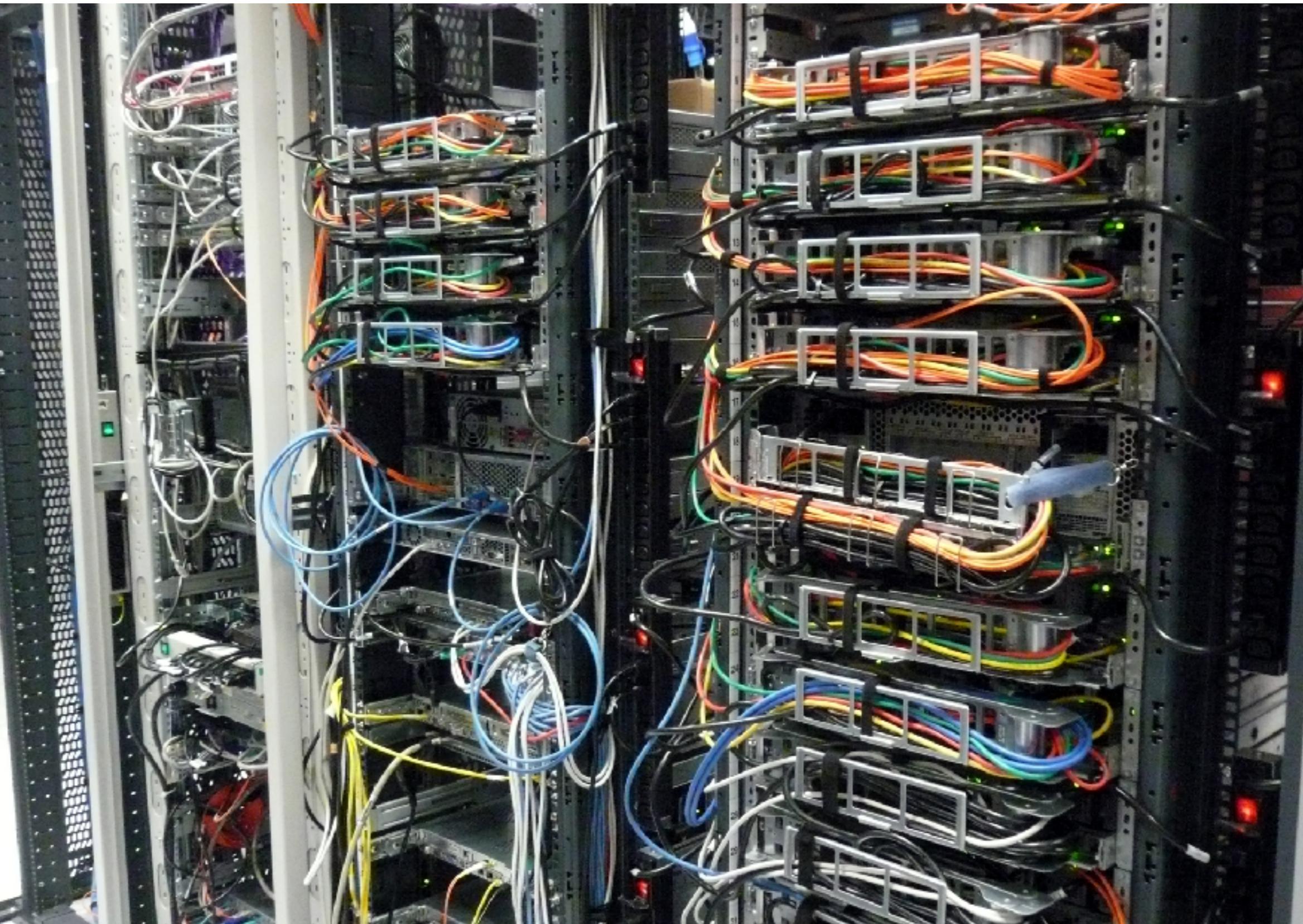


a



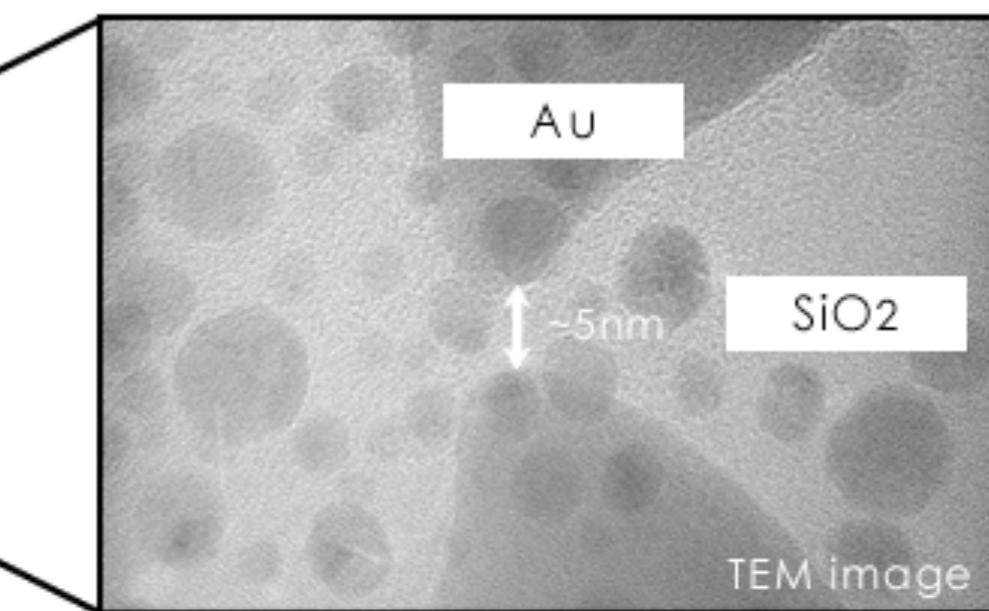
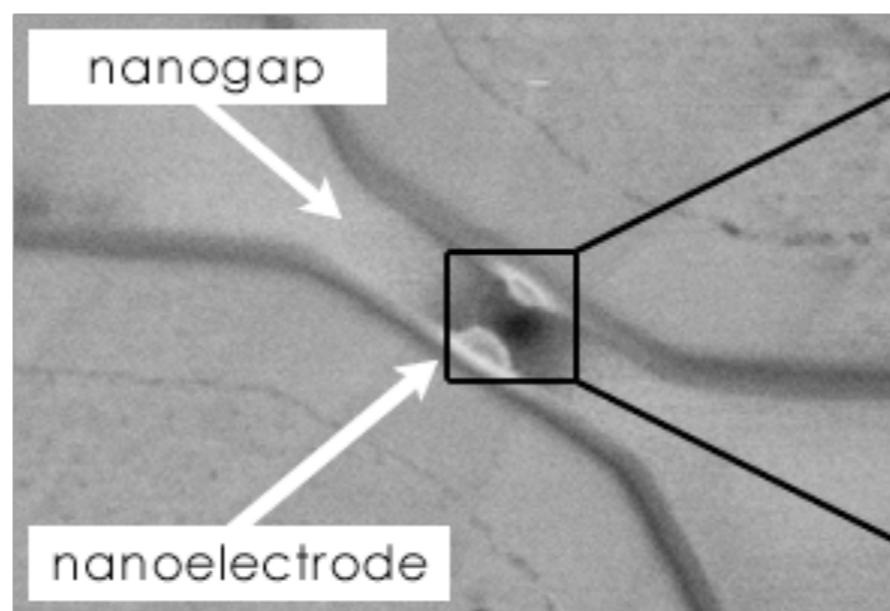
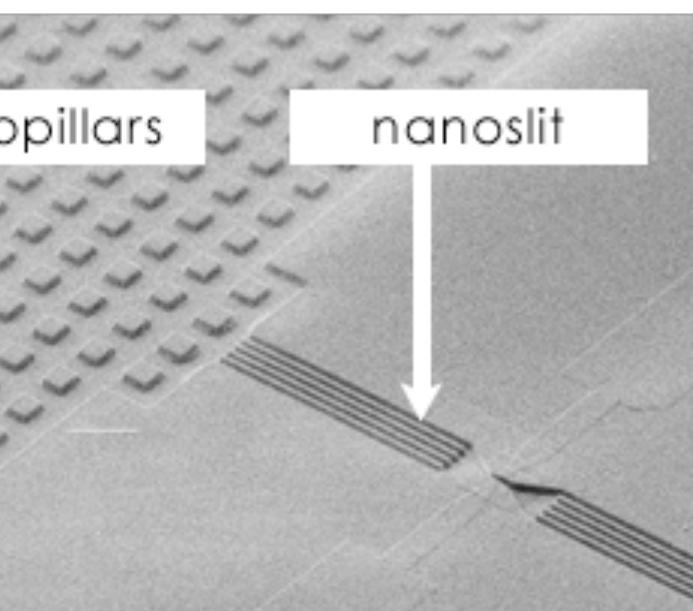
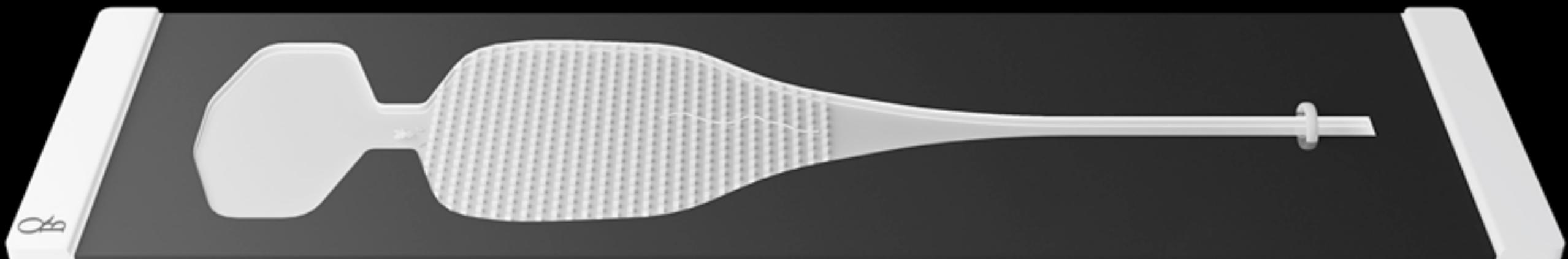


Bioinformatics





Nanopore sequencing





Oxford Nanopore MinION





Oxford nanopore



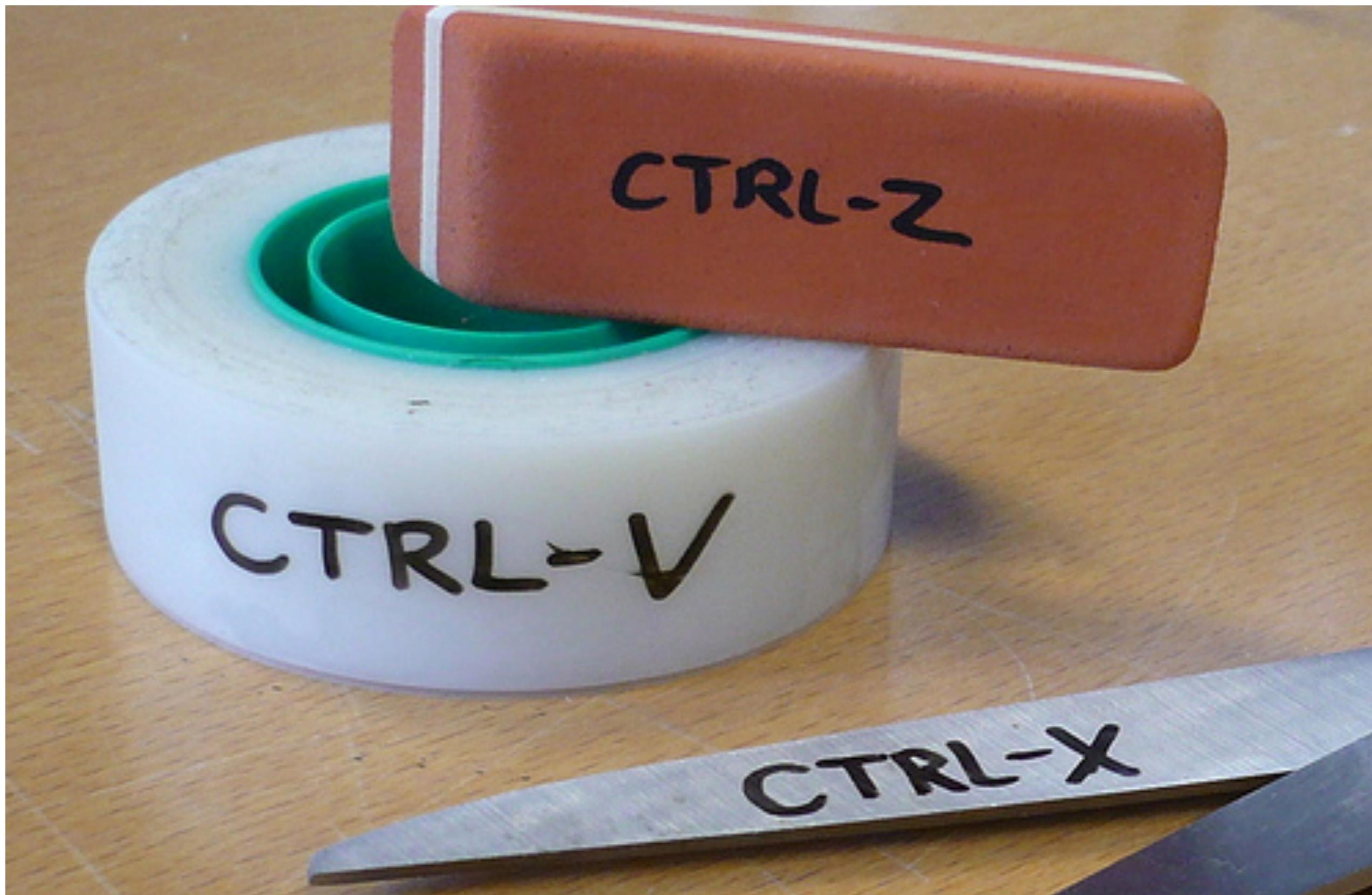


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DNA editing

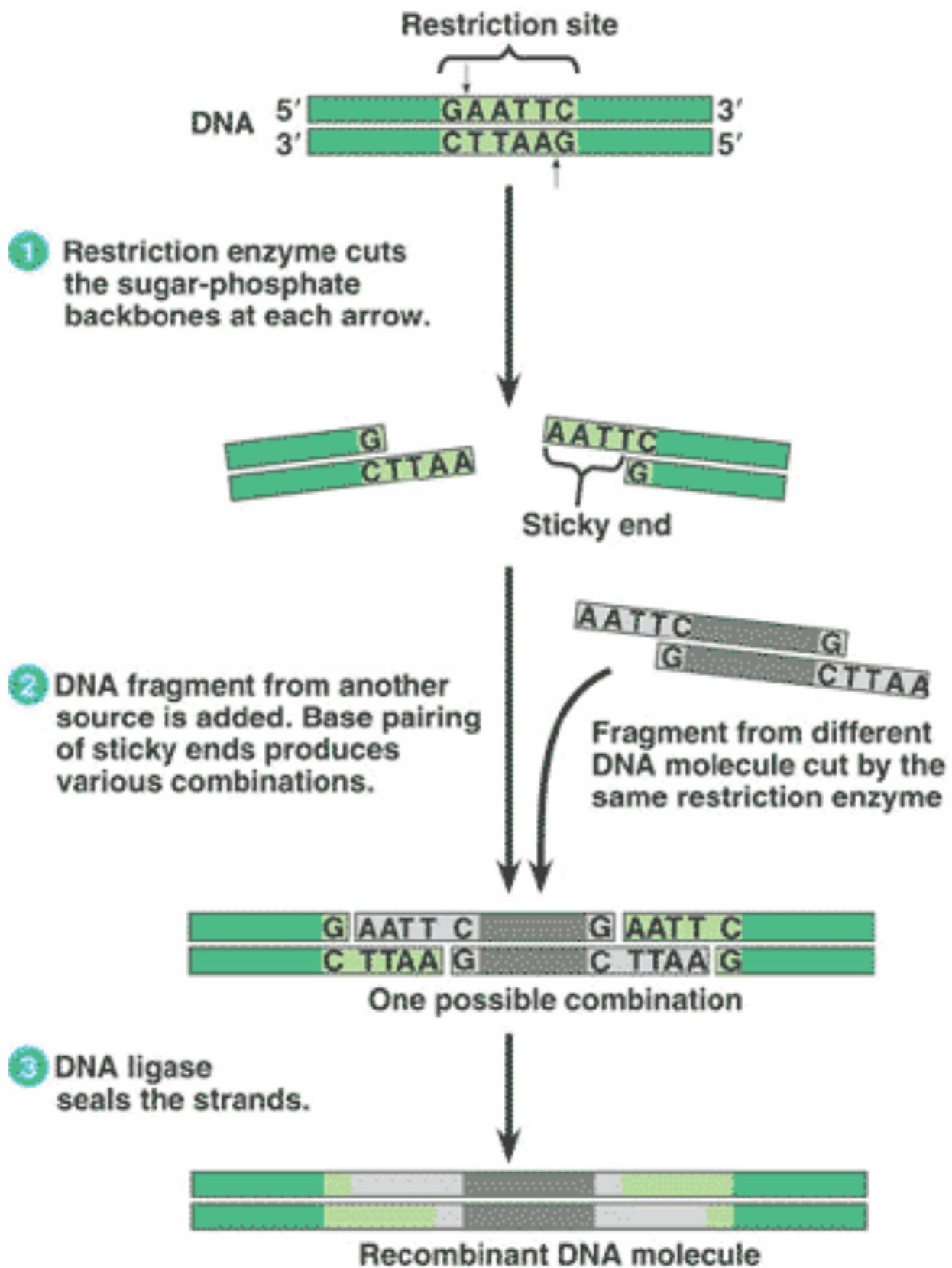


Cutting & Pasting



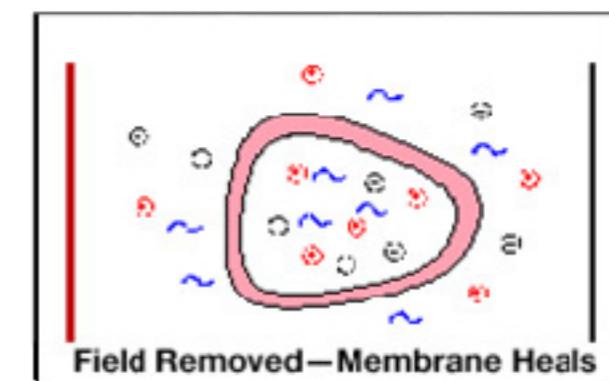
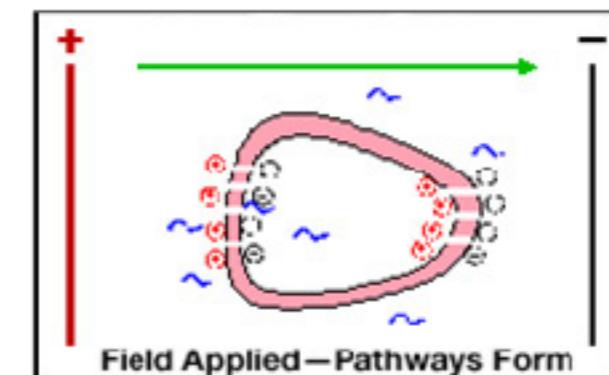
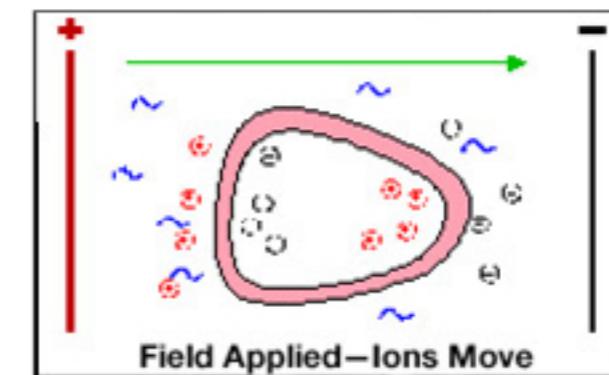
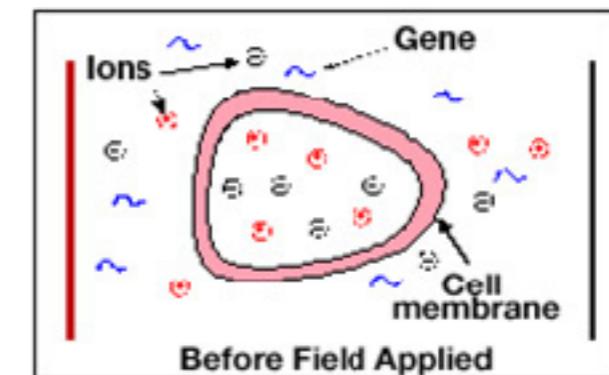


DNA Restriction Ligation





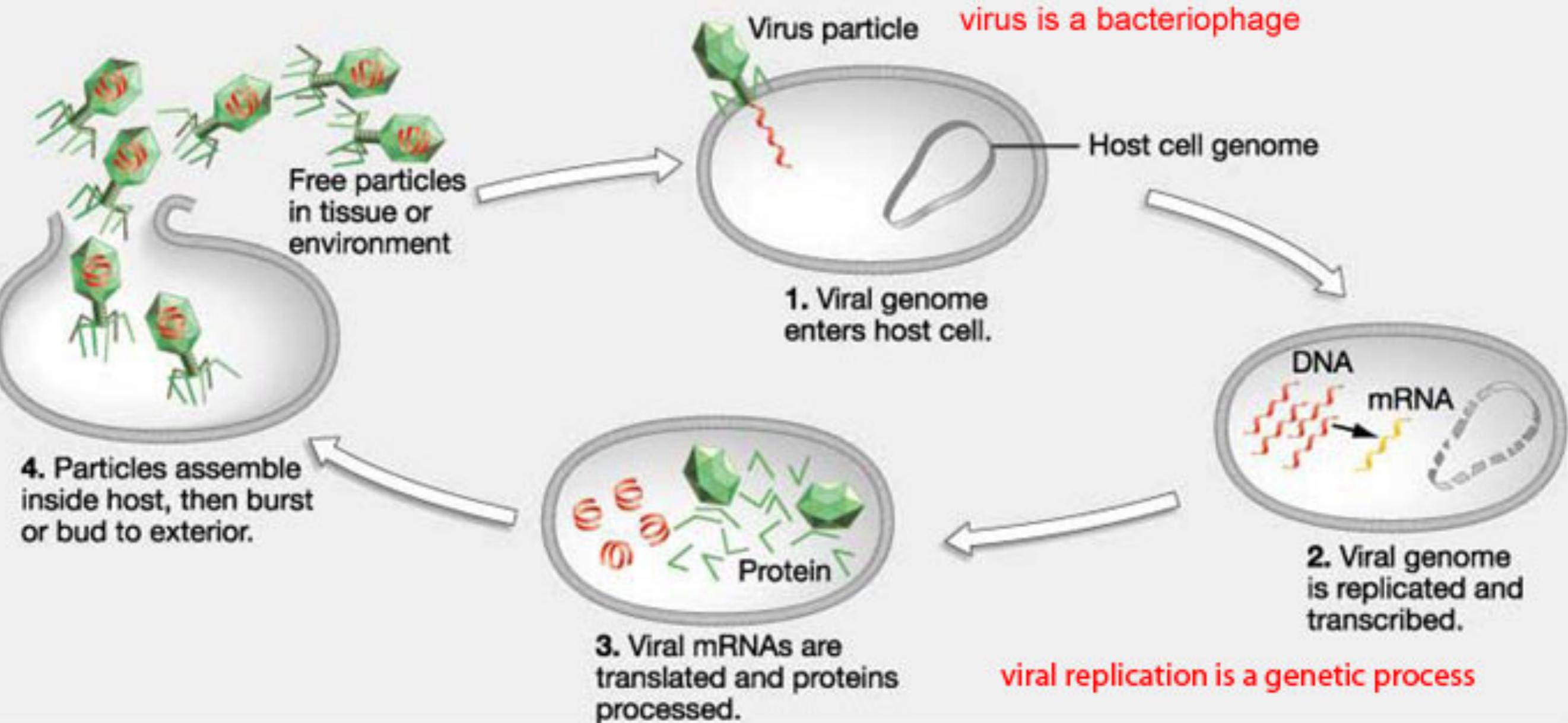
GeneGun – Electroporation





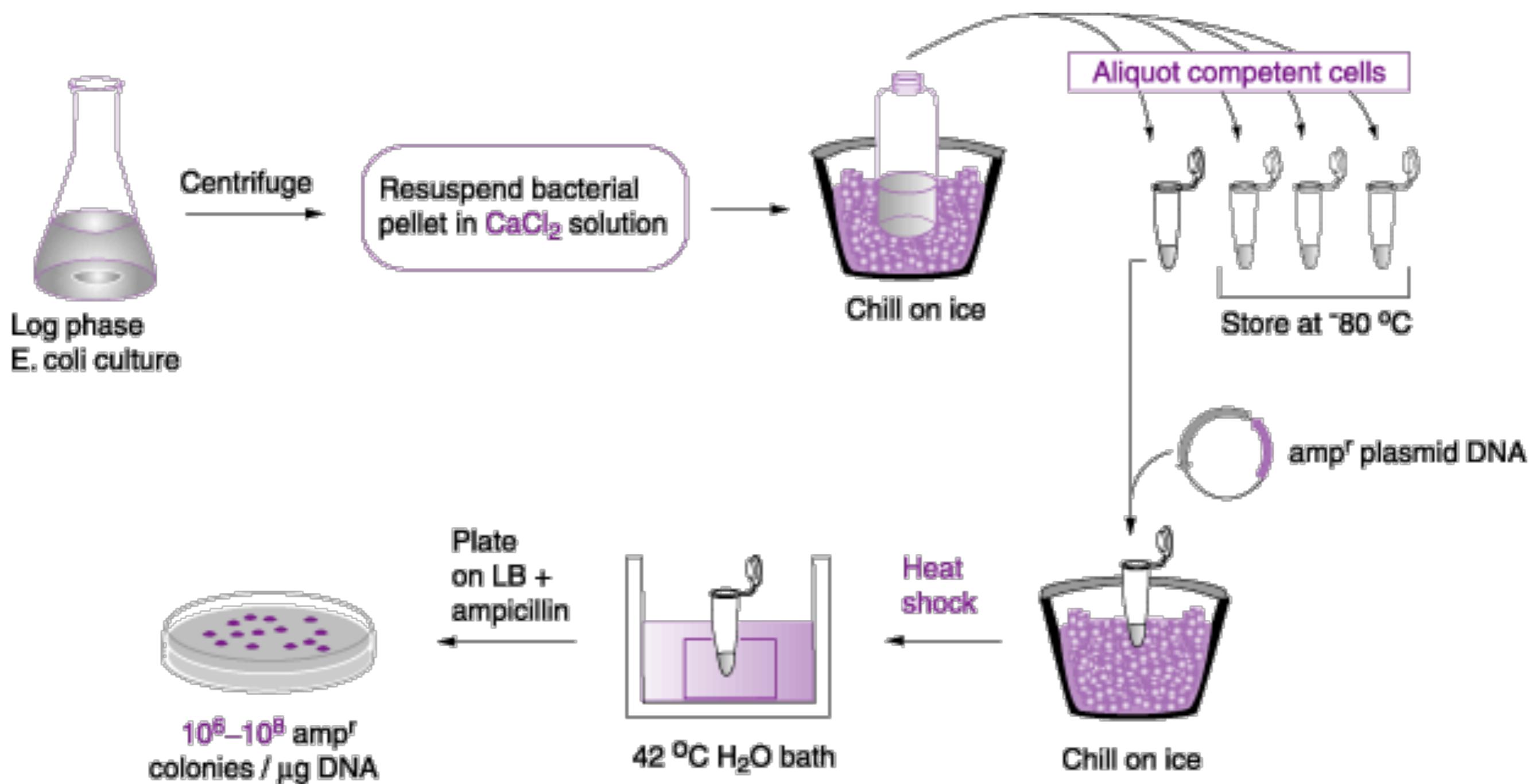
Viral Transformation

HOW DO VIRUSES WORK?





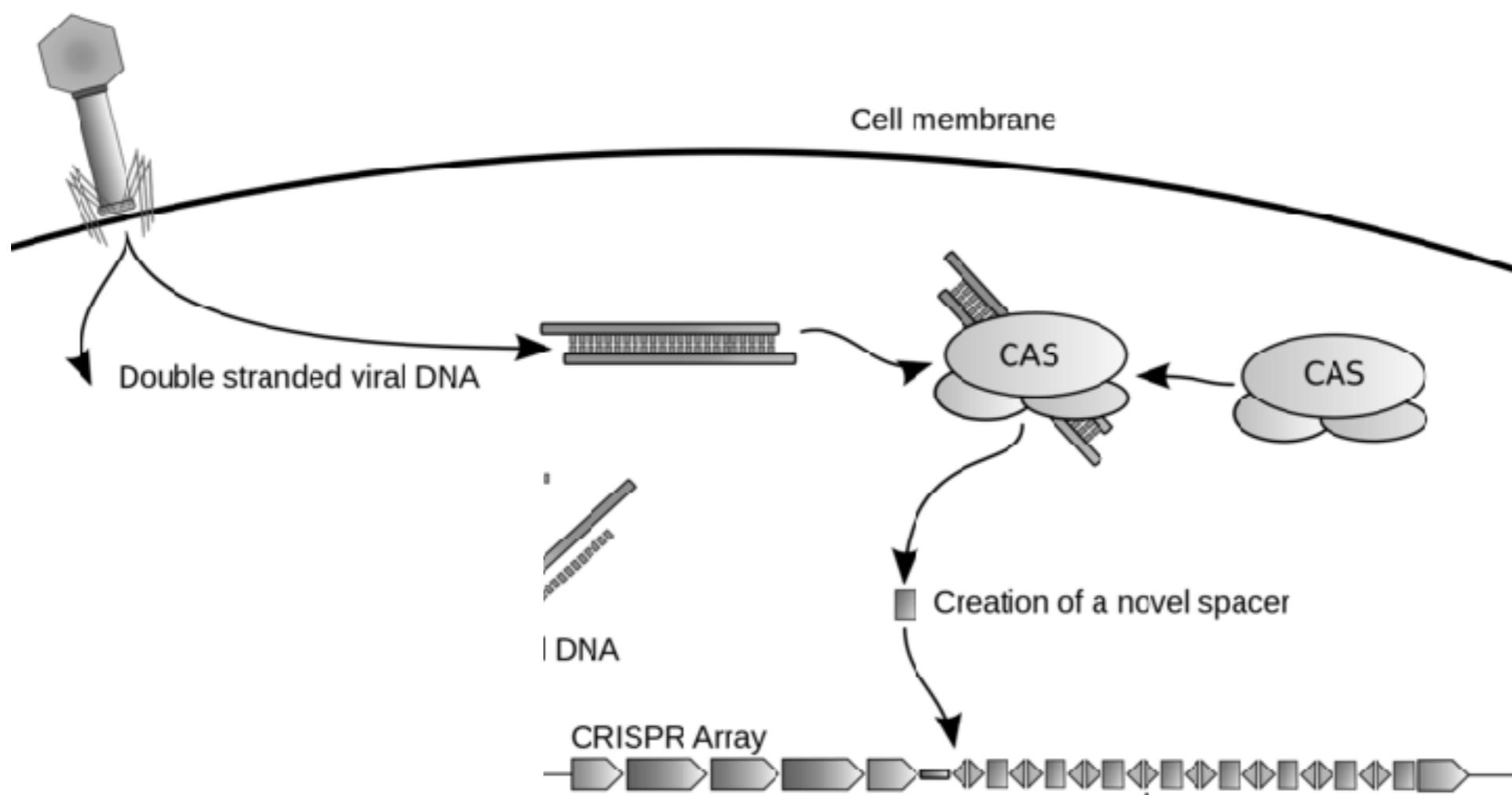
Heat Shock Transformation





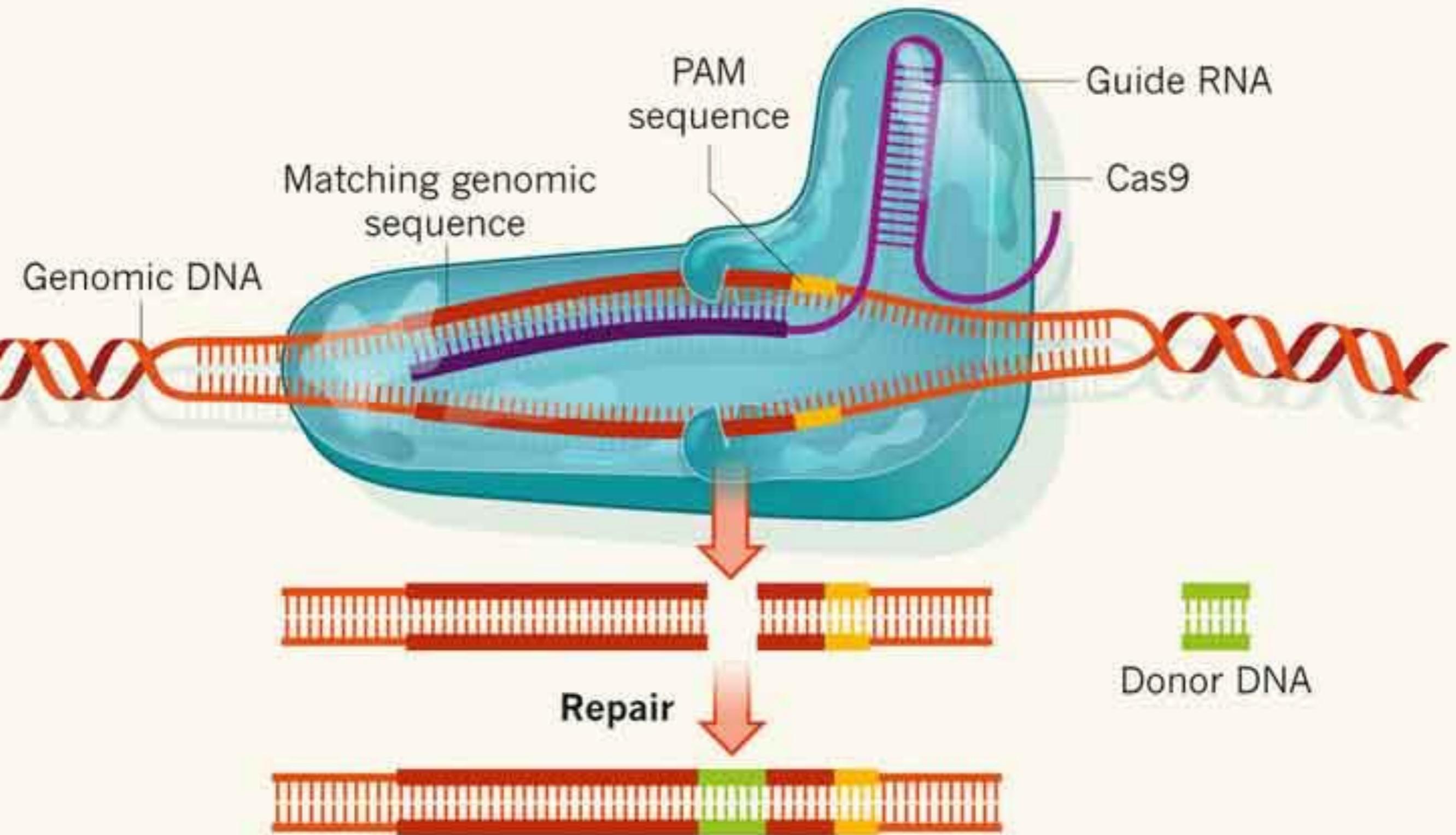
CRISPR – Cas9

James Atmos - CC-BY-SA 3.0





CRISPR





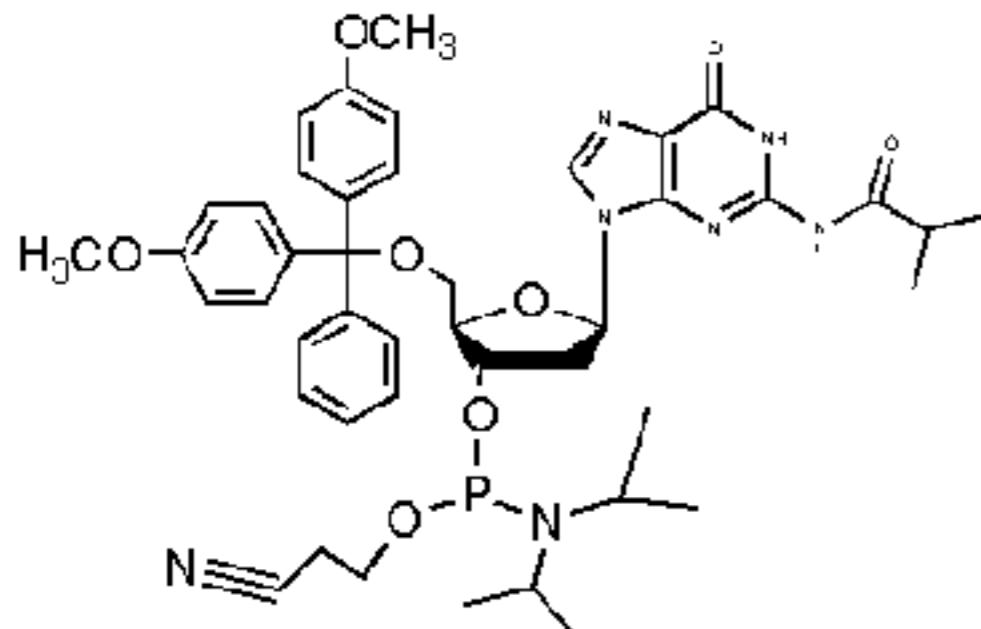
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DNA synthesis

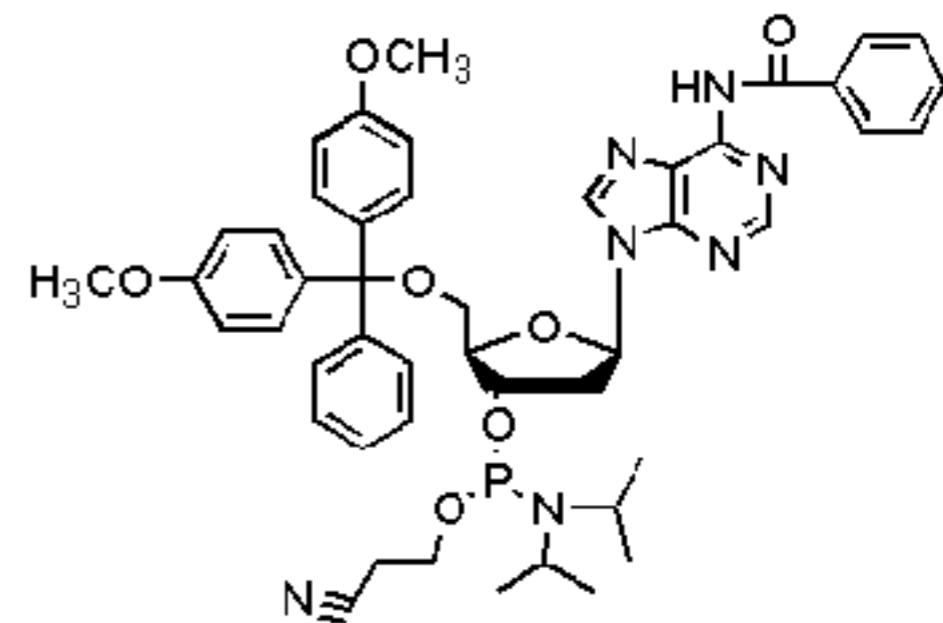
in 4 steps



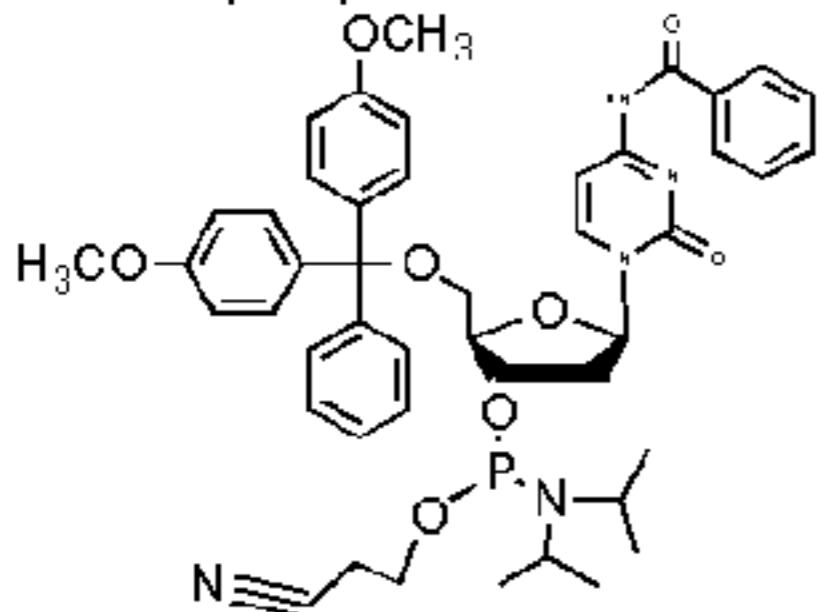
Deblocking



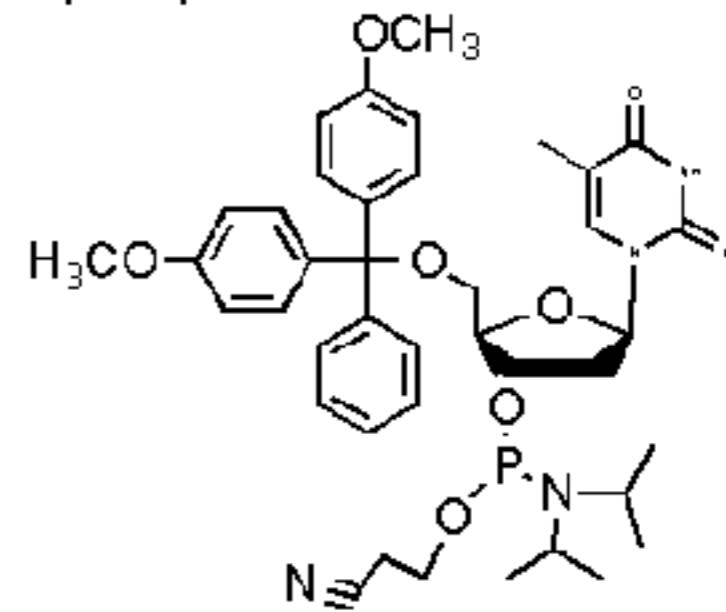
N-2-isobutryl deoxyguanosine
phosphoramidite



N-6-benzoyl-deoxyadenosine
phosphoramidite



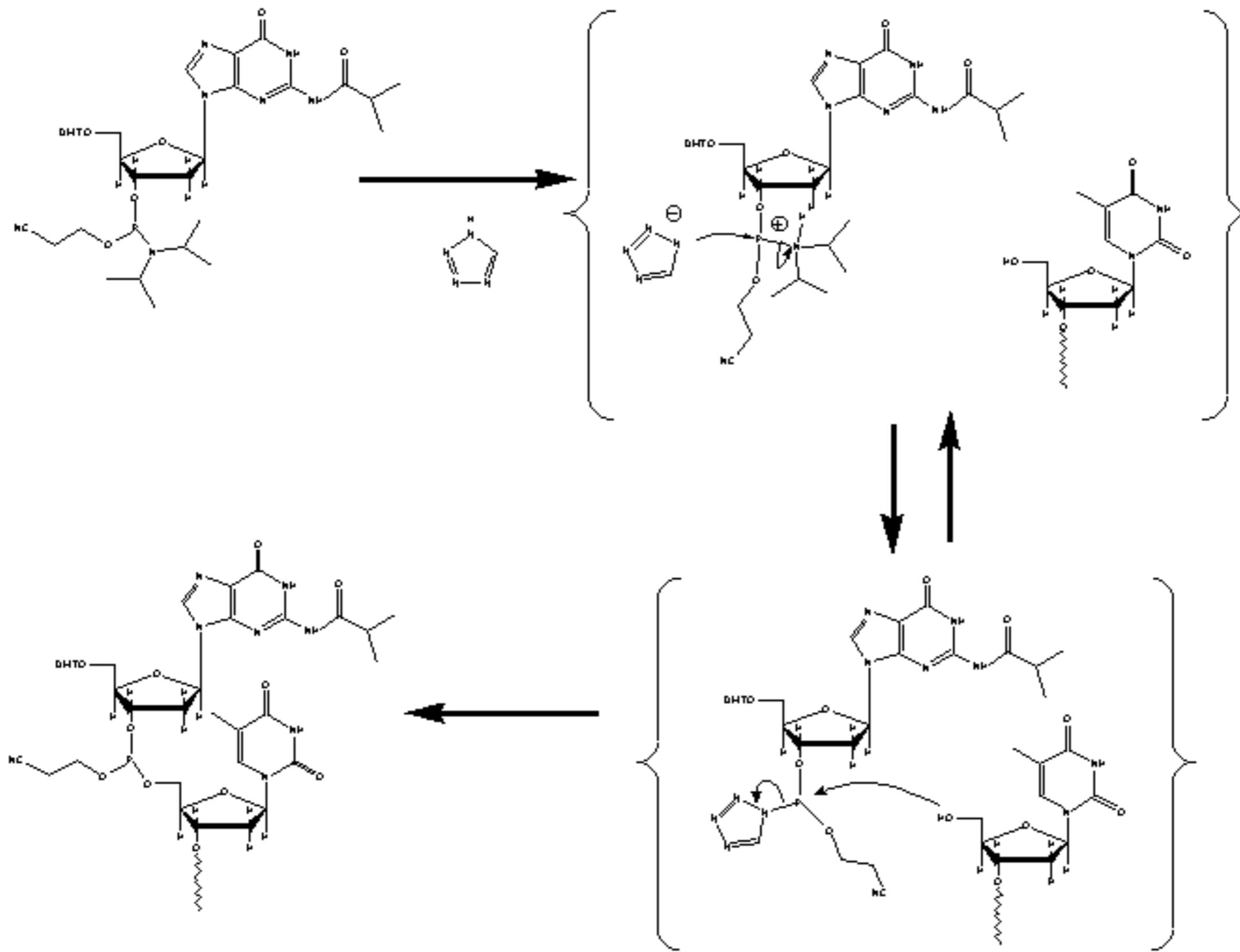
N-4-benzoyl-deoxycytidine
phosphoramidite



deoxythymidine
phosphoramidite

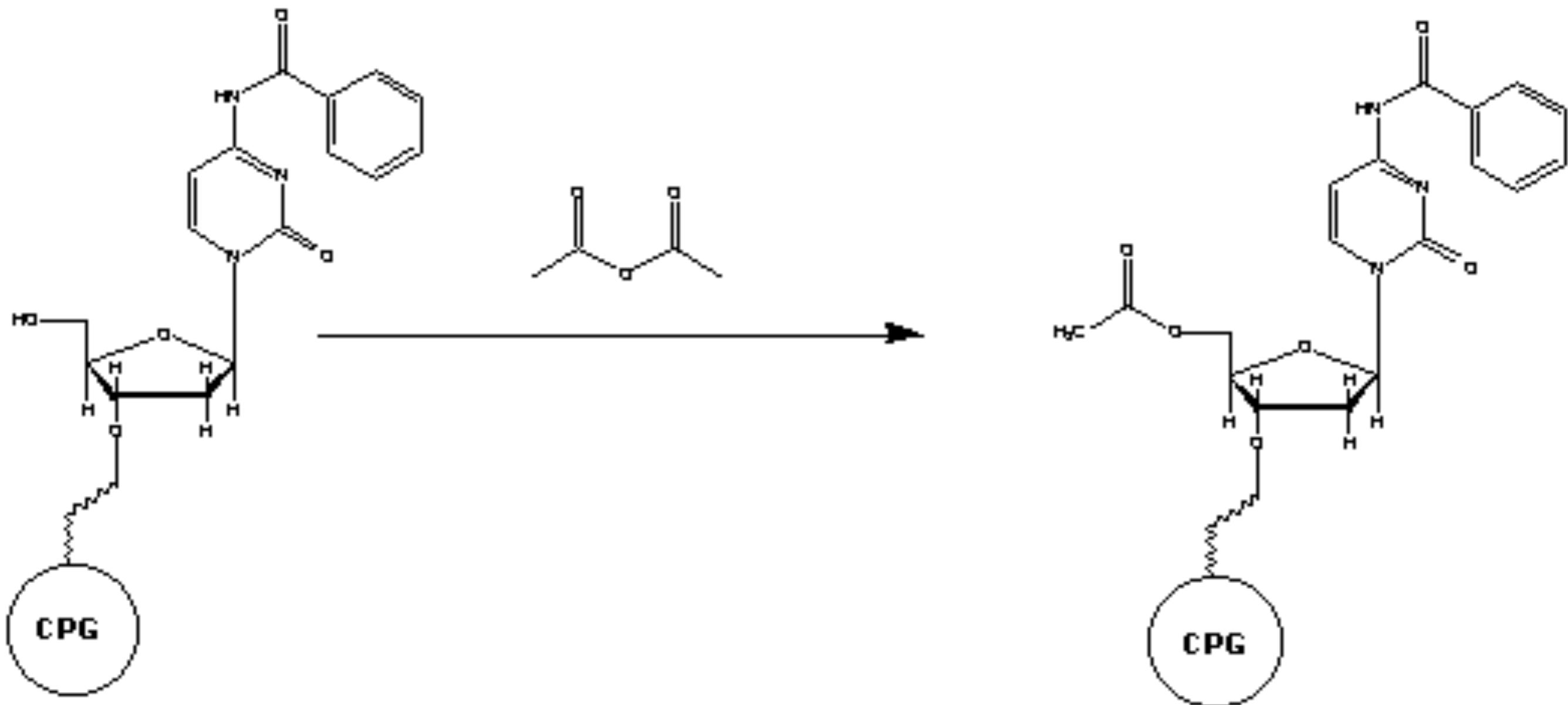


Condensation



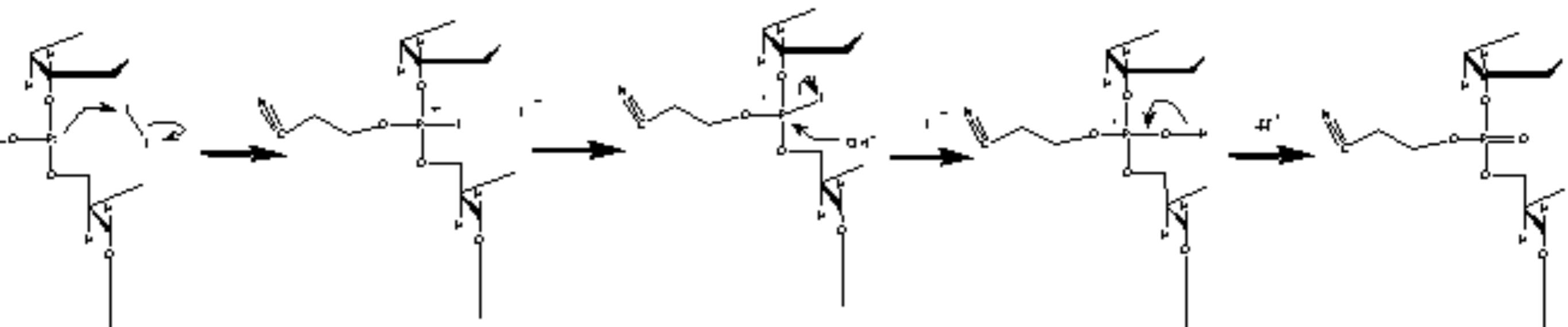


Capping



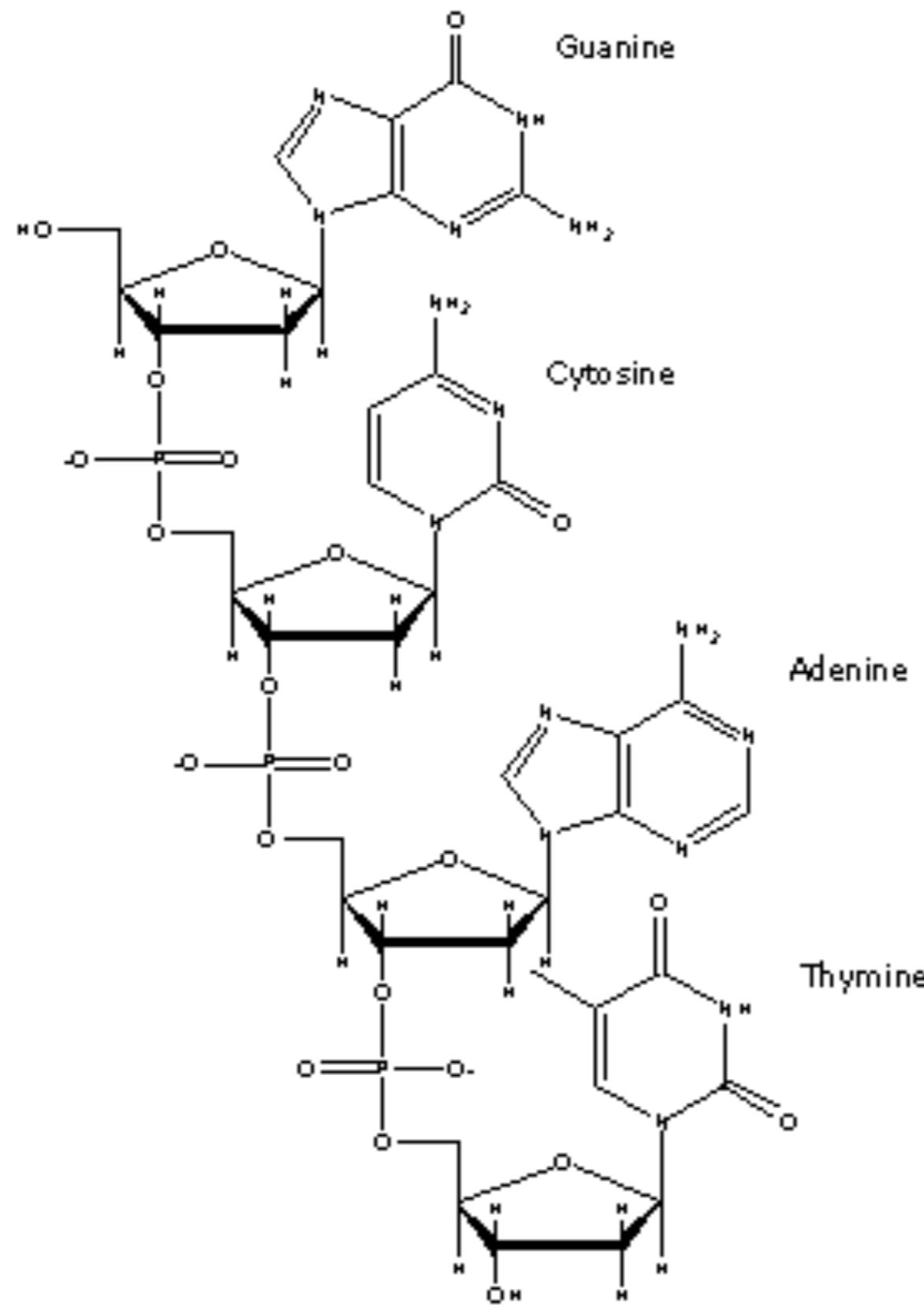


Oxidating





Repeat





**some
rights
reserved**