

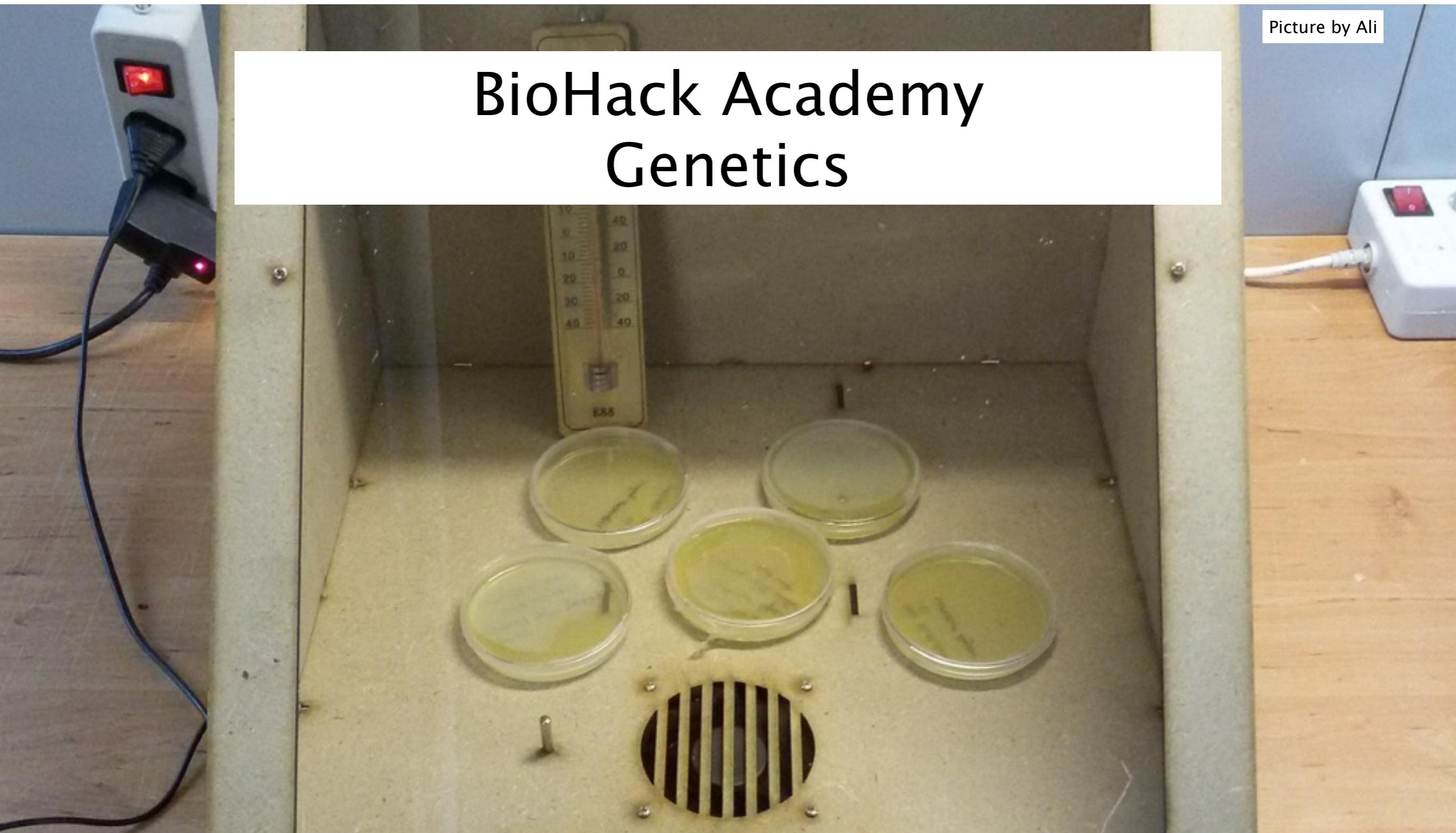


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Picture by Ali

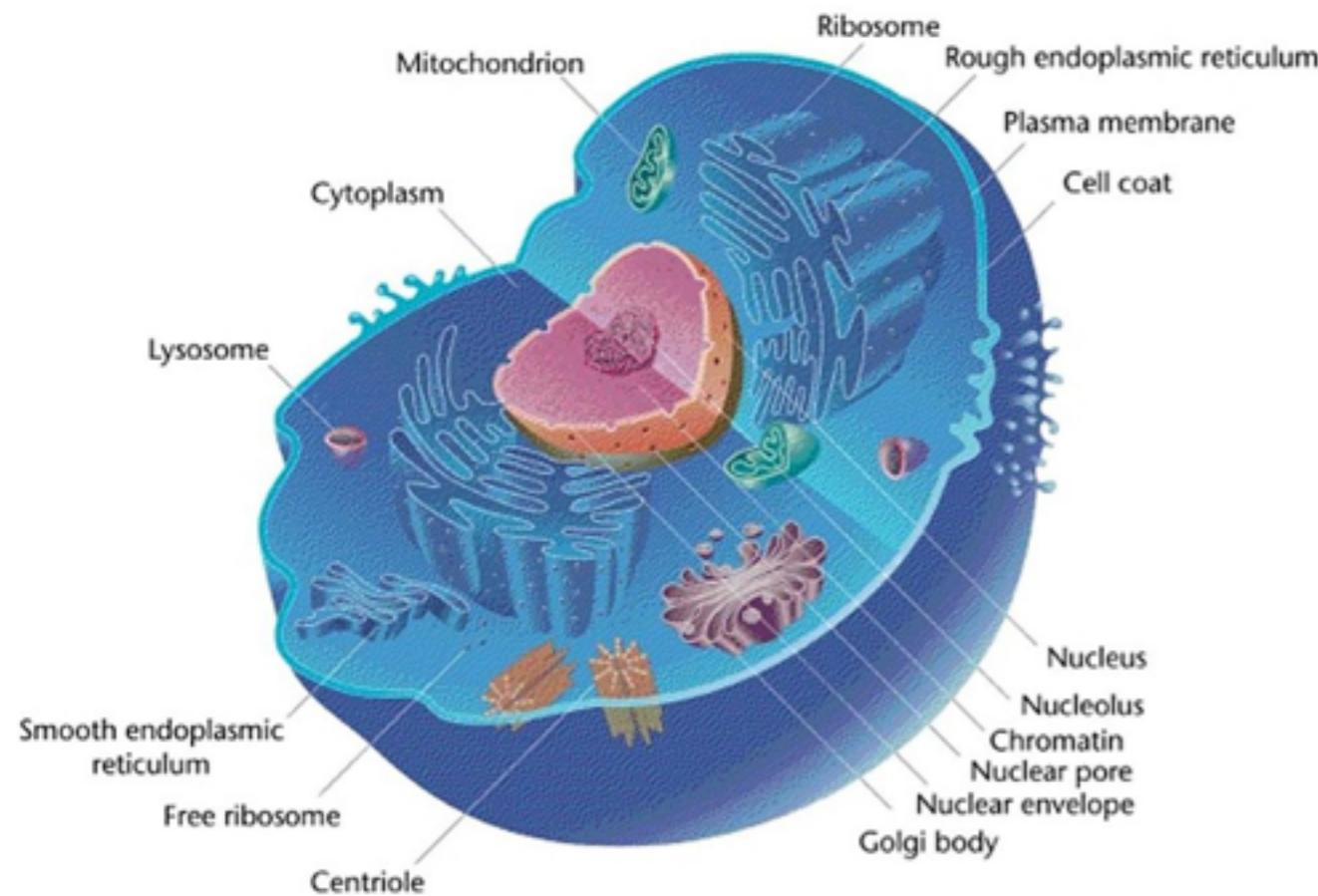
BioHack Academy Genetics



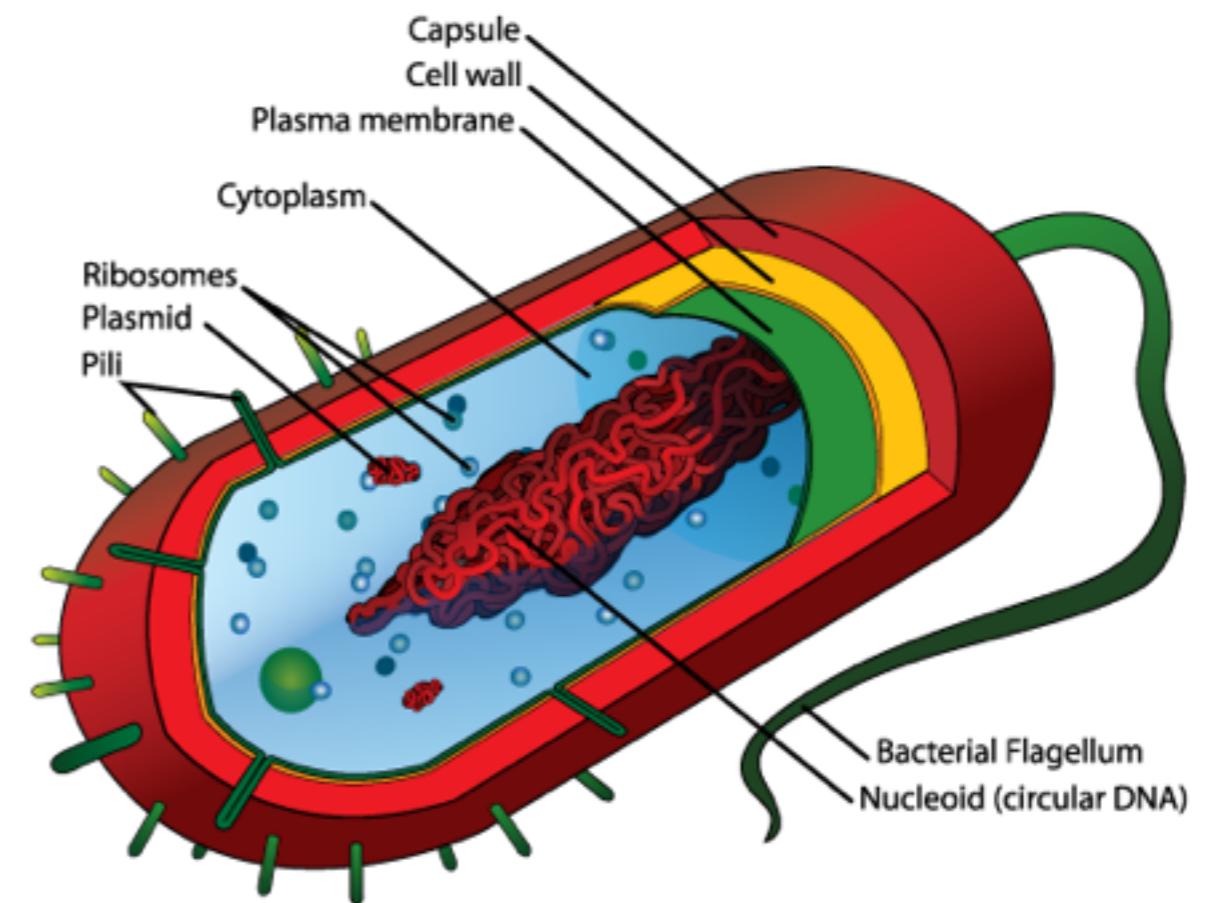


Two main categories

Eukaryotic cell

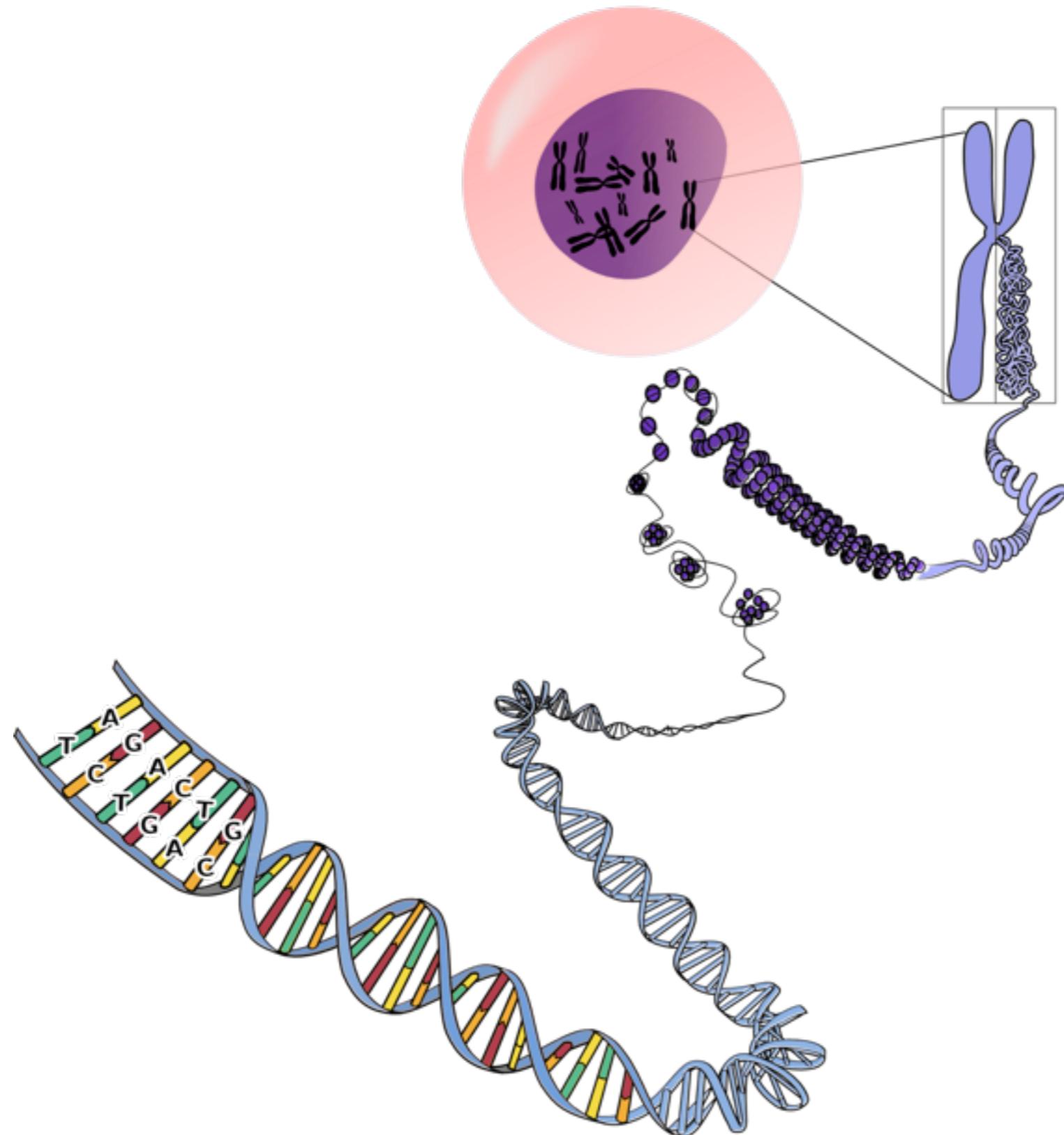


Prokaryotic cell



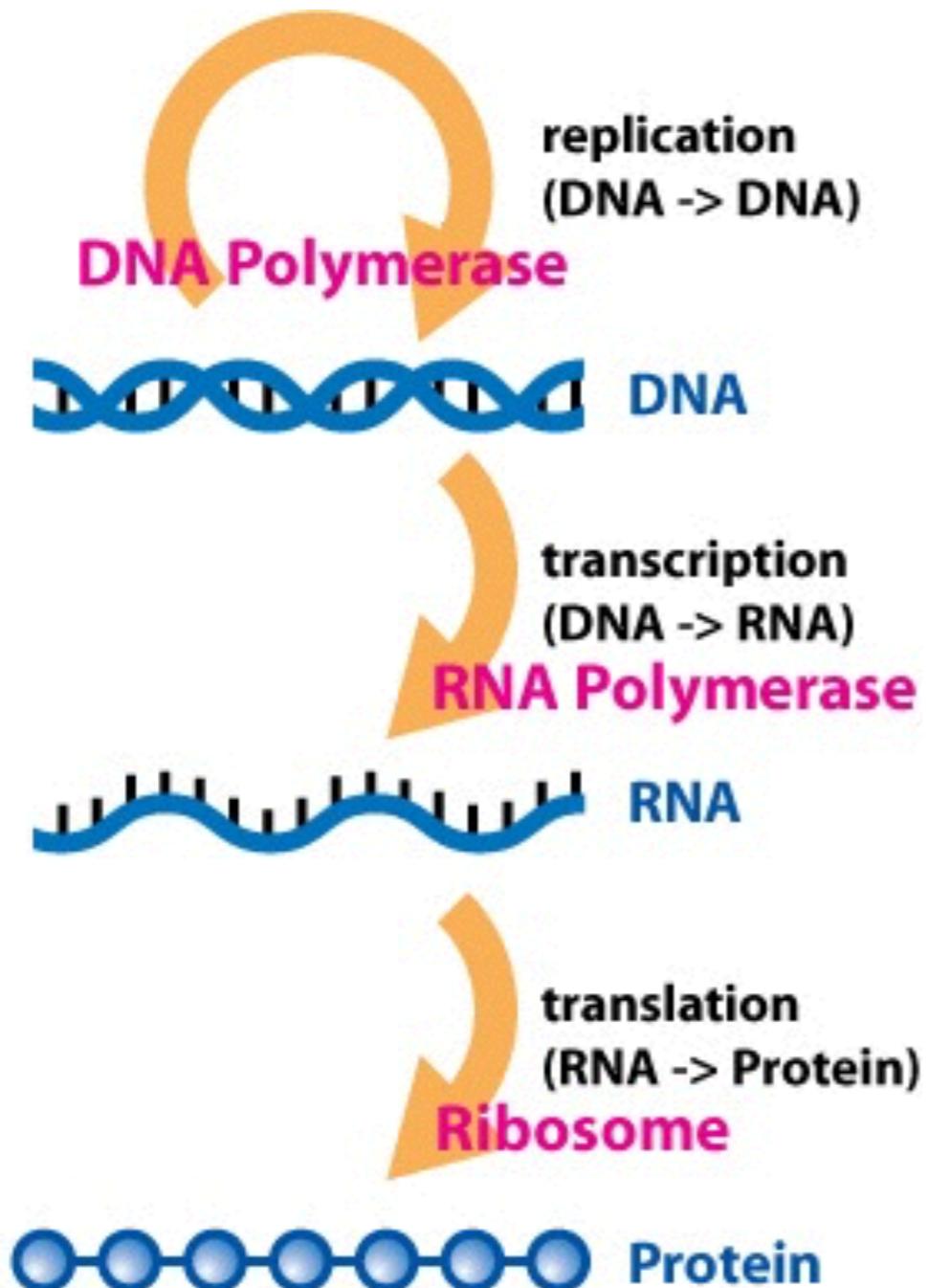


DNA in the cell





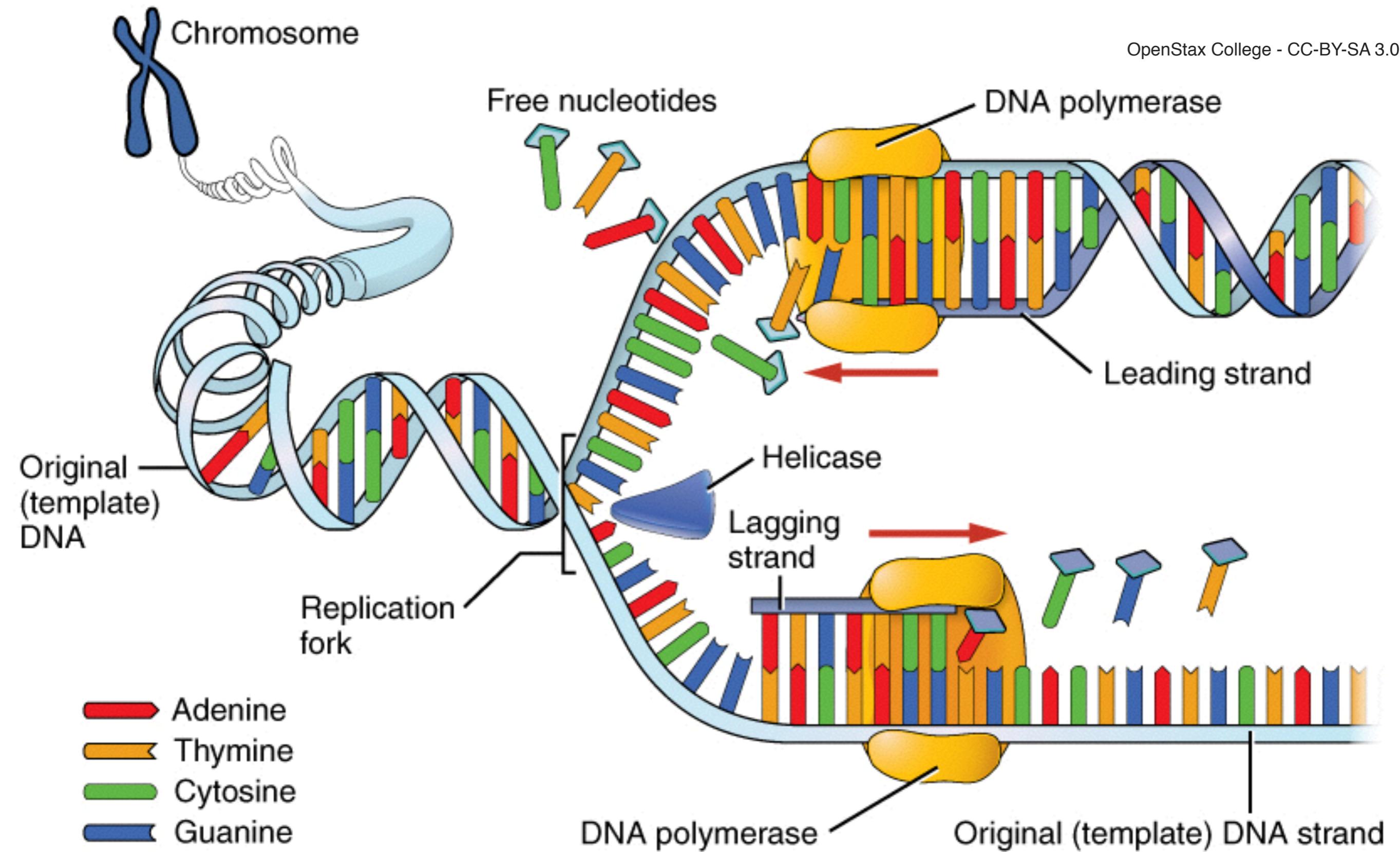
Central Dogma





DNA Replication

OpenStax College - CC-BY-SA 3.0





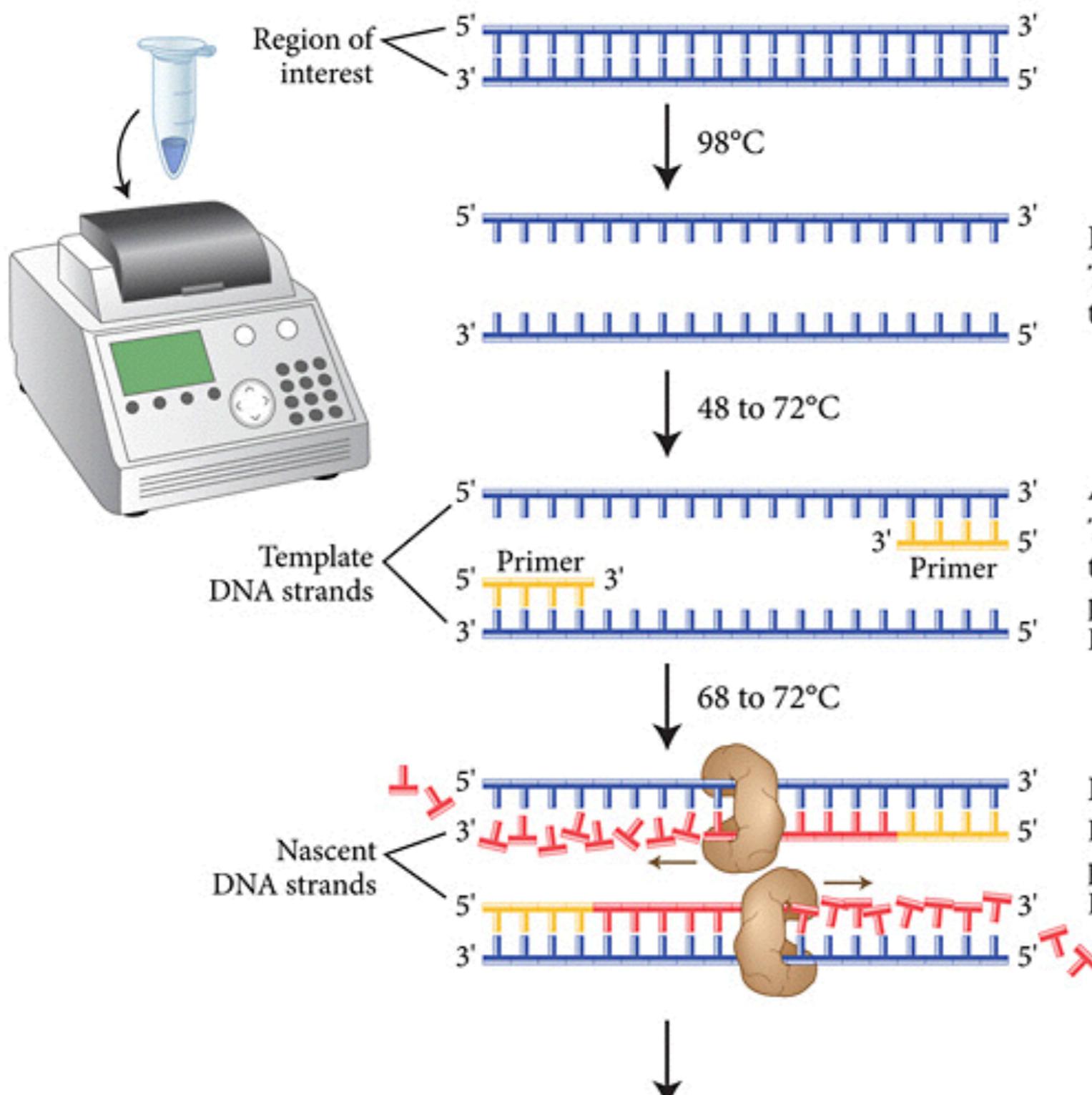
Polymerase Chain Reaction, 1983



Kary Mullis



Polymerase Chain Reaction



Denaturation

Temperature is increased to separate DNA strands

Annealing

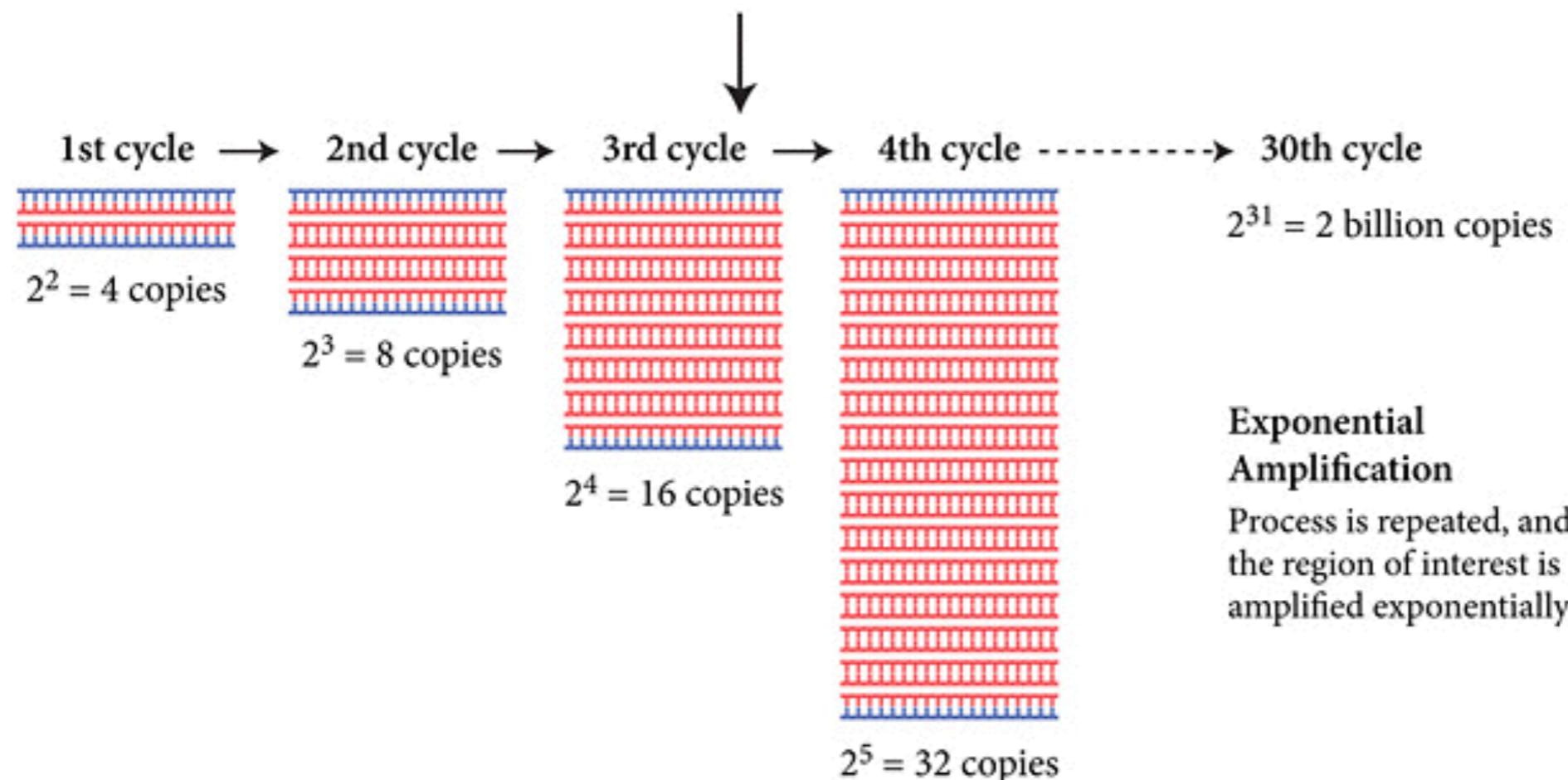
Temperature is decreased to allow primers to base pair to complementary DNA template

Extension

Polymerase extends primer to form nascent DNA strand



Polymerase Chain Reaction





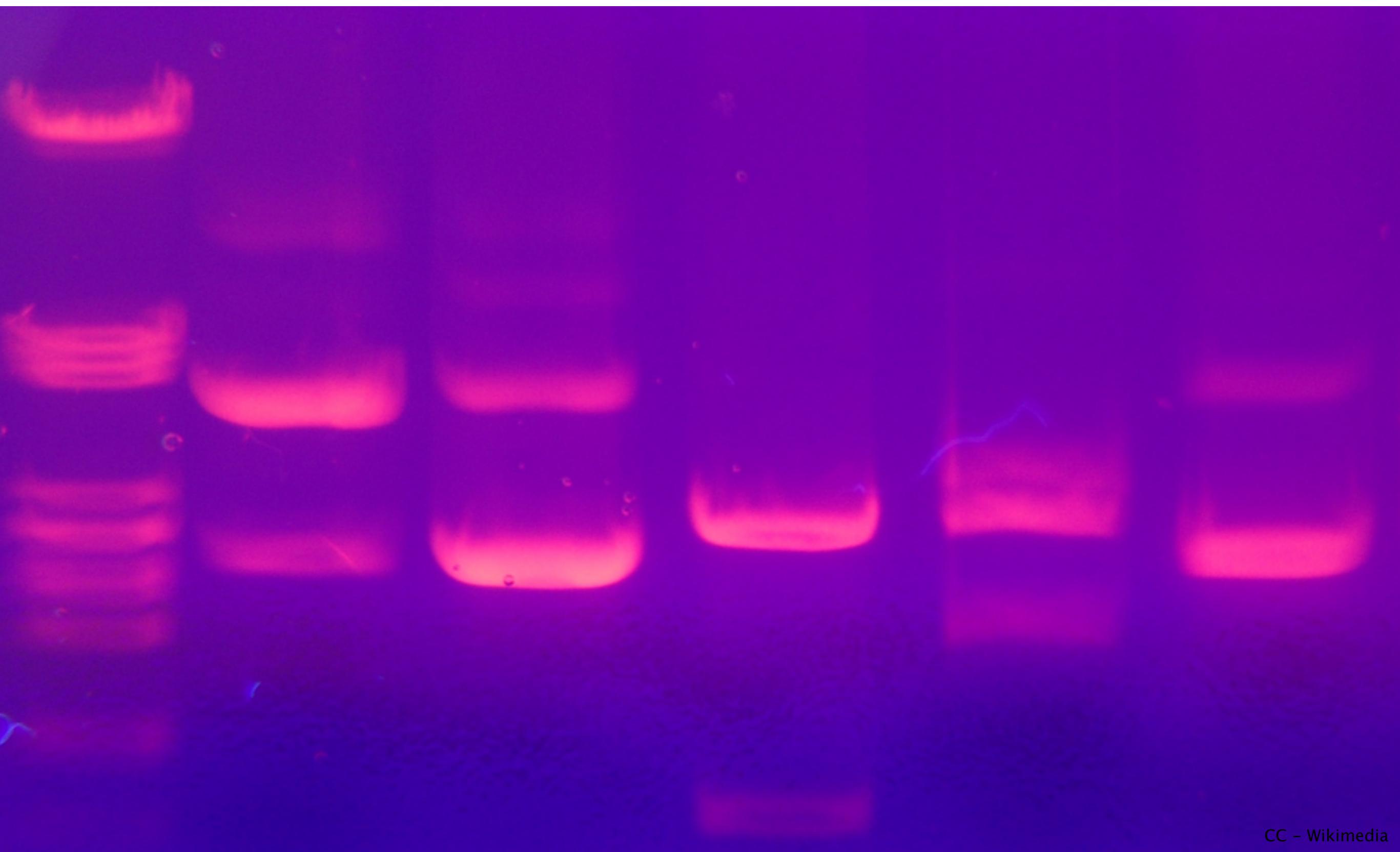
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DNA fingerprinting



DNA fingerprint





Sushi test





PooPrints

PooPrints™

Match The Mess Through DNA

D305-520

DNA Collection Kit

PET Identification Card

www.pooprints.com
DN001-
BioPet
Vet Lab
A DIVISION OF BAYER BIOPHARM CORPORATION
1-866-883-7389

DNA PET ID
DN001-11111
1-866-
883-7389

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 BAYER BIOPHARM CORPORATION
BioPet
Vet Lab
A DIVISION OF BAYER BIOPHARM CORPORATION

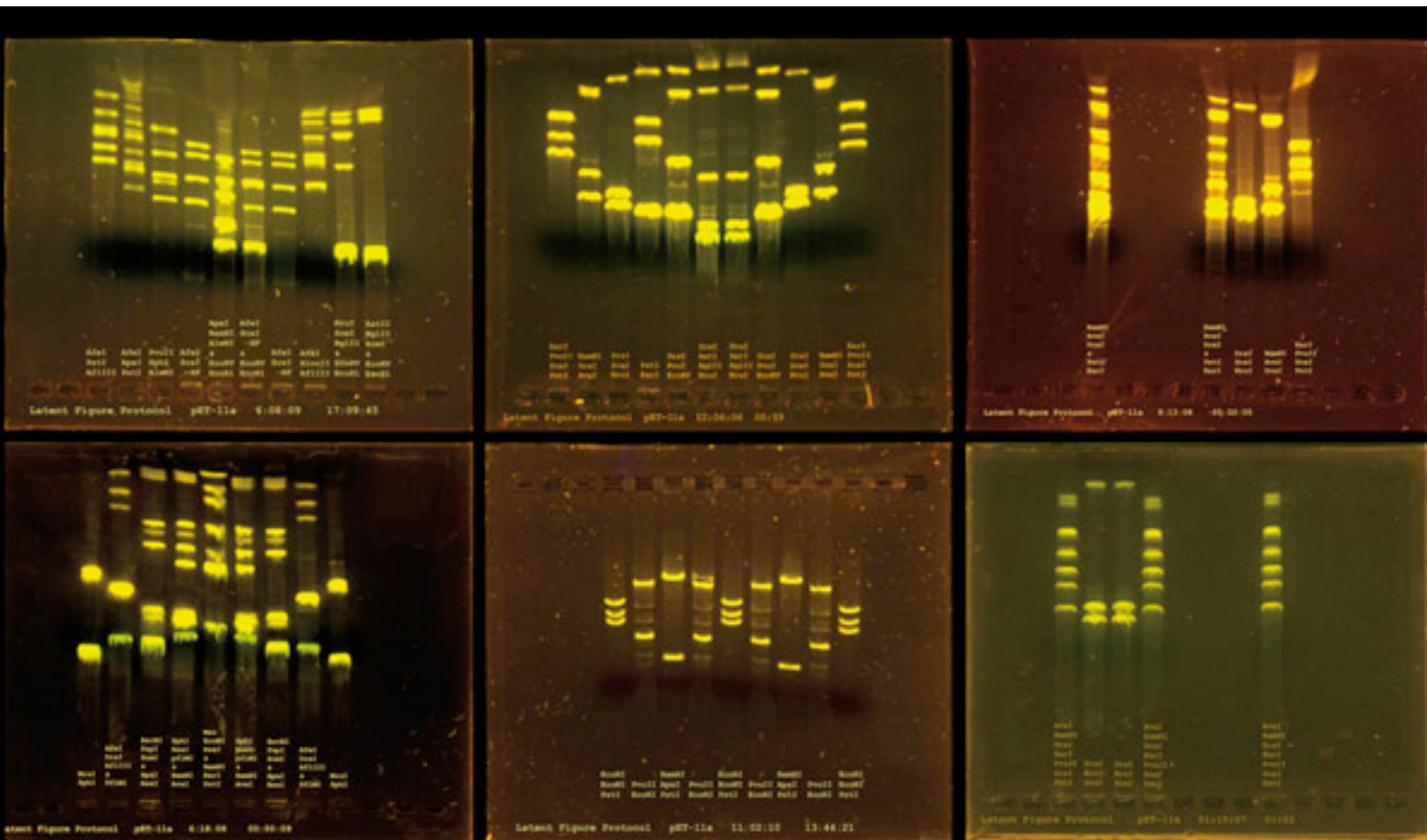


Barcode



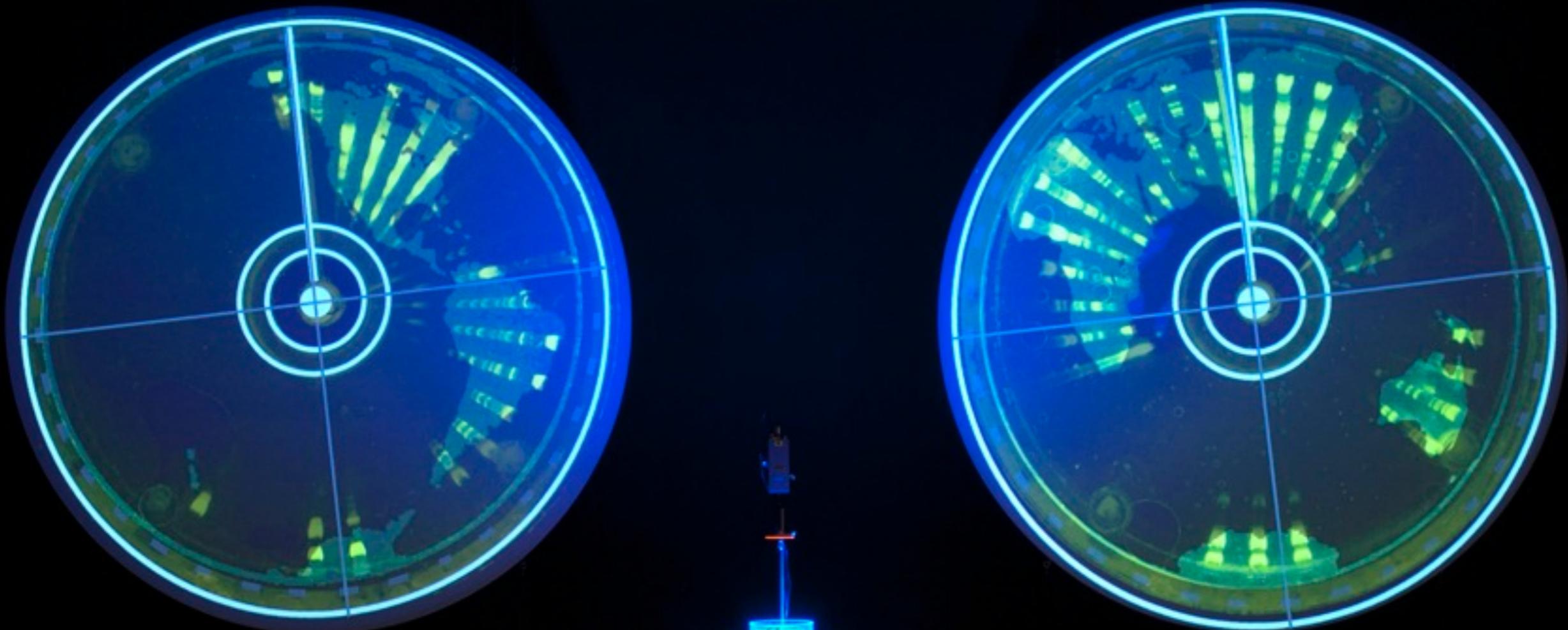


Paul Vanouse





Paul Vanouse





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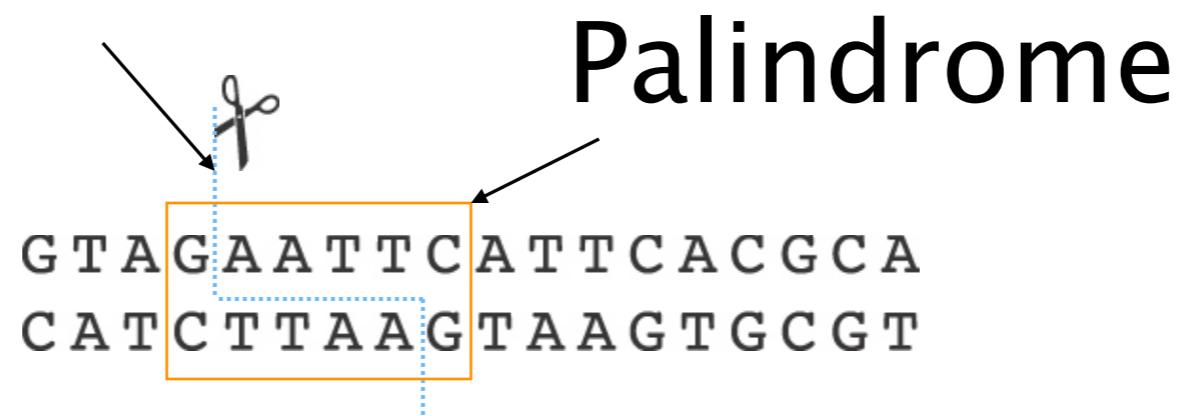
DNA restriction

a.k.a cutting DNA



Sequence specific cuts

Restrictie site



Palindrome

Fragment 1

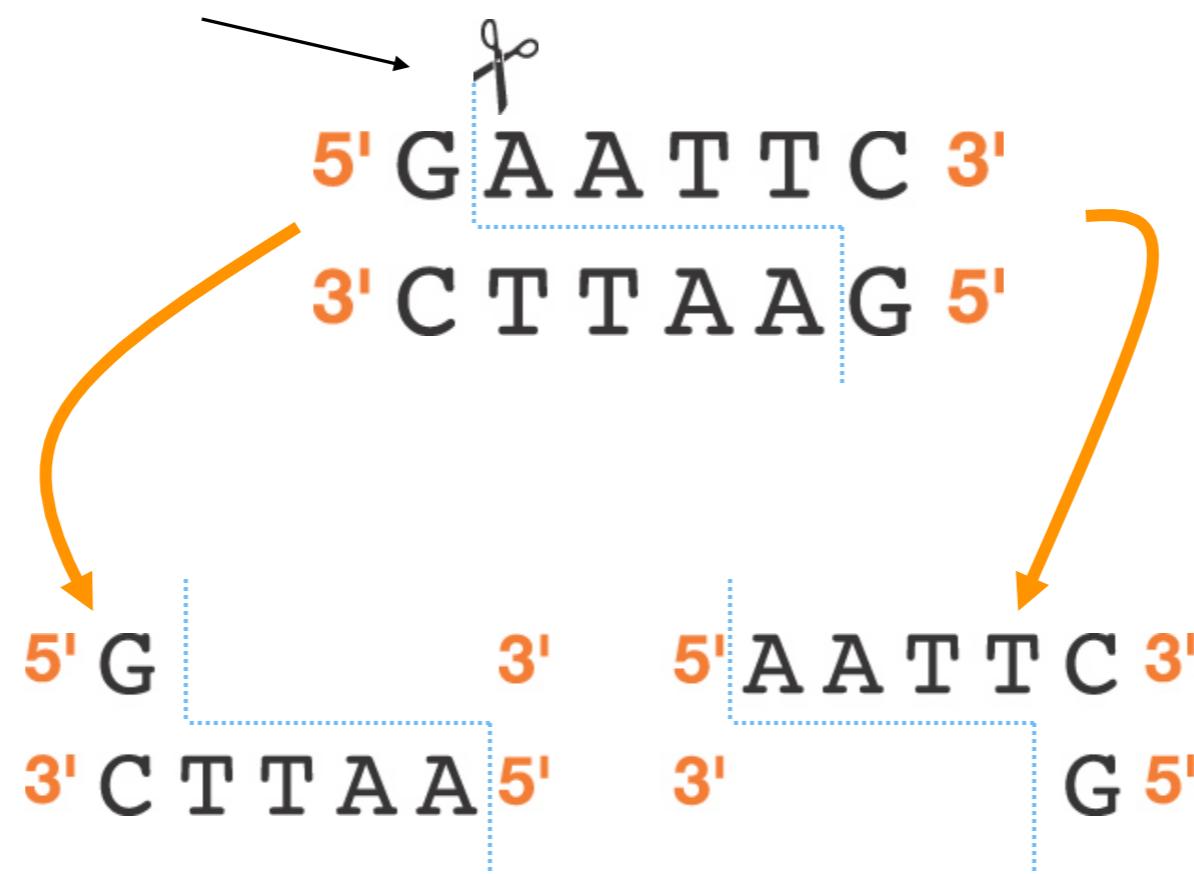


Fragment 2



5 vs 3 accent overlap

cut site



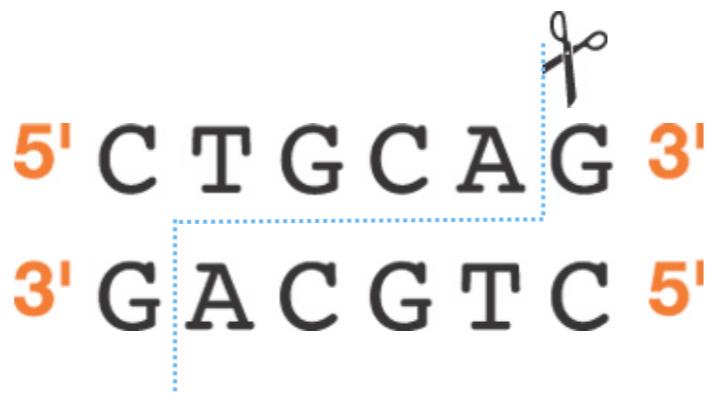


EcoRI en PstI



EcoRI

- Escherichia coli
- 5 prime overlap



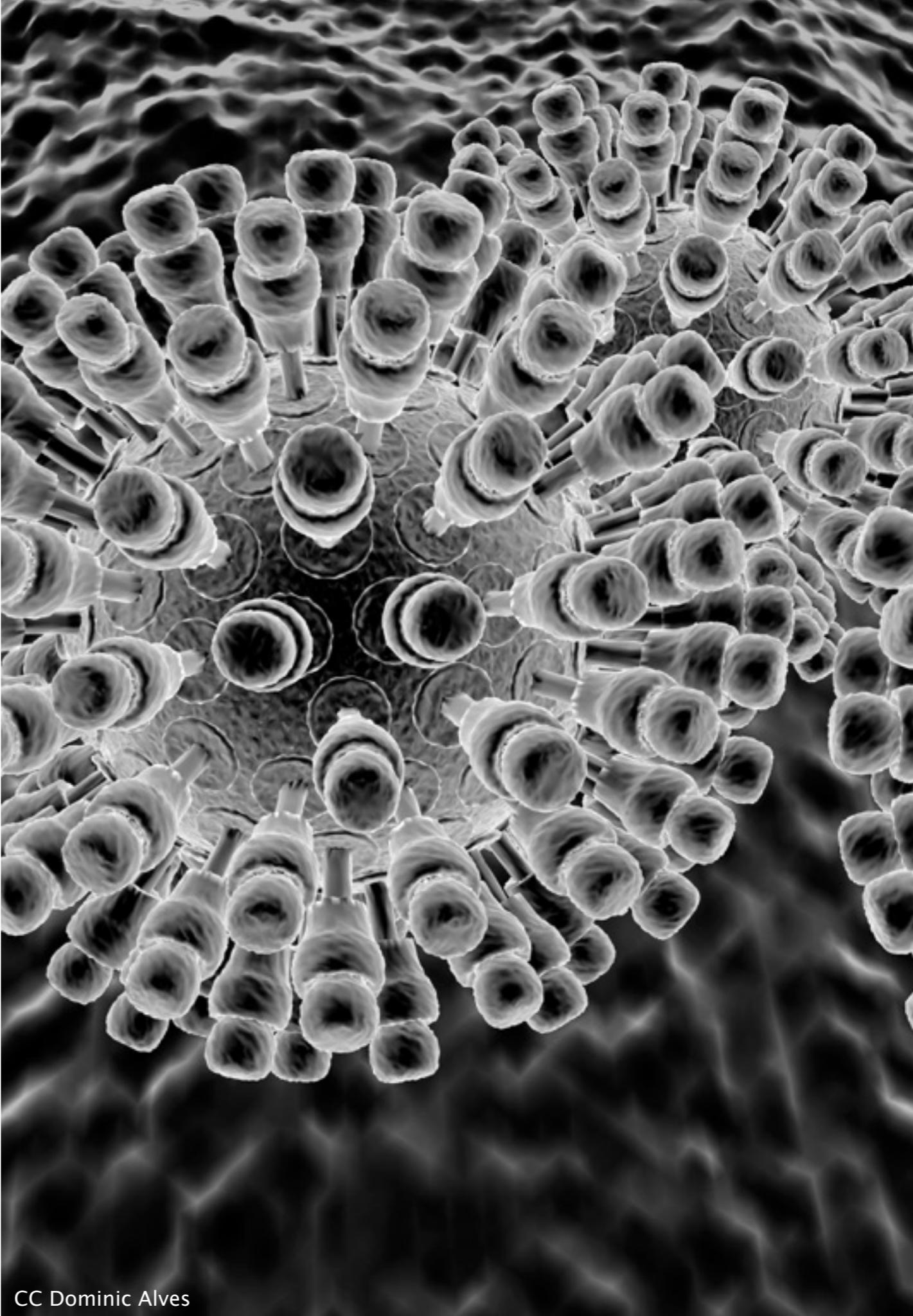
PstI

- Providencia stuartii
- 3 prime overlap



DNA restriction enzymes

- Protect against viral infections
- Over 3000 types known





Step 1: samples and enzymes

Get DNA and enzymes

Crime Scene → Suspects → DNA reference



Take the 5 samples



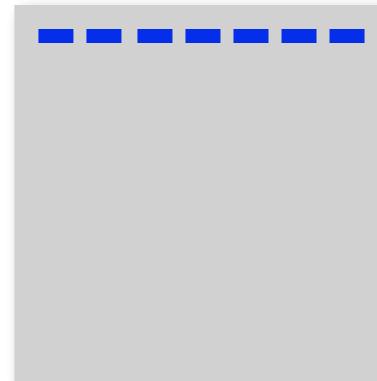
Cut it using a EcoRI/
PstI restriction–
enzymmix

Incubate 45 minutes at 37 degrees

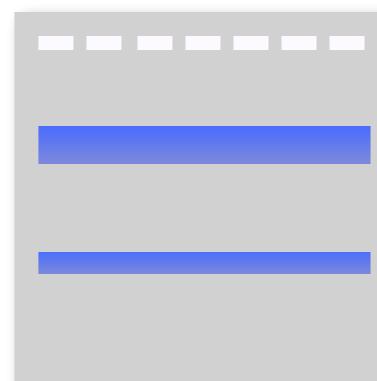


Step 2: Gel electrophoreses

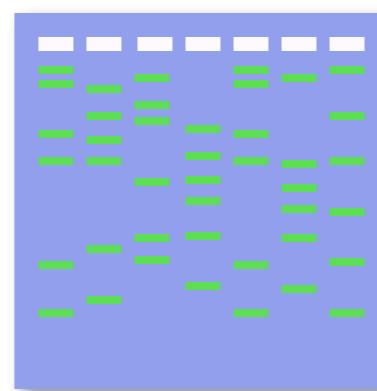
Mix the samples with loading dye



Load the samples in a gel



Apply current

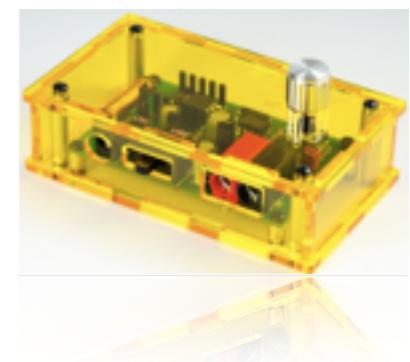
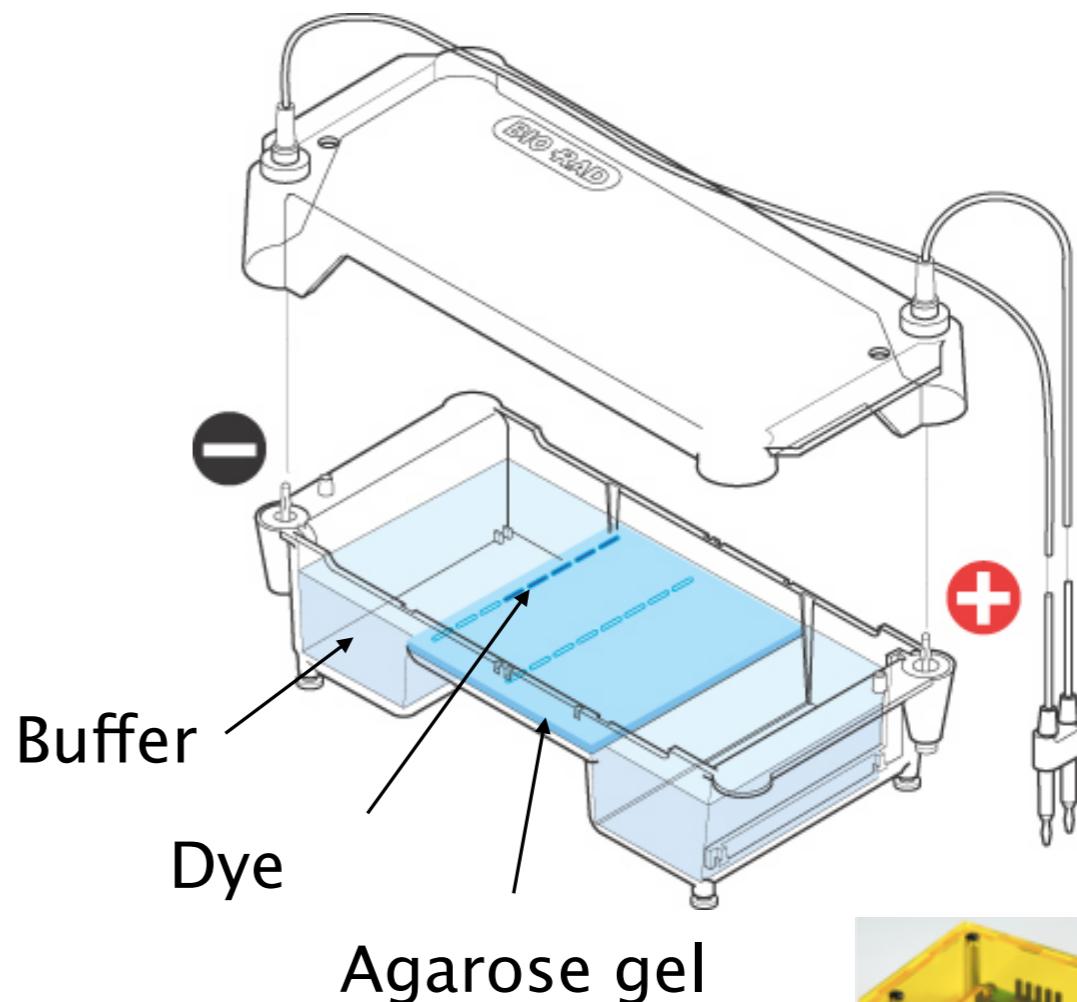


Read the pattern

Identify the killer

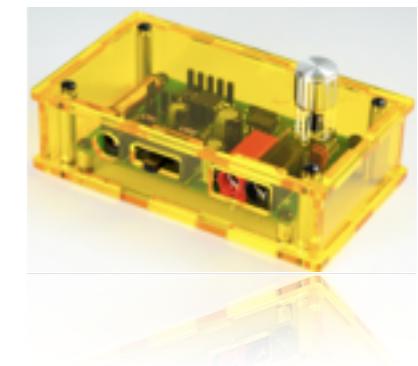
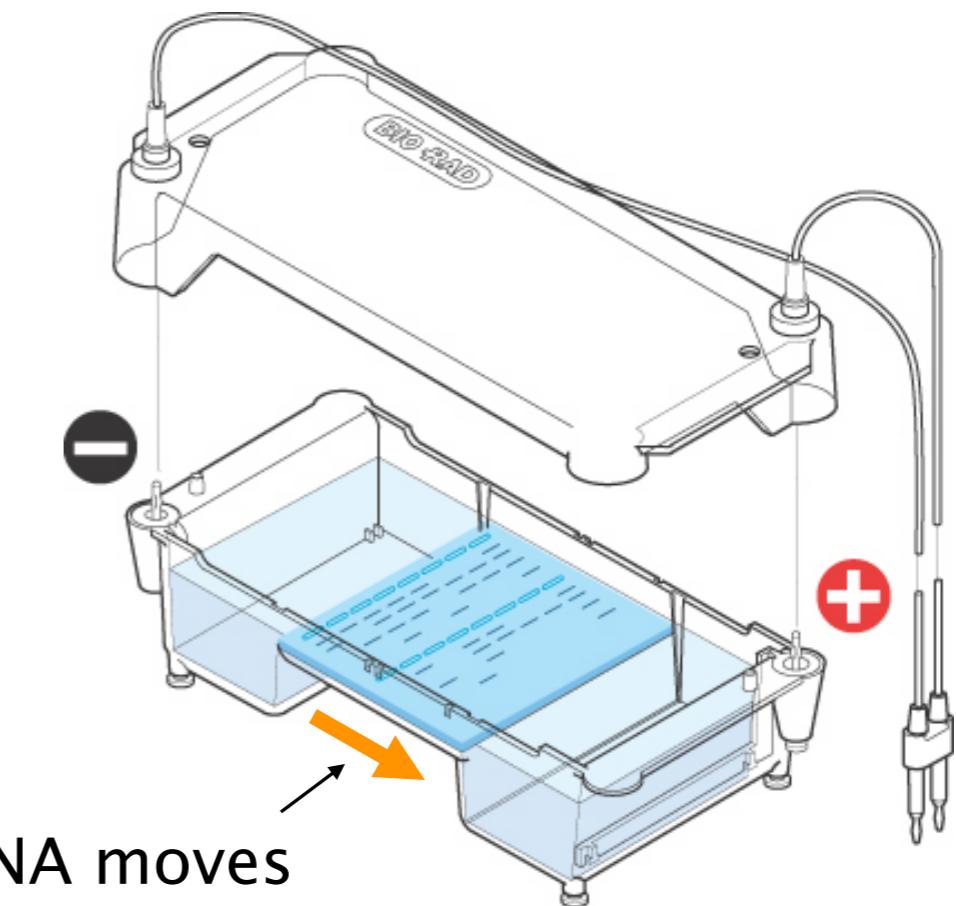
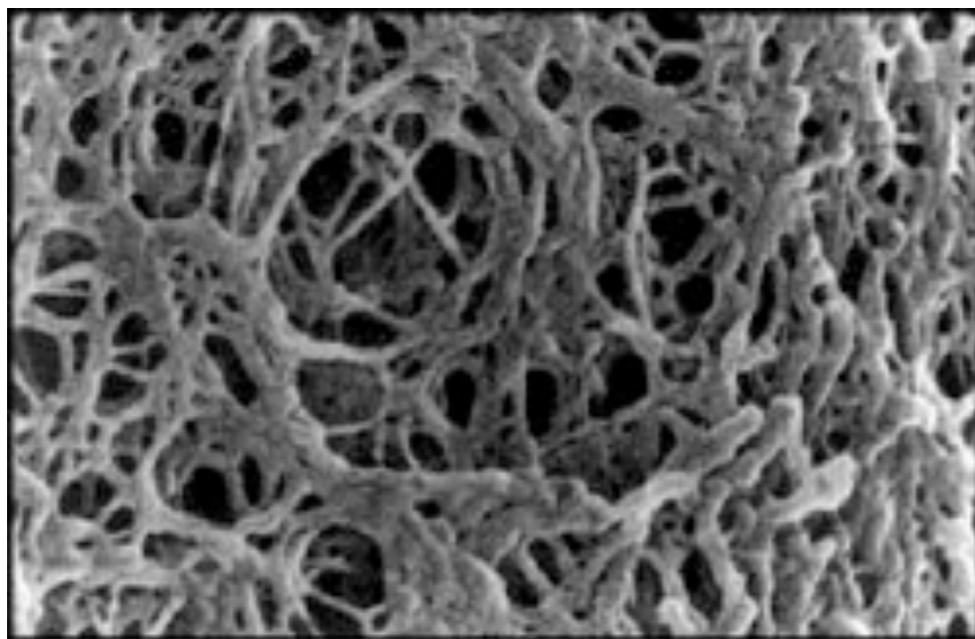


DNA is attracted by the anode





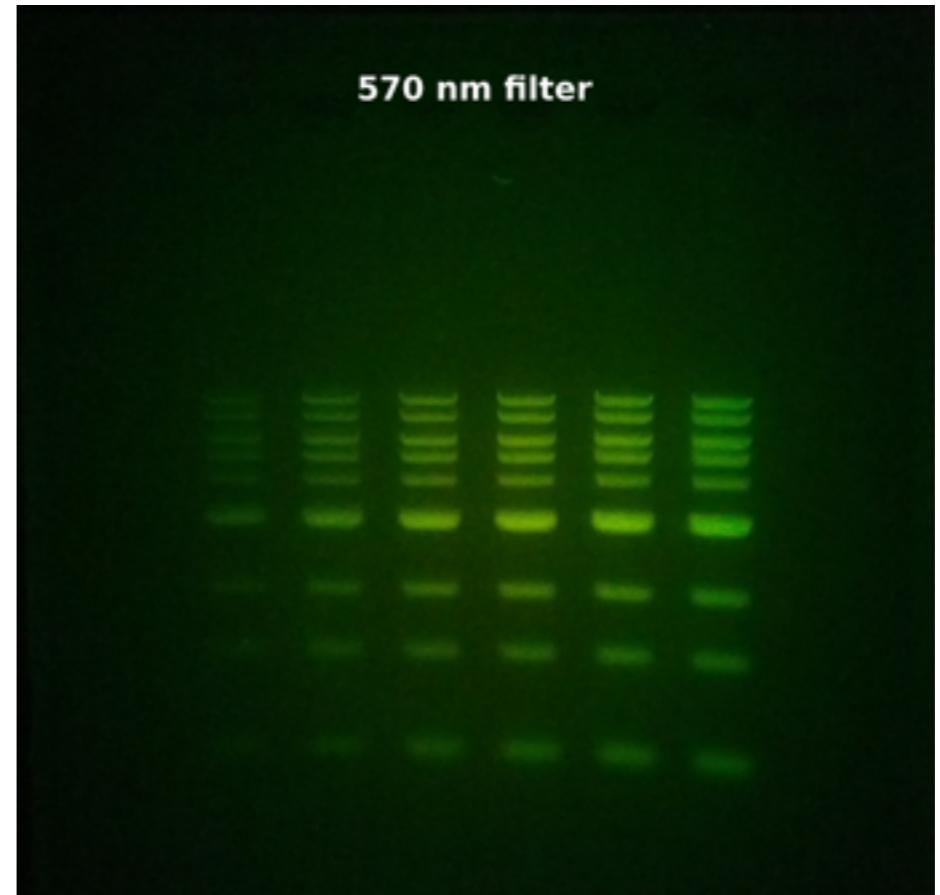
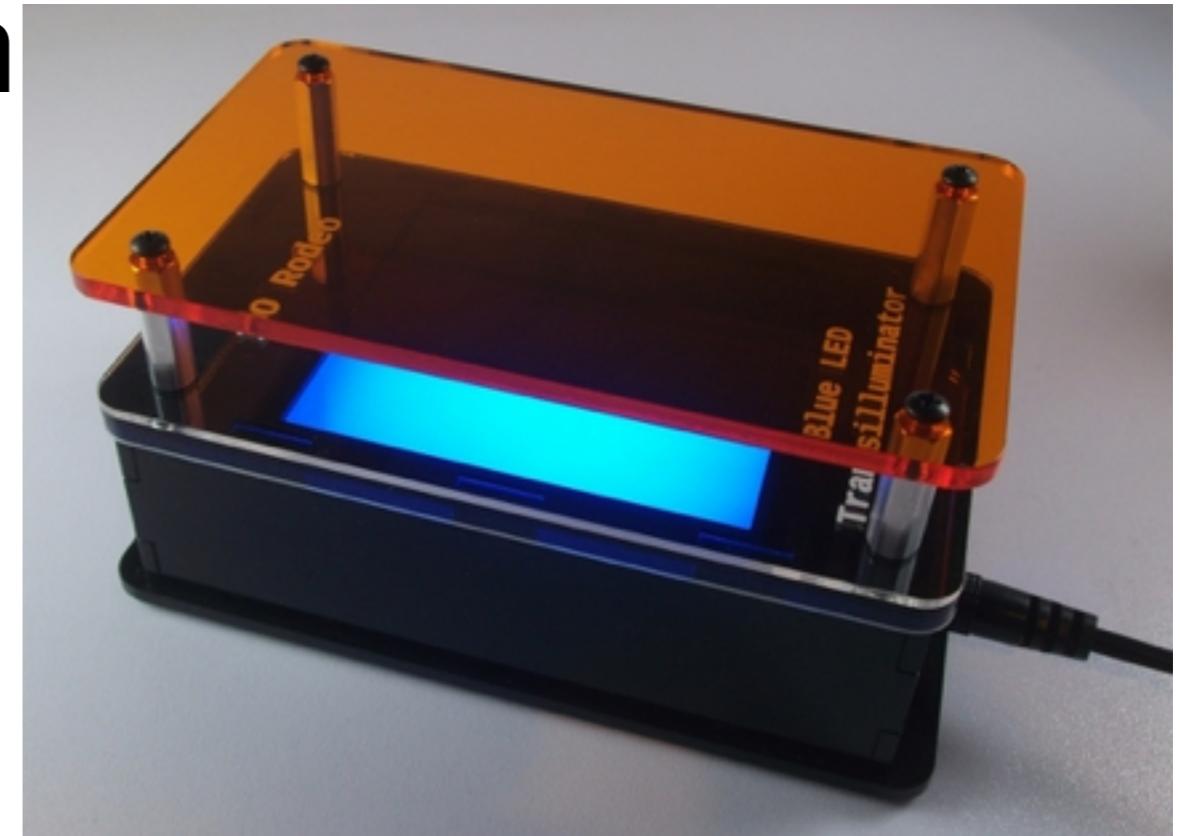
Short pieces move faster
than long pieces





Transillumination

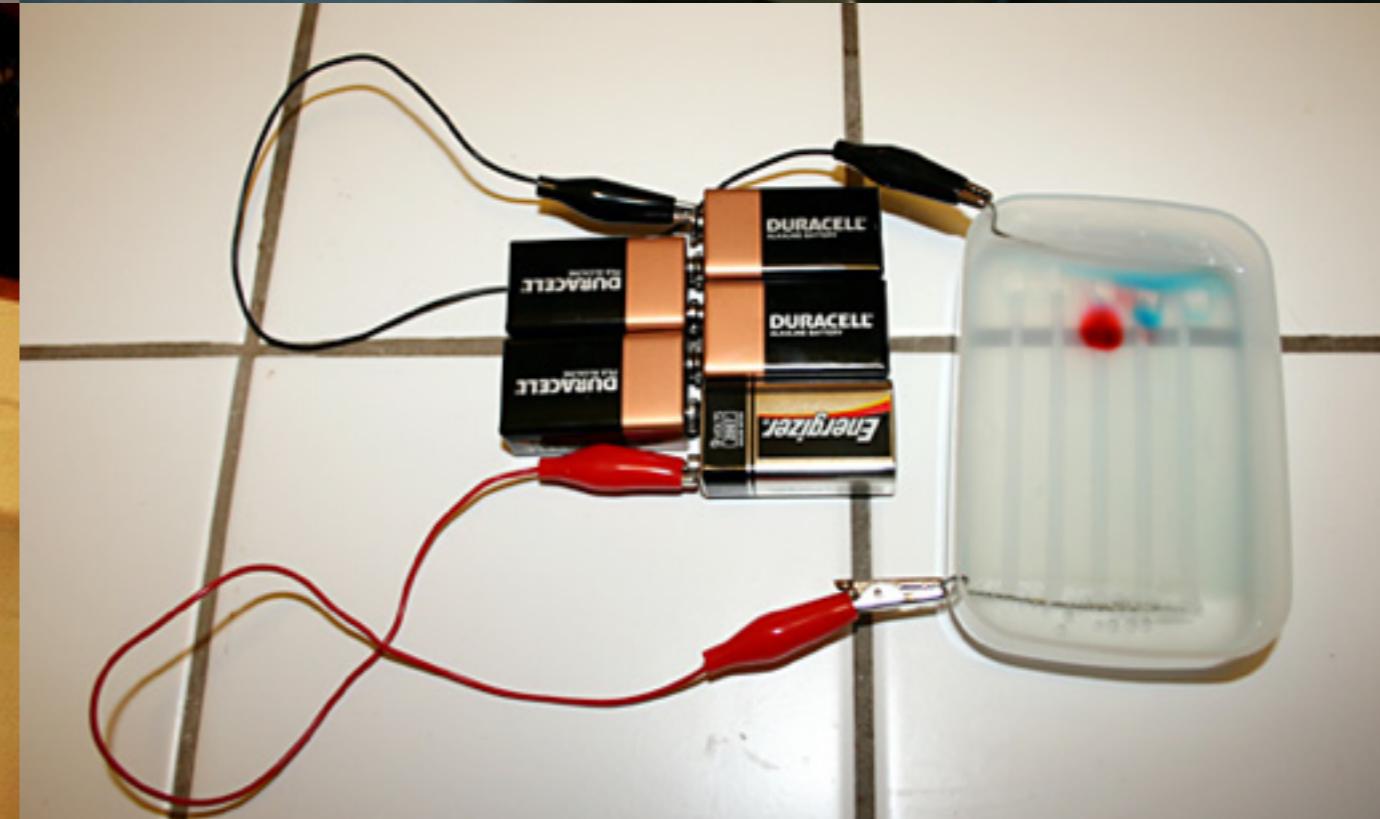
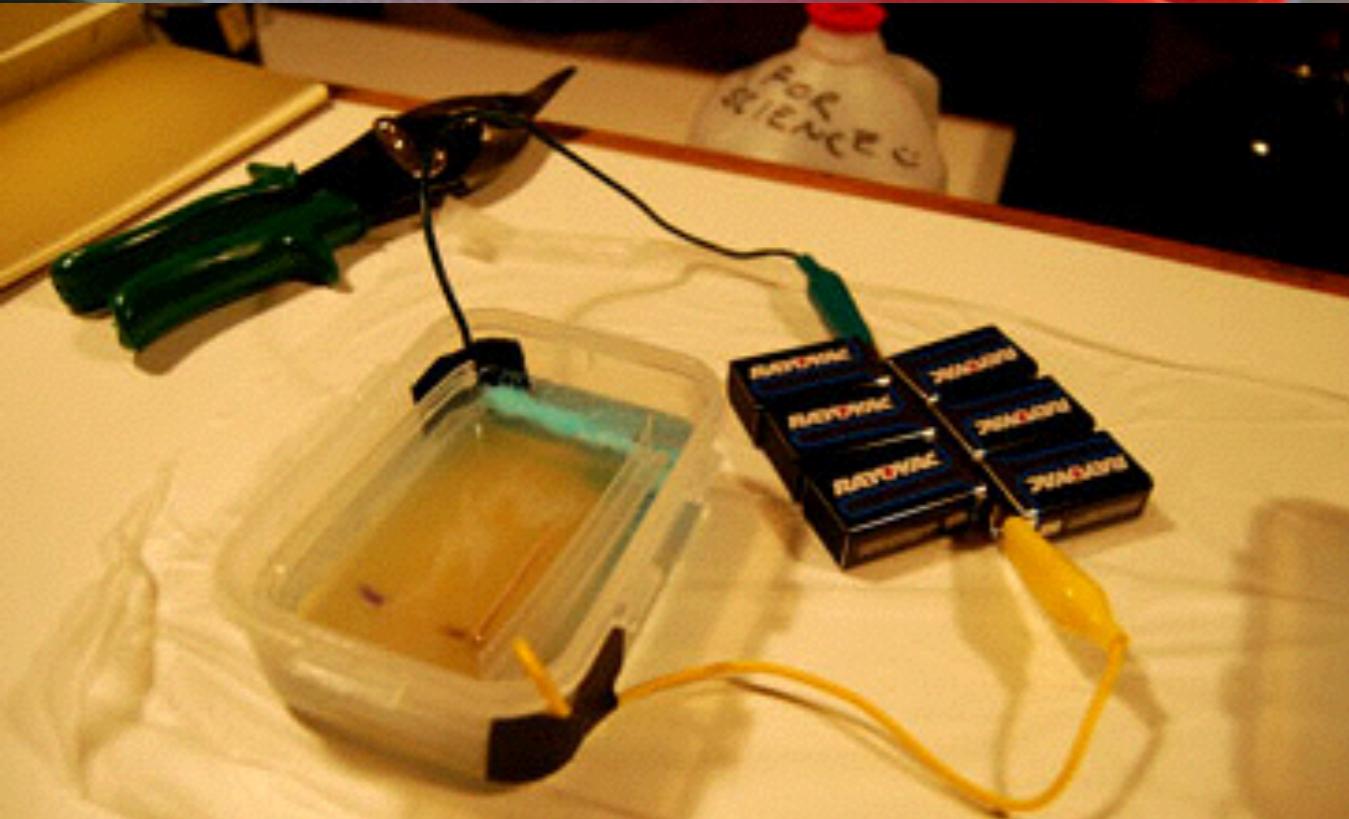
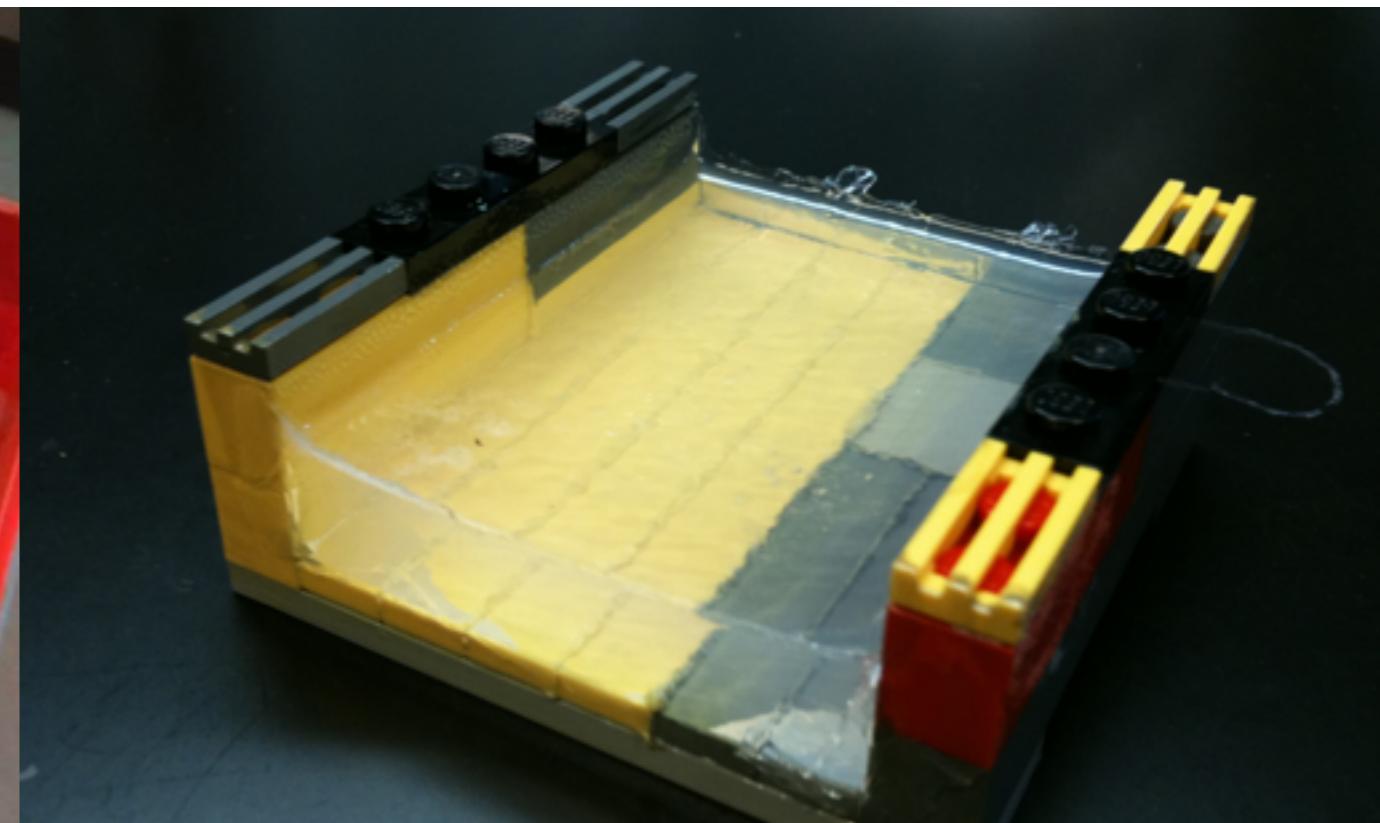
- Fluorescent DNA dye
- Sensitive to blue light
- Emits green light
- Orange filter blocks blue light





DIY Electrophoresis

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





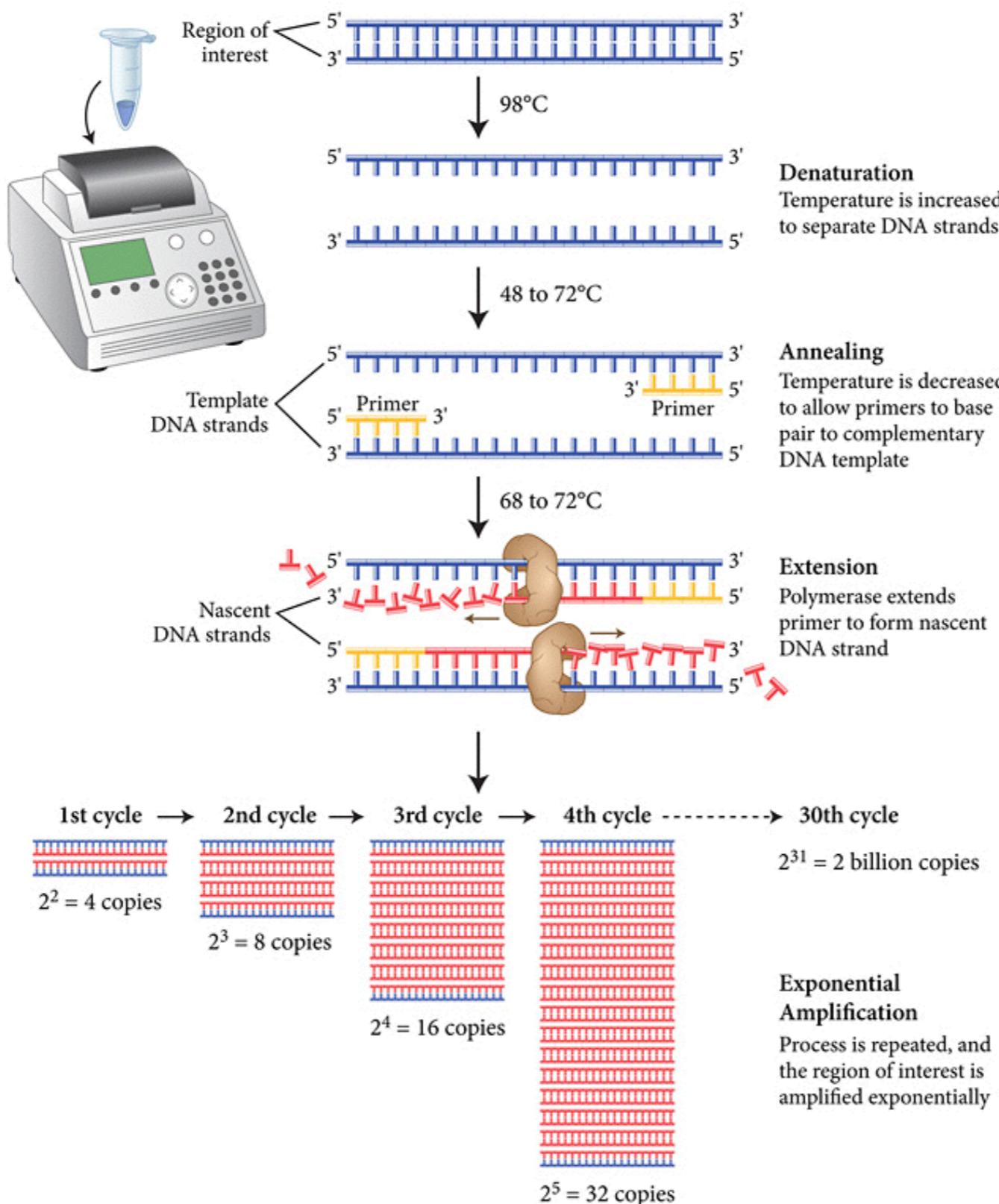
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DNA analytics

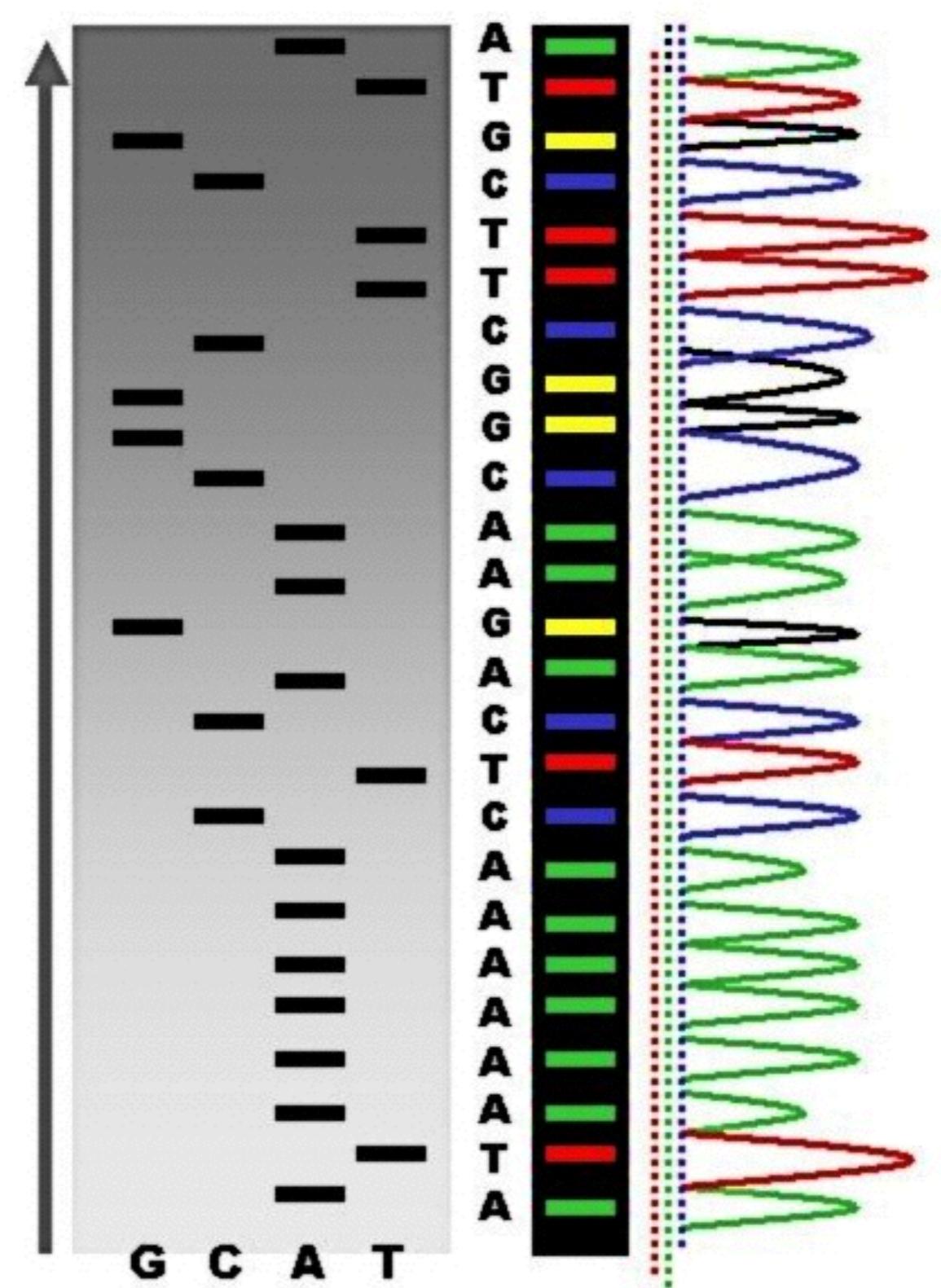
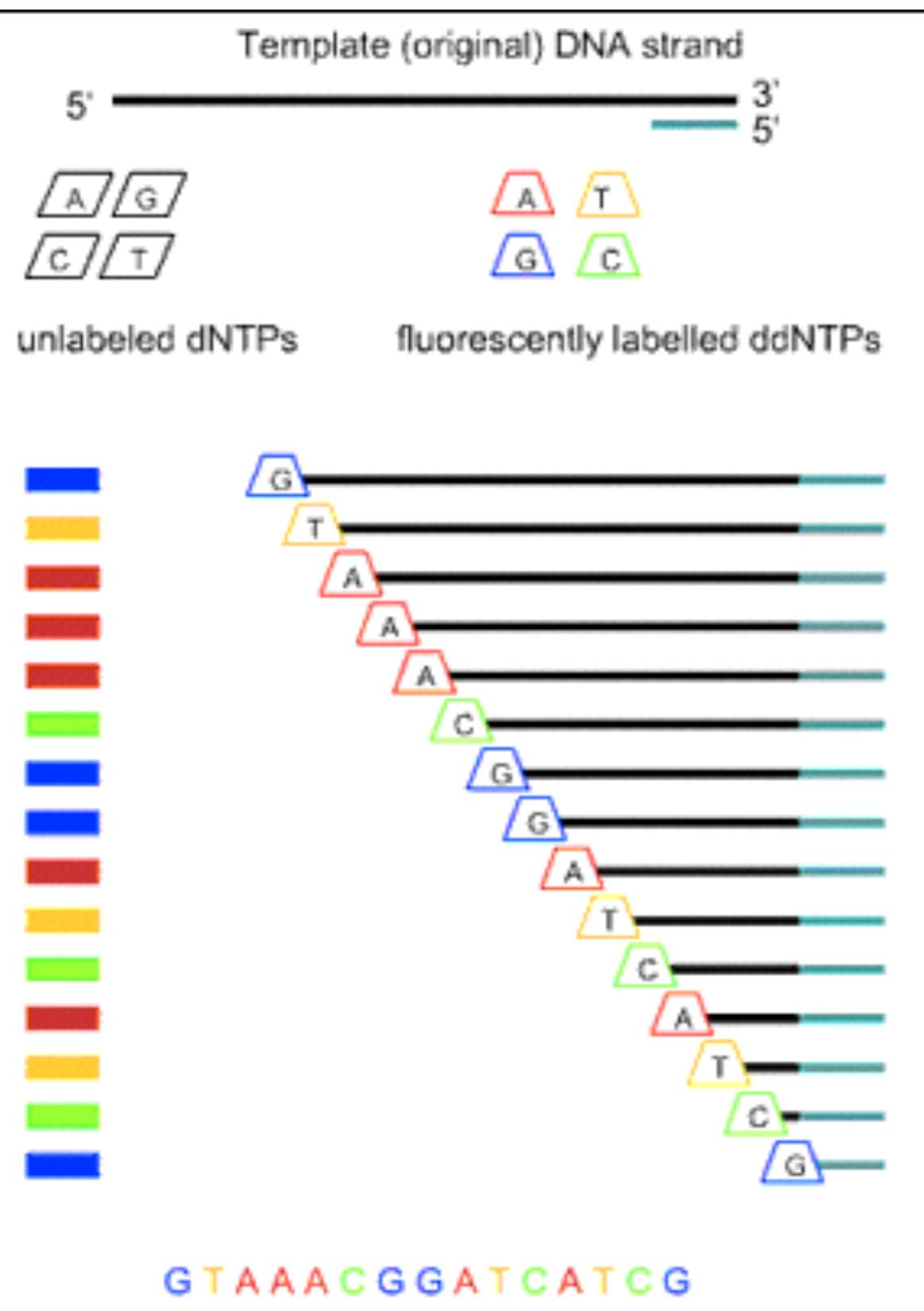


Polymerase Chain Reaction





Sanger Sequencing - chain termination





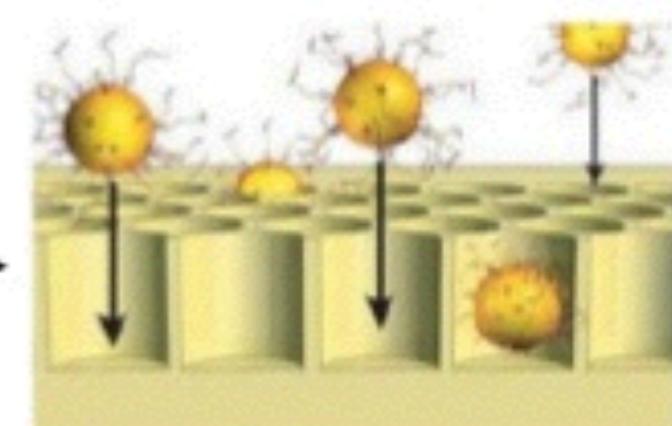
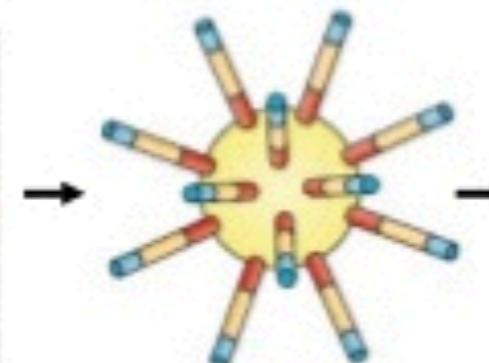
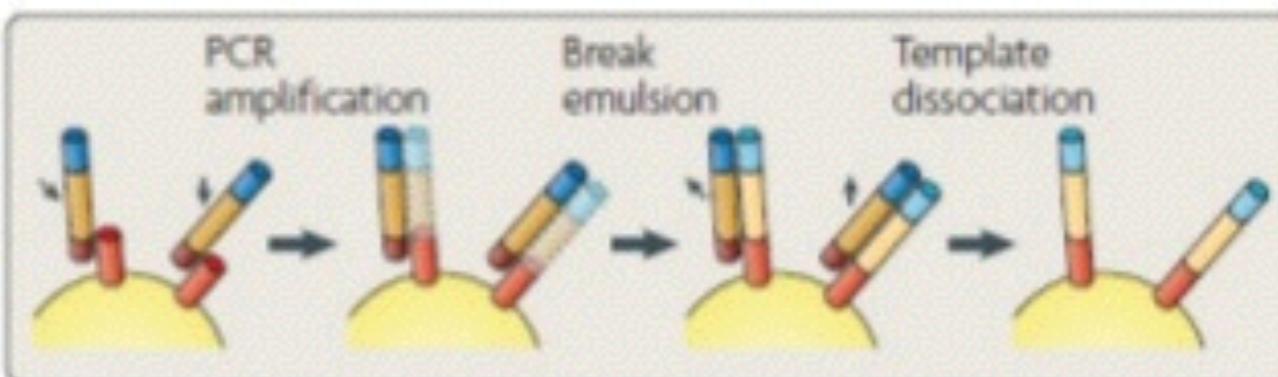
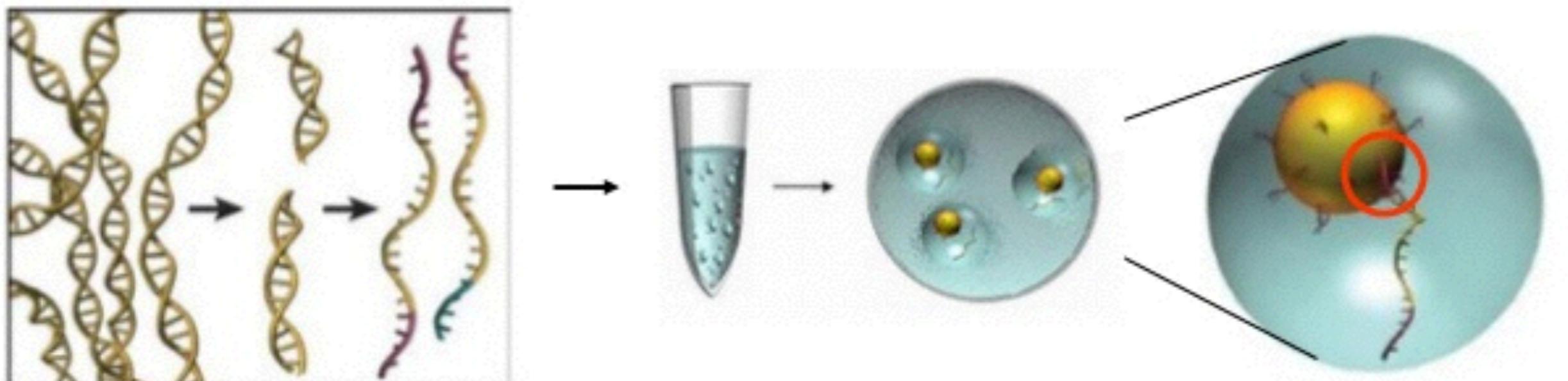
454 sequencer





454 Pyrosequencing

1. Emulsion-based sample preparation (emPCR)

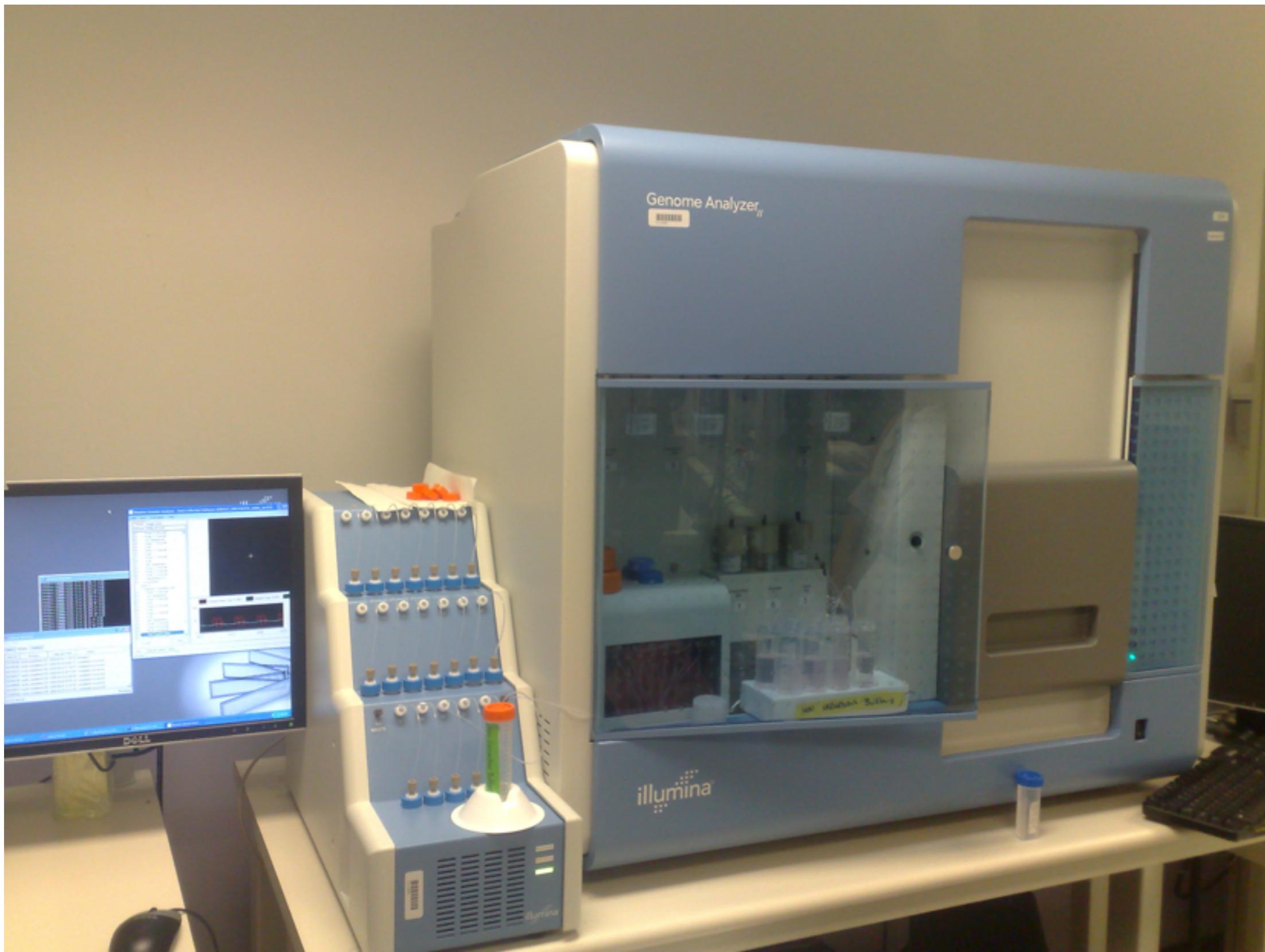


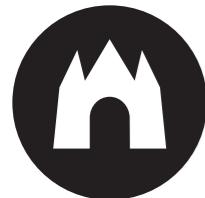
Several thousand
copies of the same
template sequence
on each bead

on average 1.6 million wells



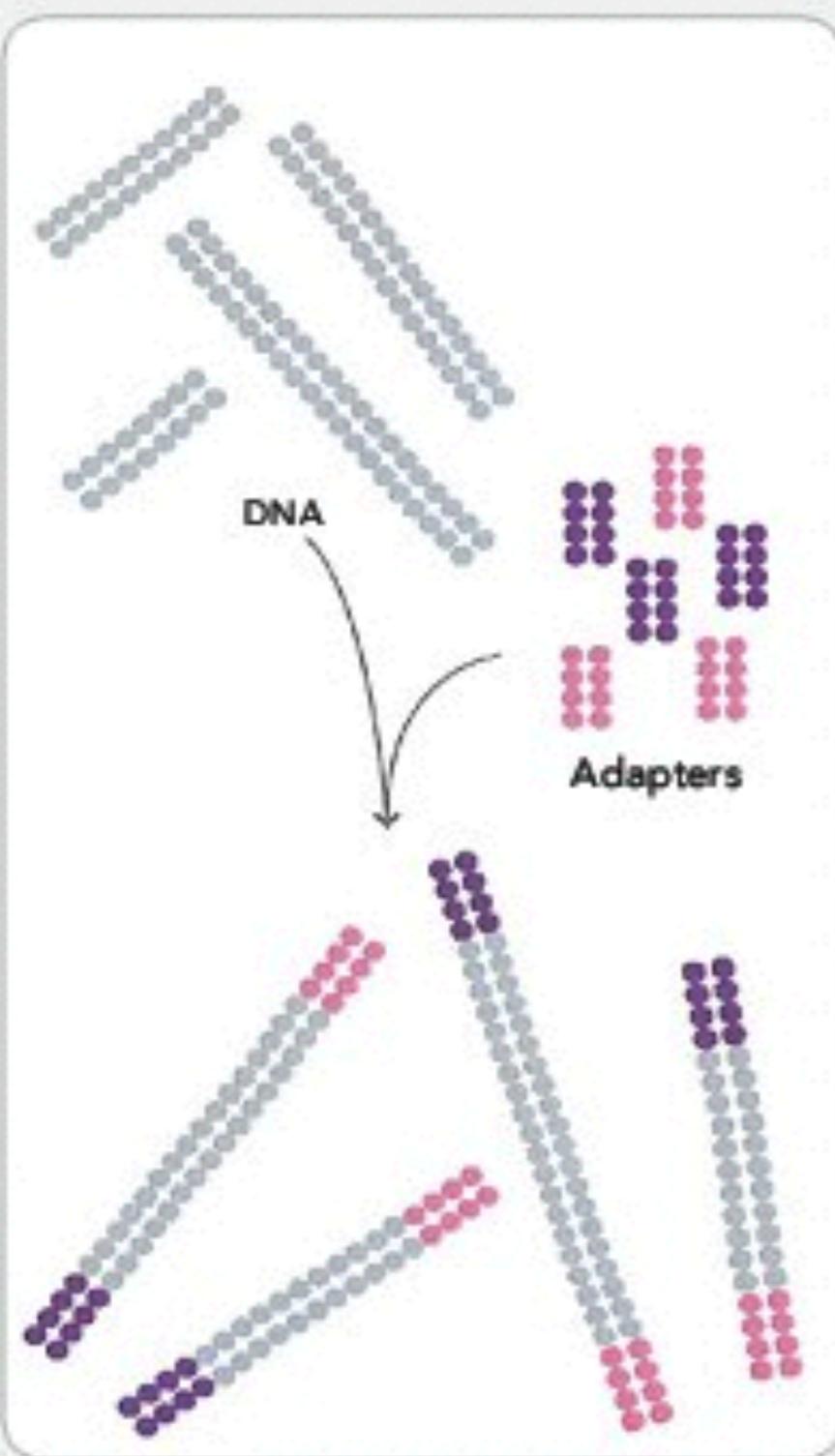
Illumina - Solexa



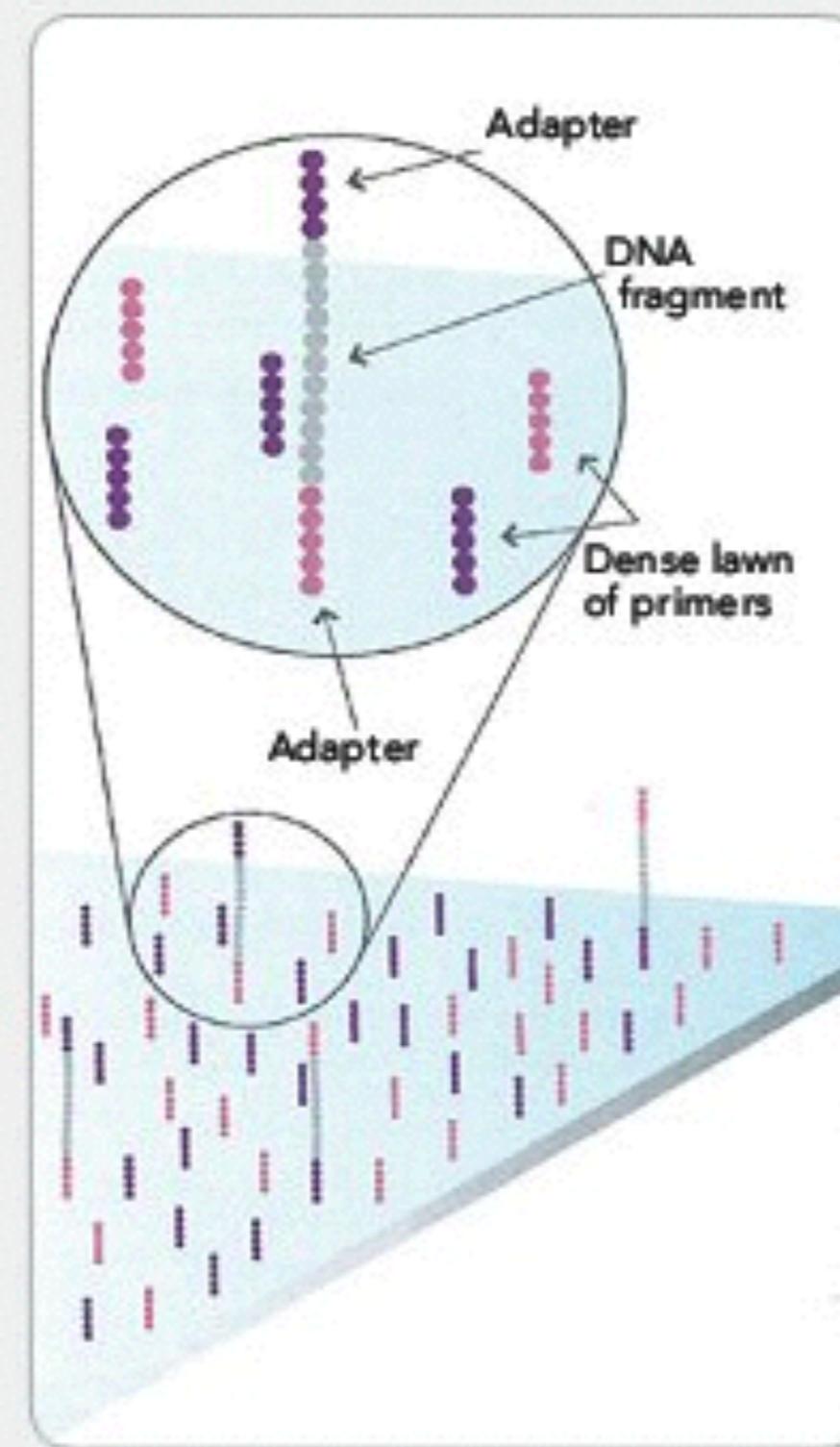


Solexa - Illumina sequencing

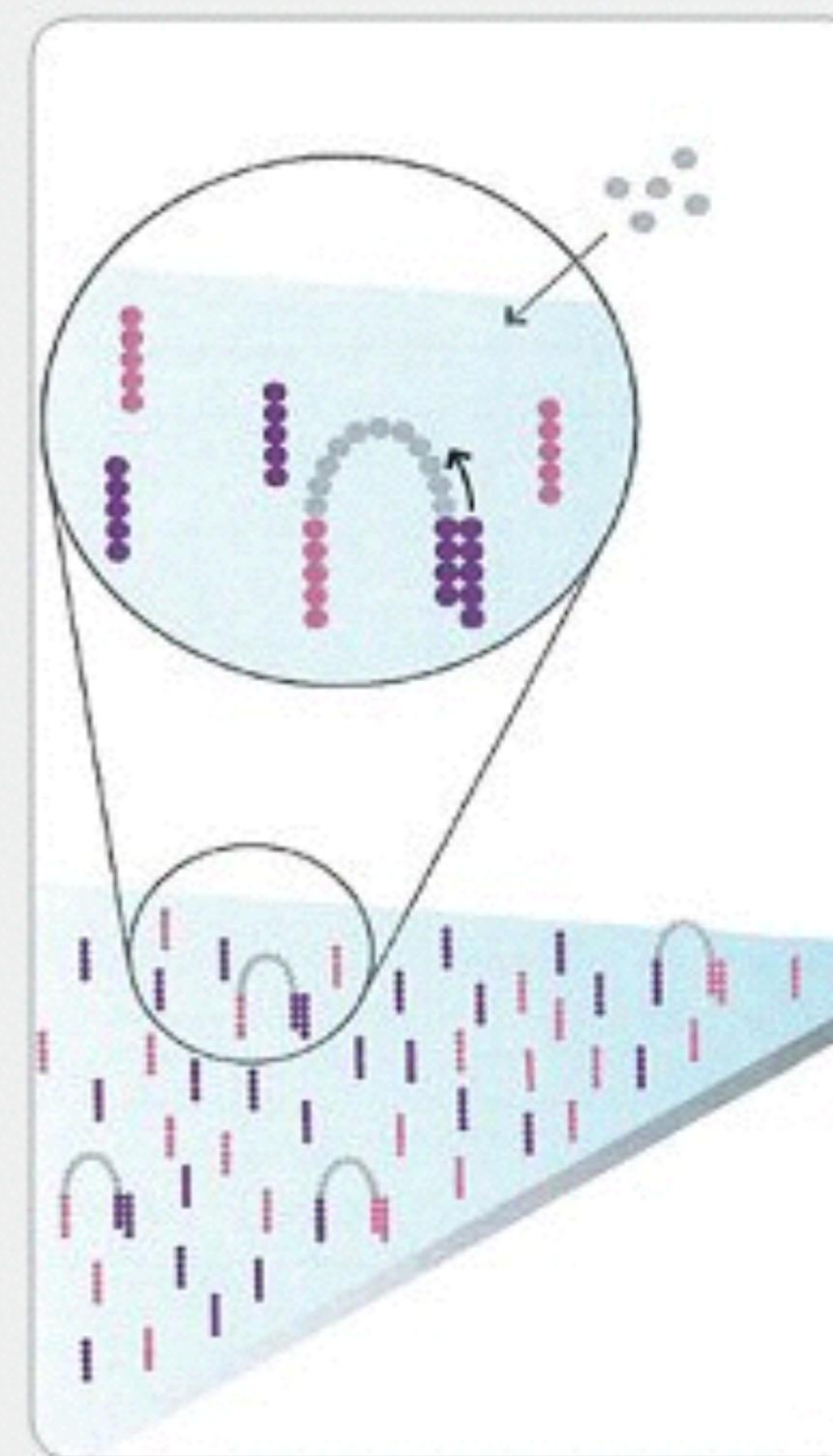
1. PREPARE GENOMIC DNA SAMPLE



2. ATTACH DNA TO SURFACE

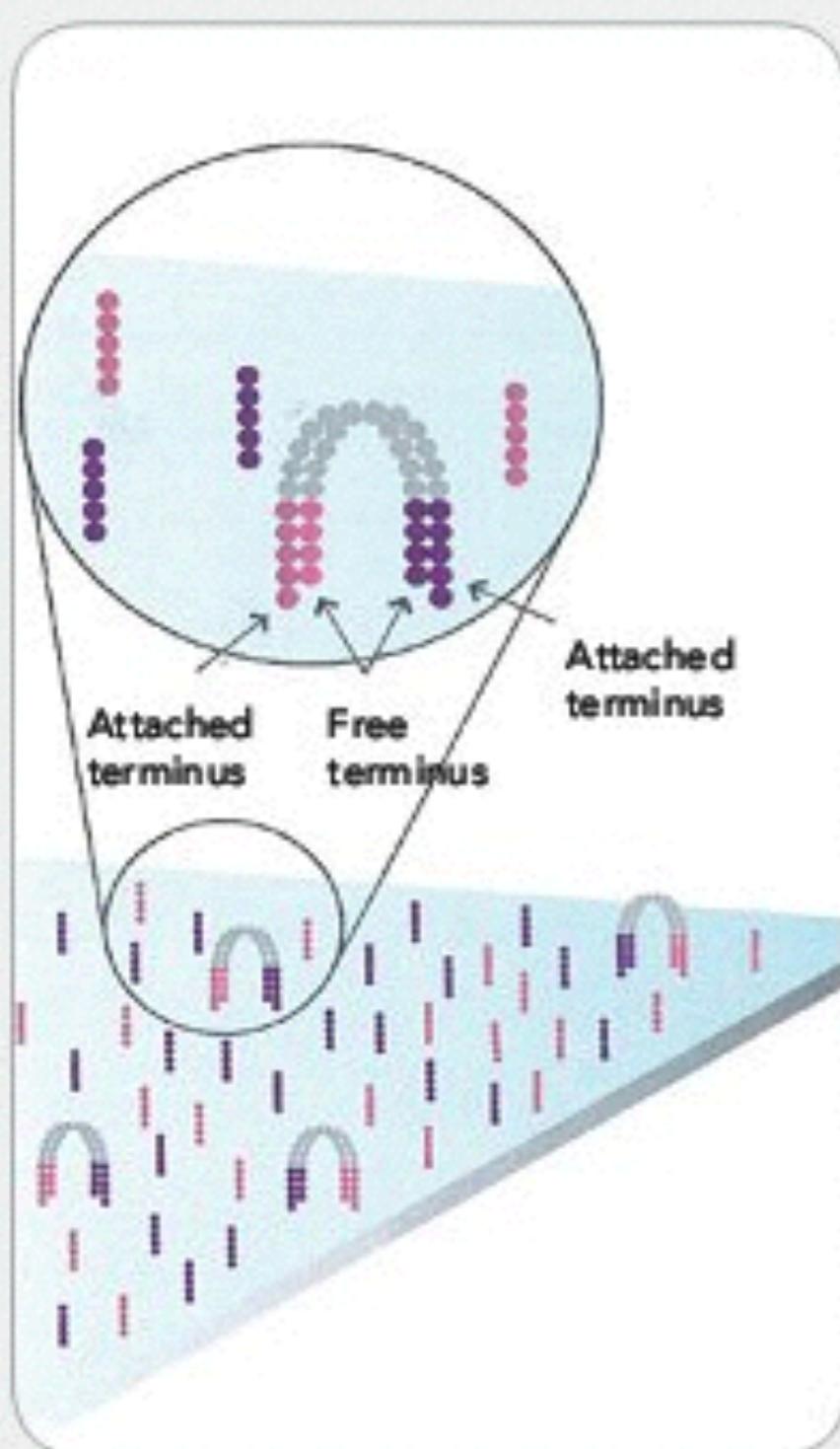


3. BRIDGE AMPLIFICATION

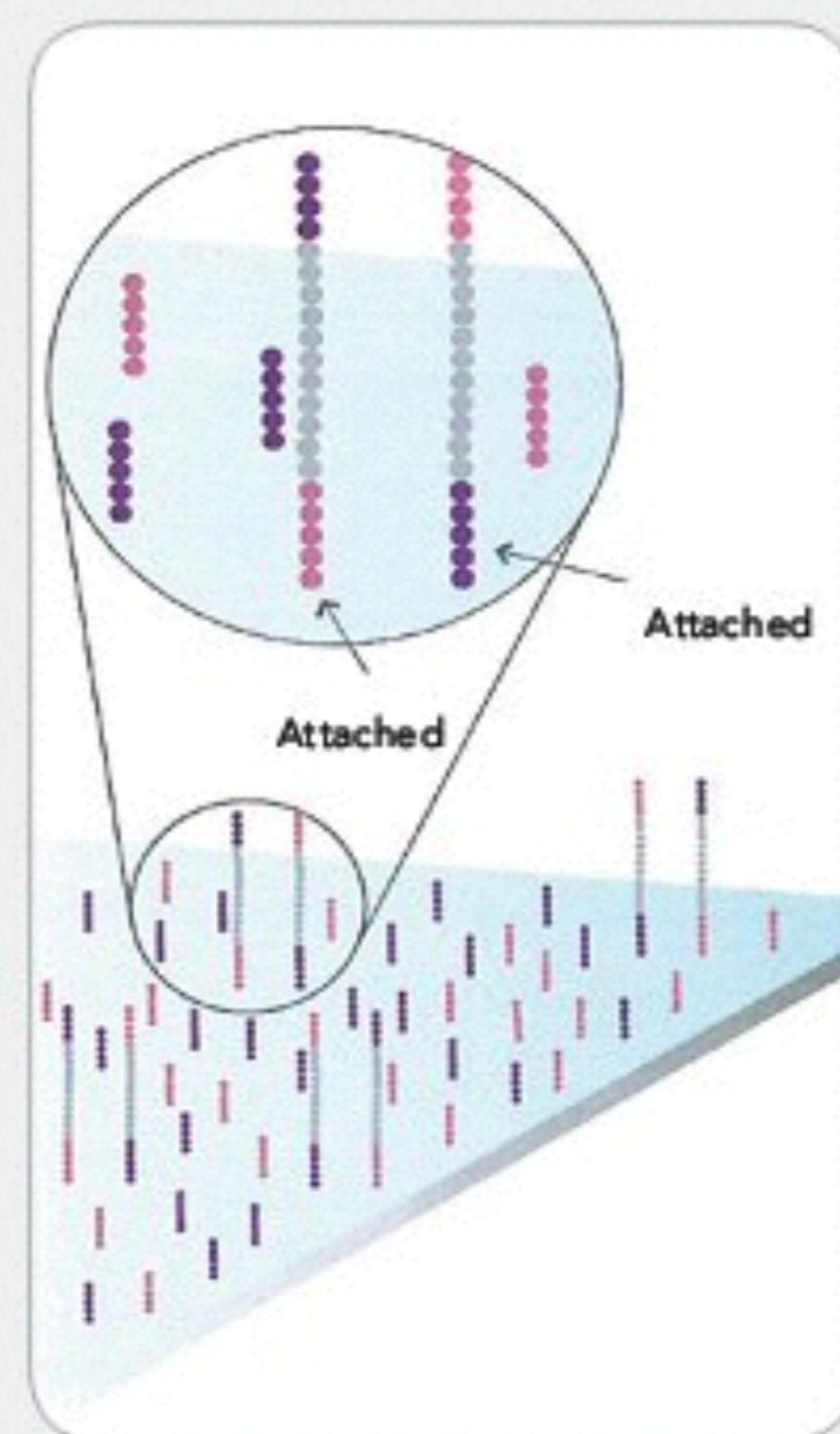




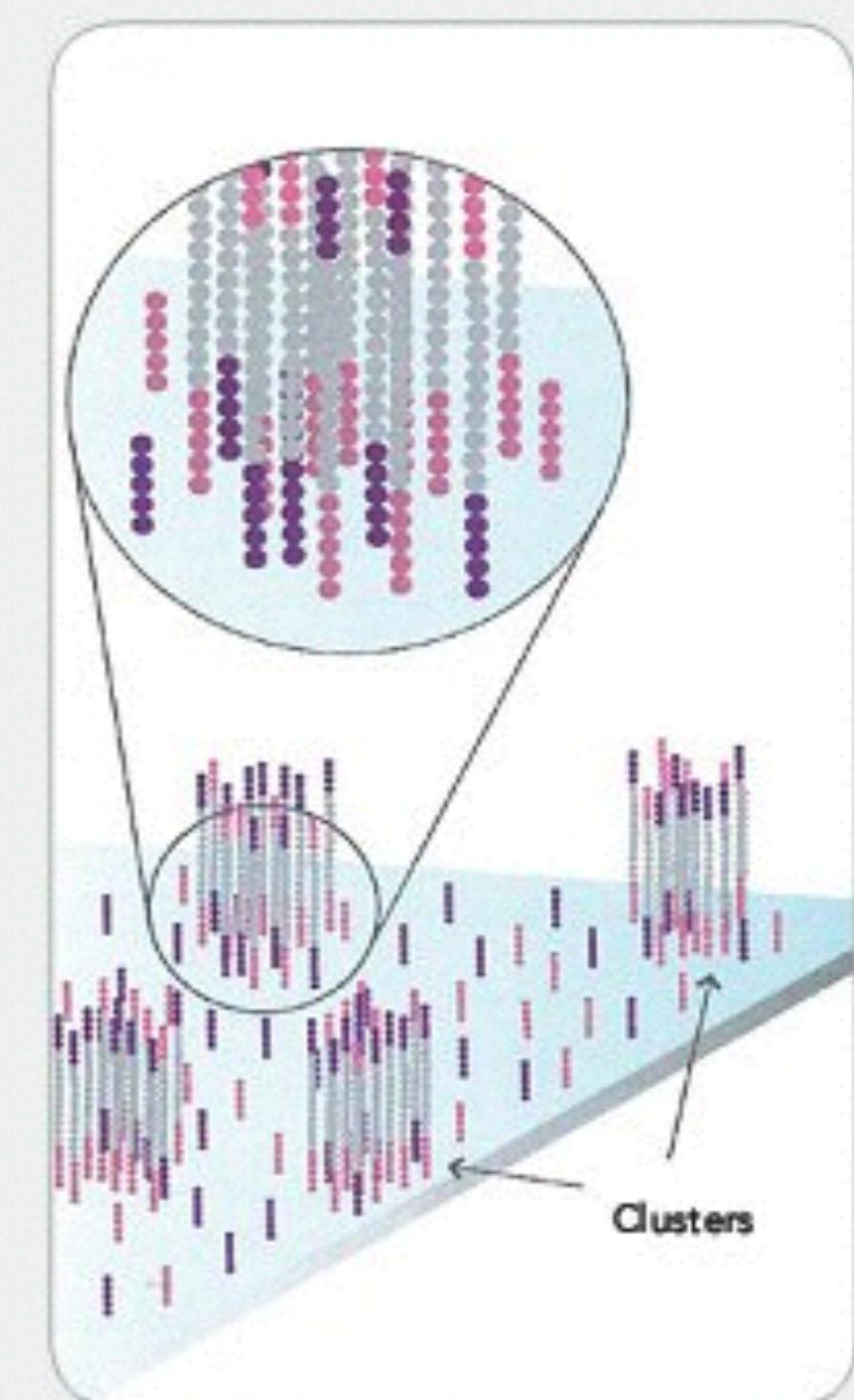
4. FRAGMENTS BECOME DOUBLE STRANDED



5. DENATURE THE DOUBLE-STRANDED MOLECULES

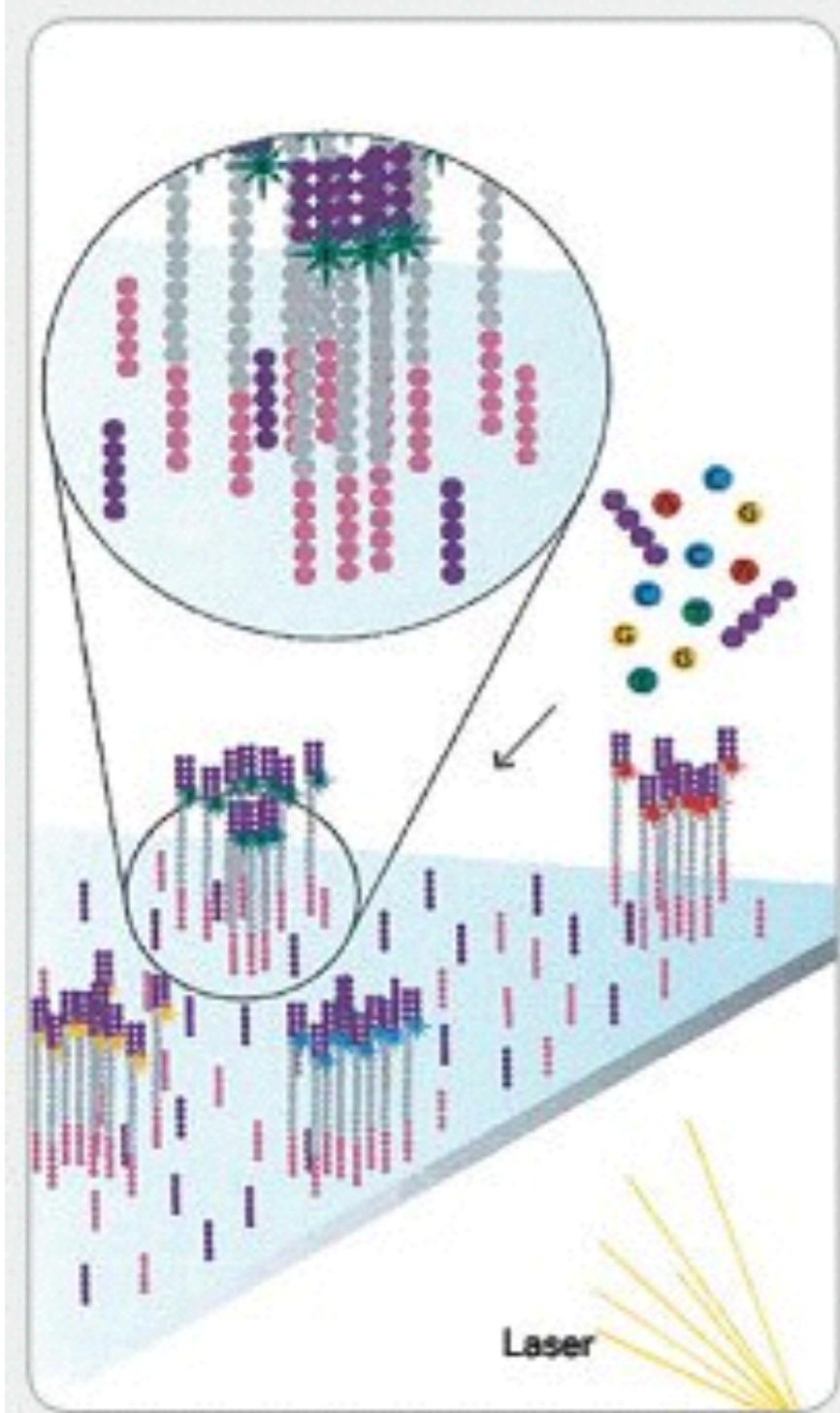


6. COMPLETE AMPLIFICATION

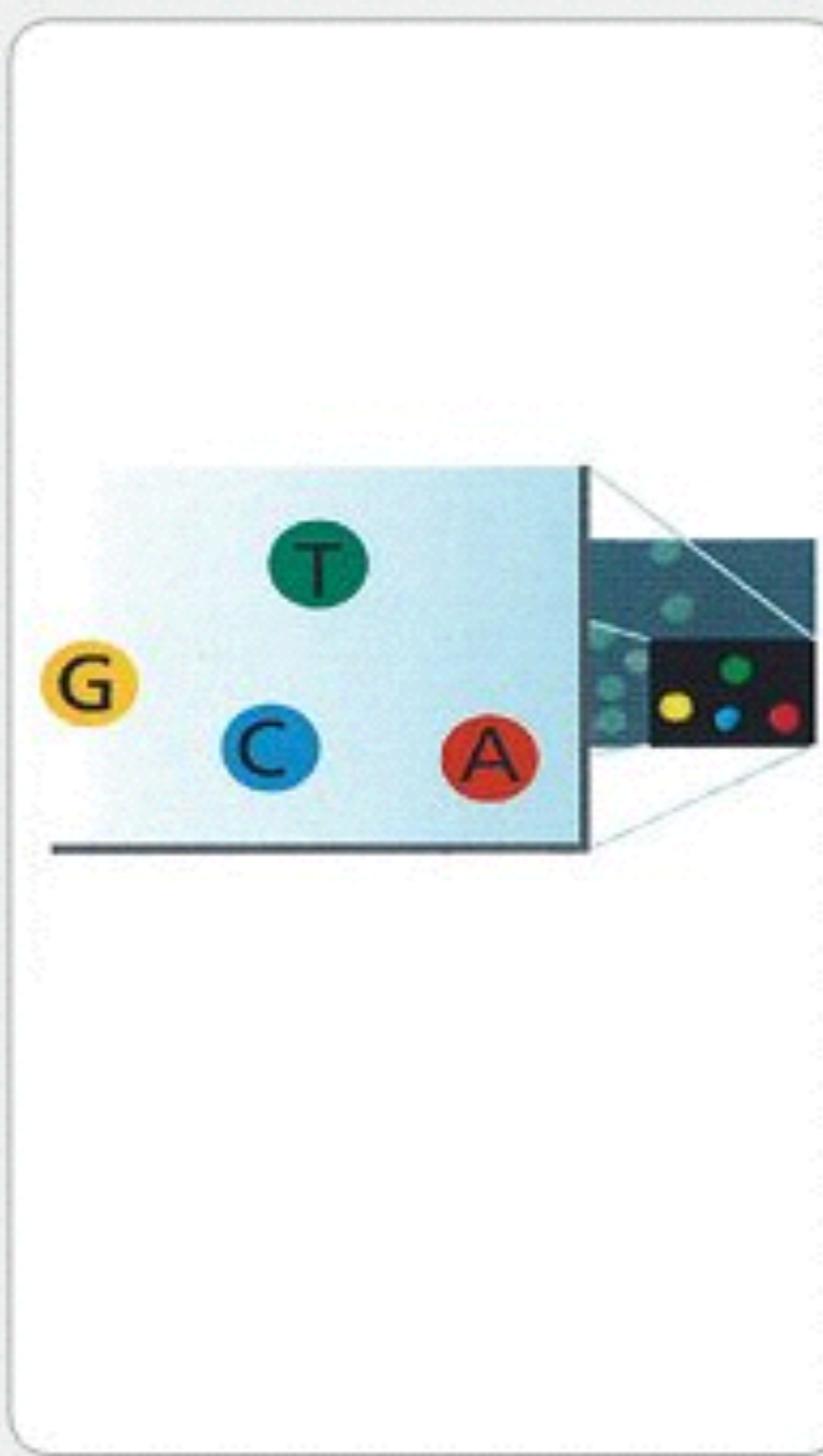




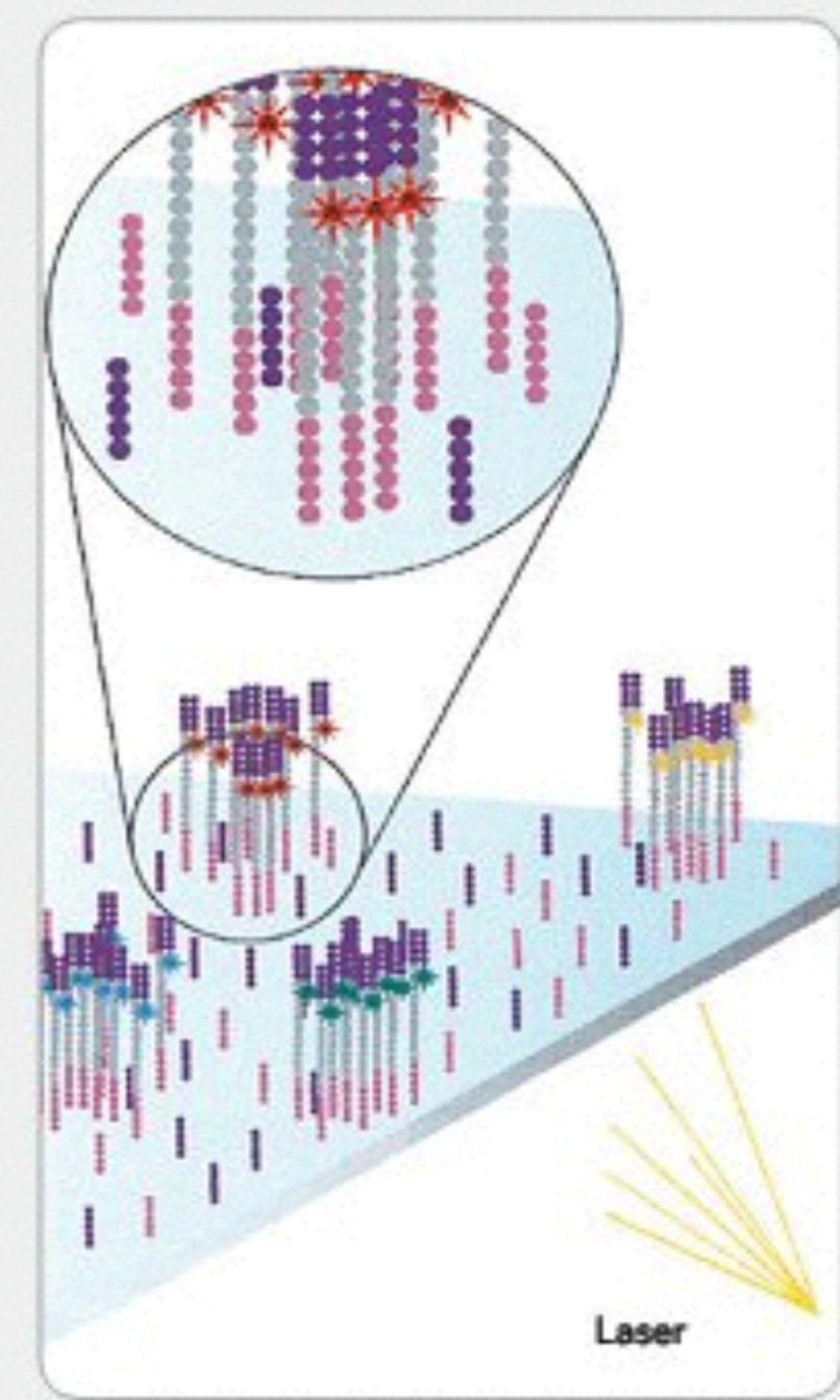
7. DETERMINE FIRST BASE



8. IMAGE FIRST BASE

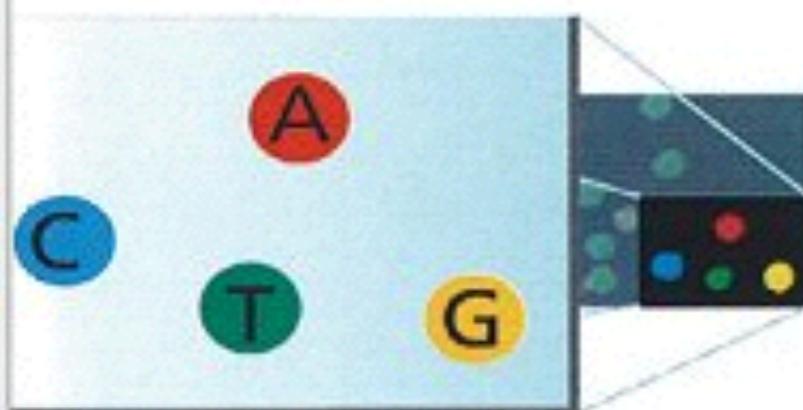


9. DETERMINE SECOND BASE

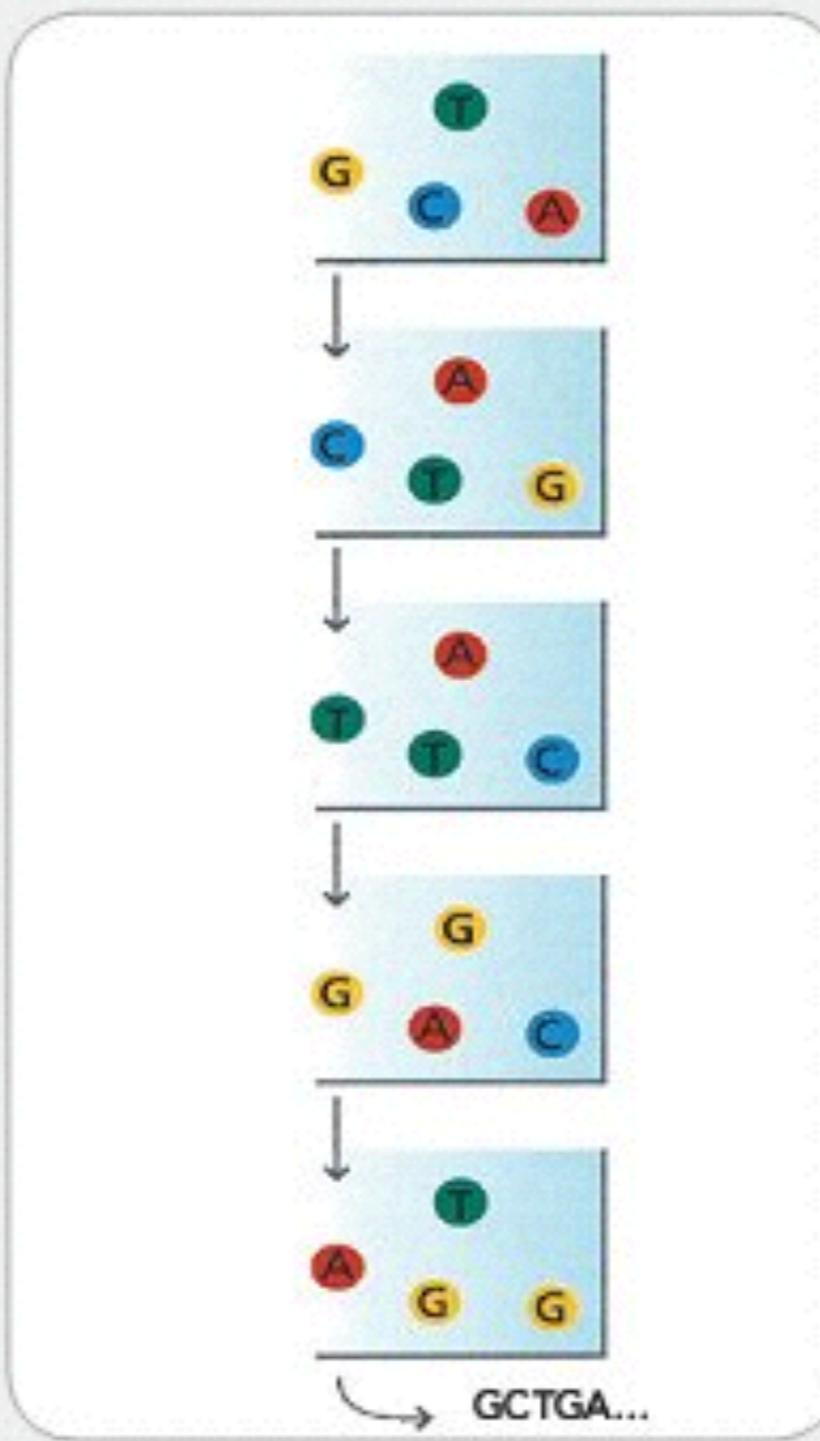




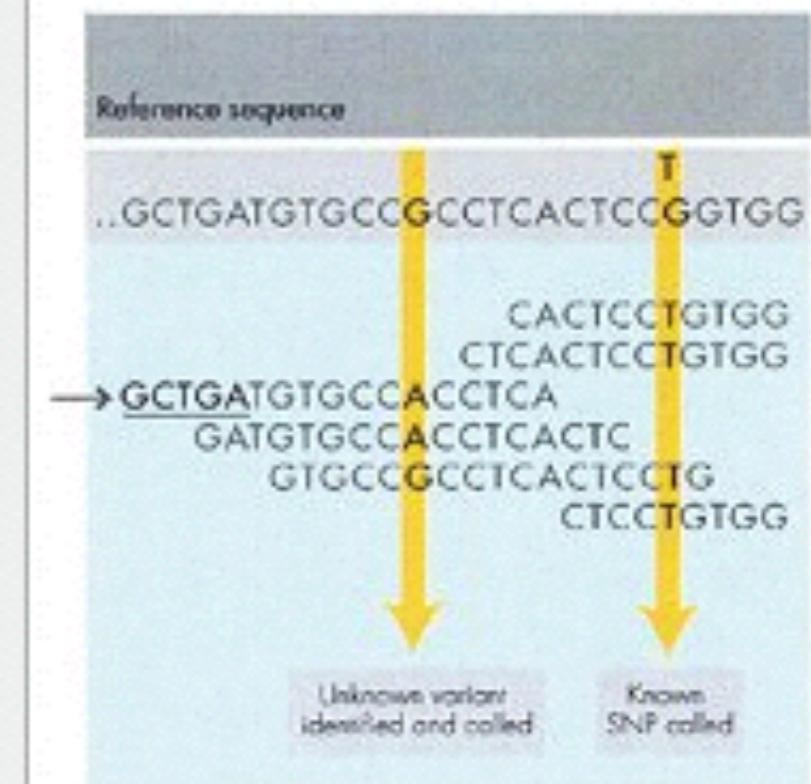
10. IMAGE SECOND CHEMISTRY CYCLE



11. SEQUENCE READS OVER MULTIPLE CHEMISTRY CYCLES



12. ALIGN DATA

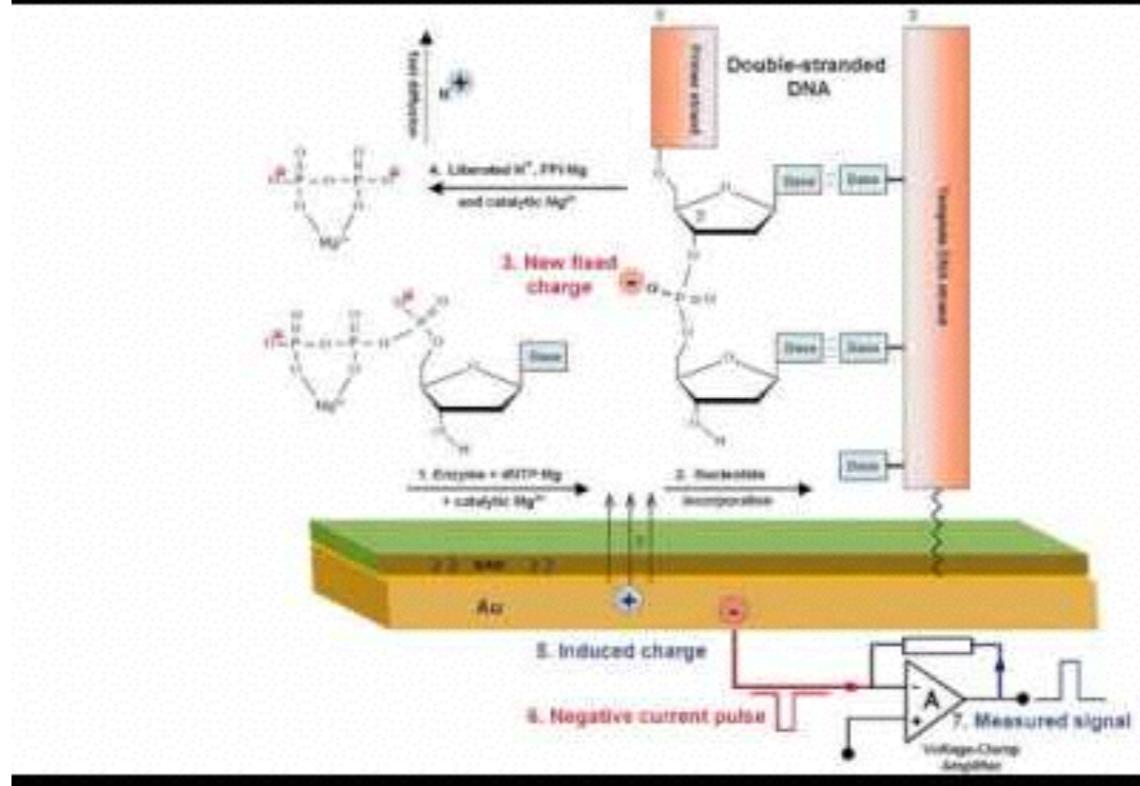
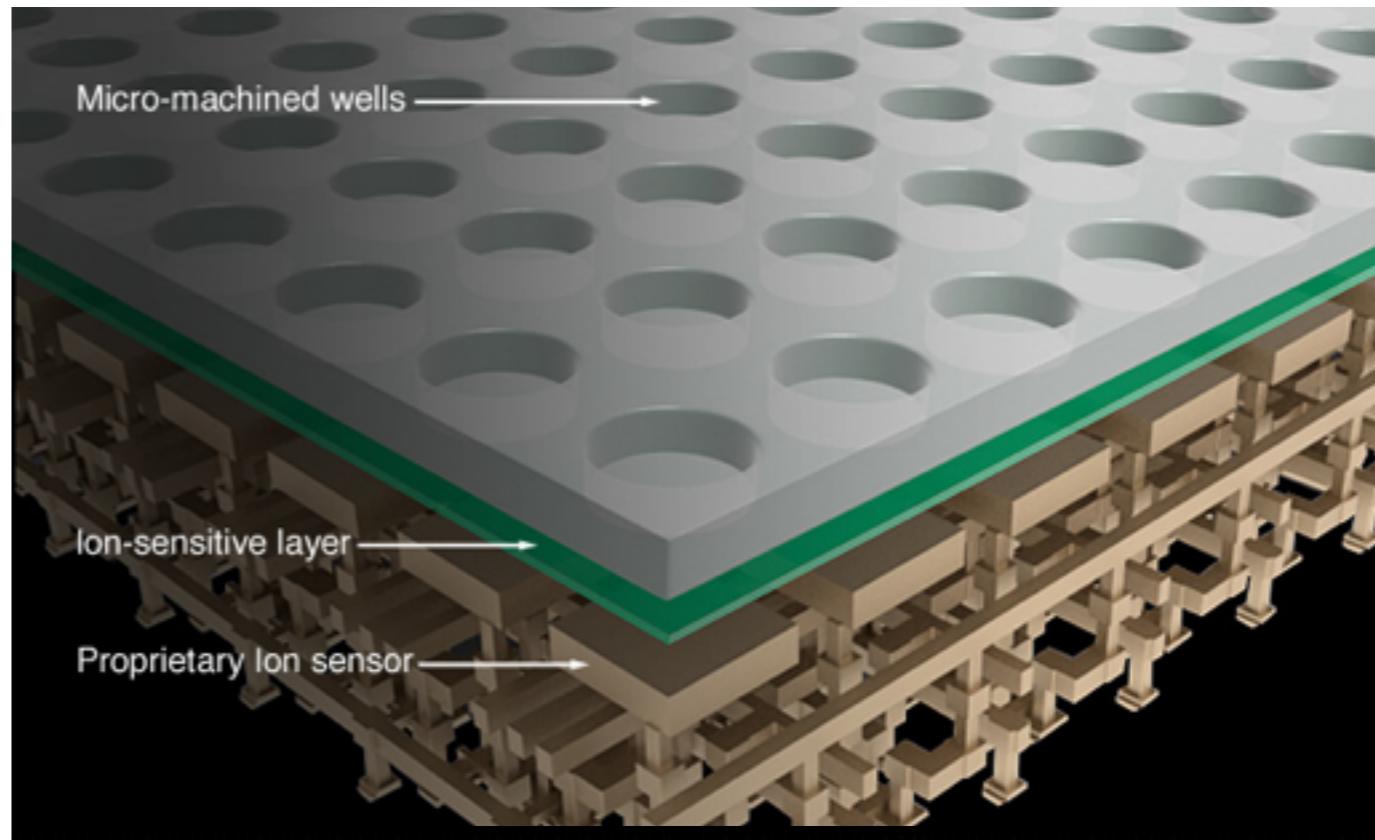
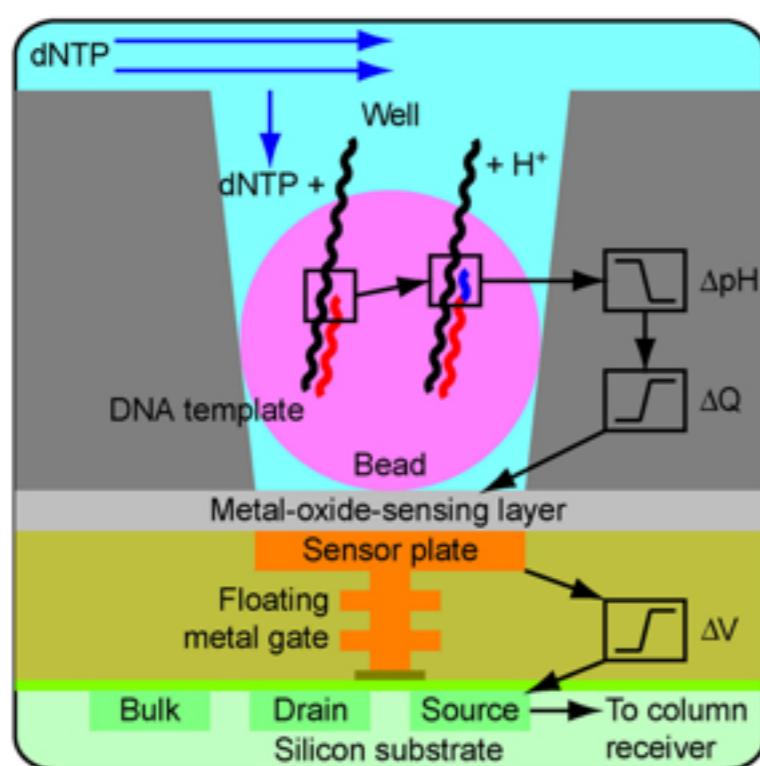




IonTorrent sequencing

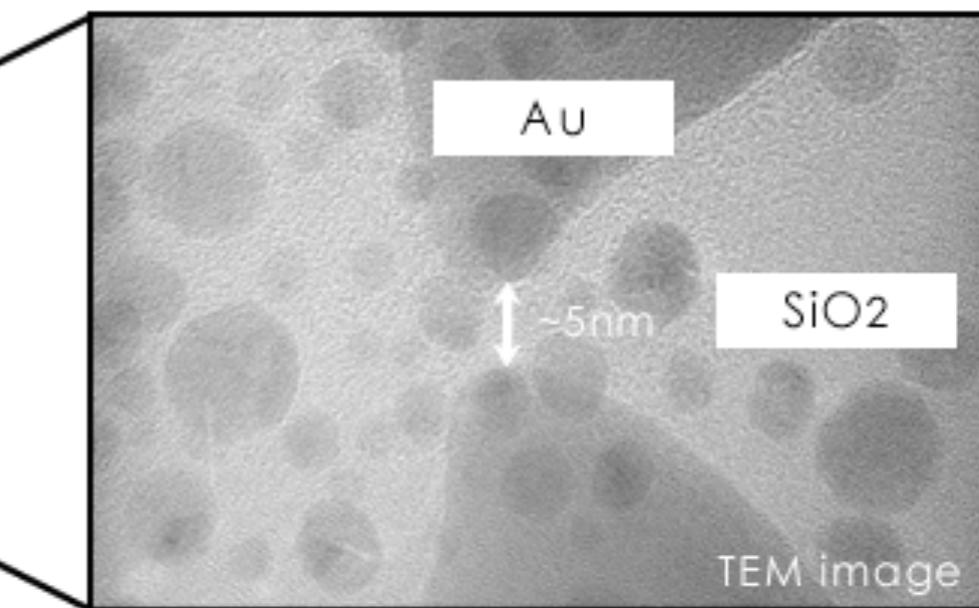
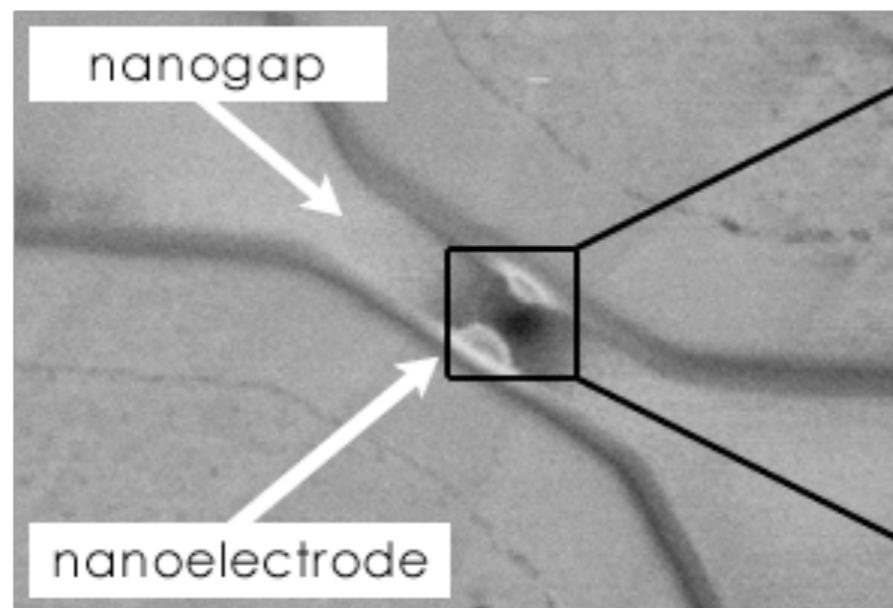
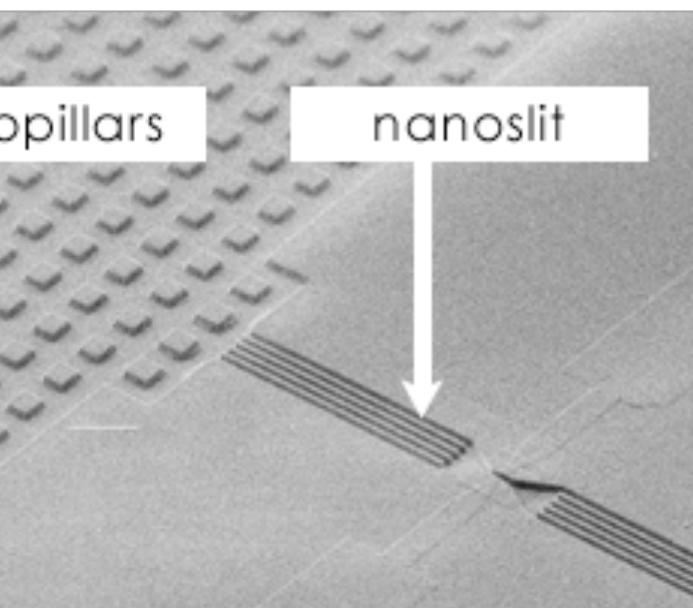
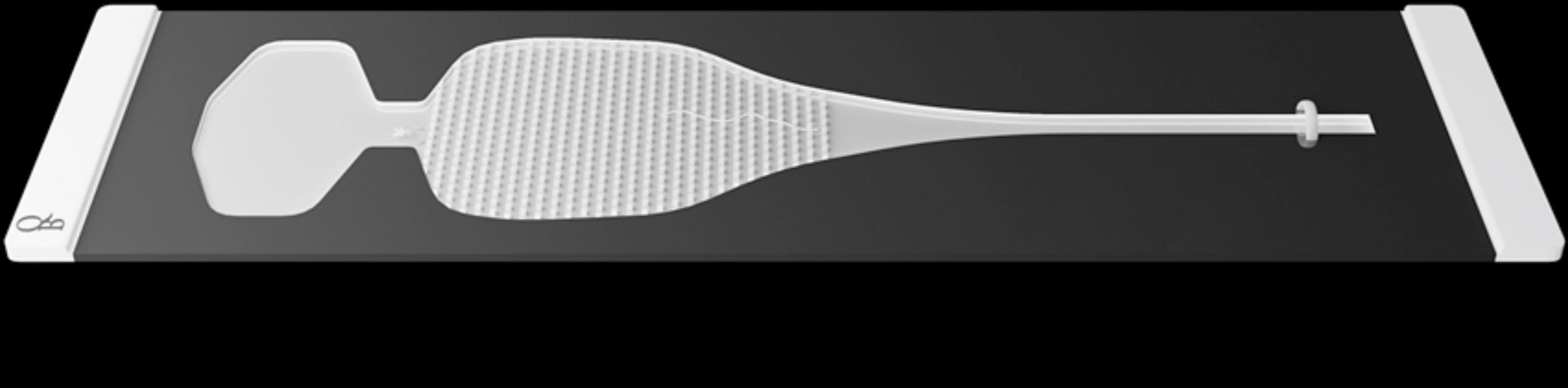


a



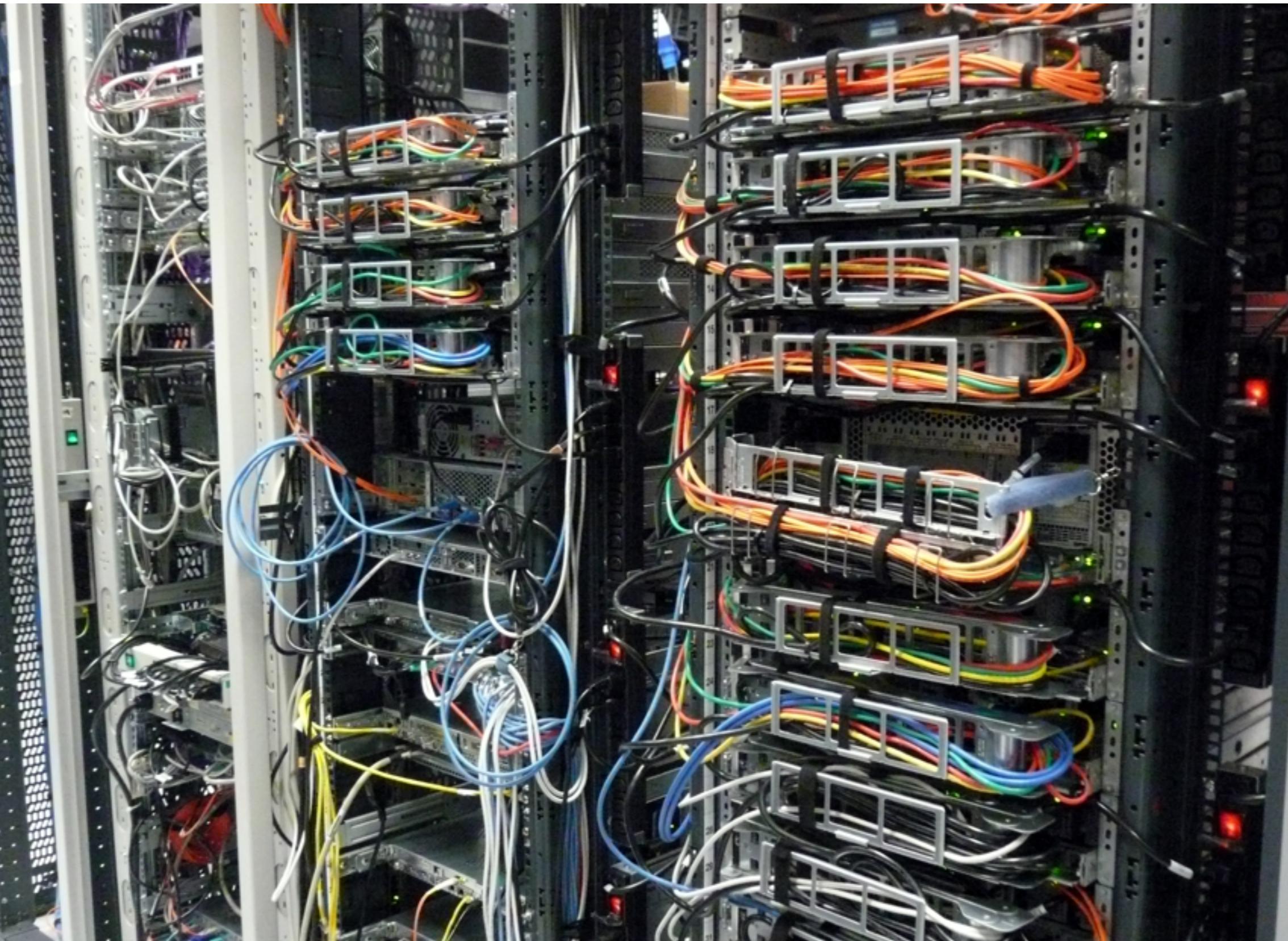


Nanopore sequencing





Bioinformatics





DIY?



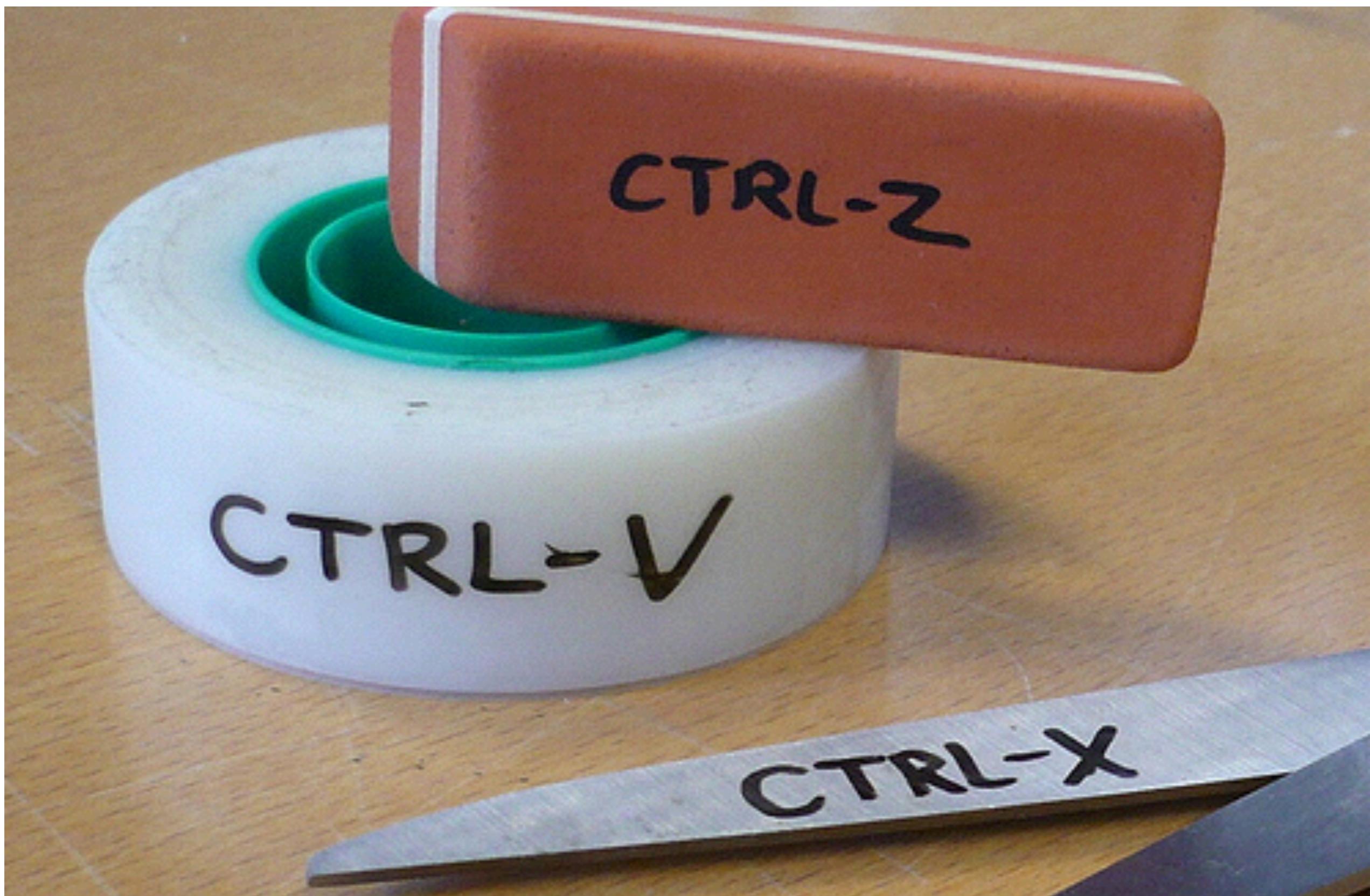
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DNA editing

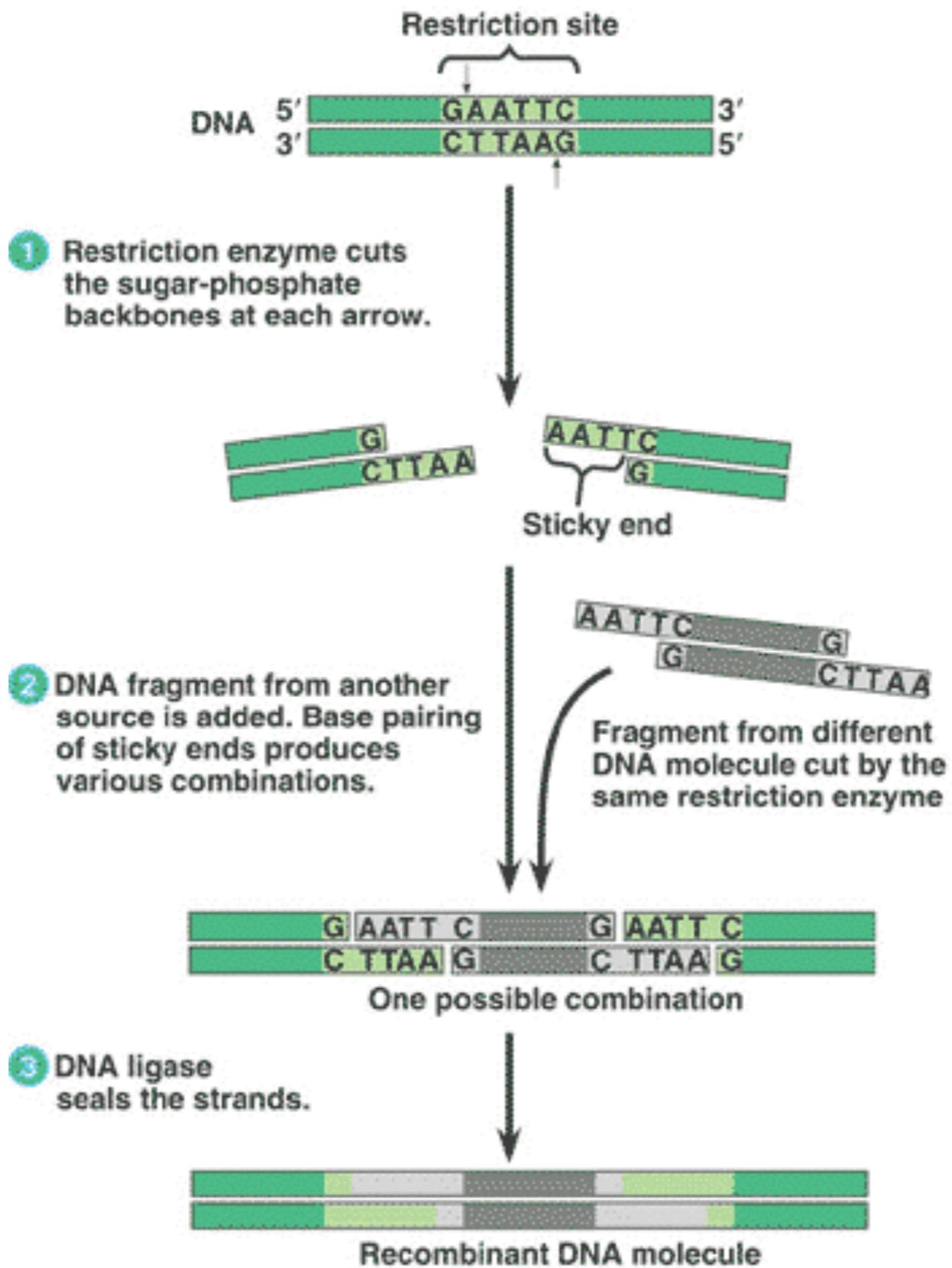


Cutting & Pasting



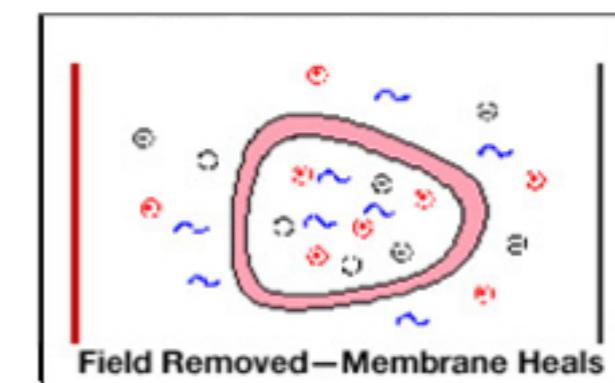
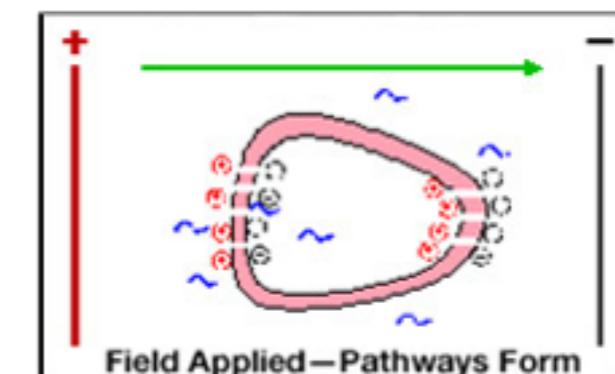
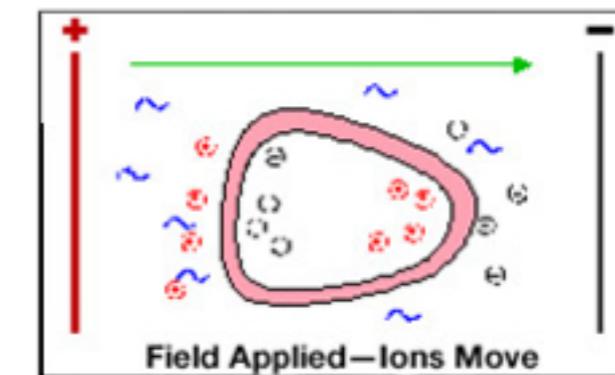
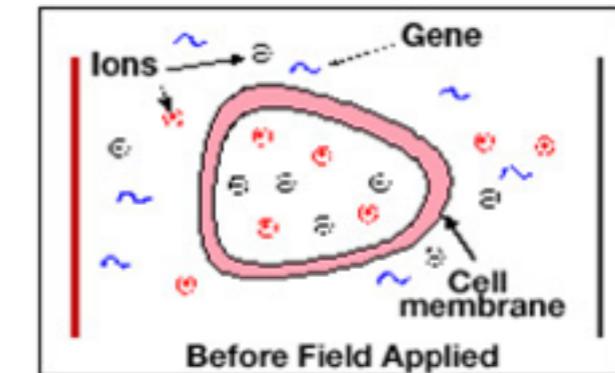


DNA Restriction Ligation





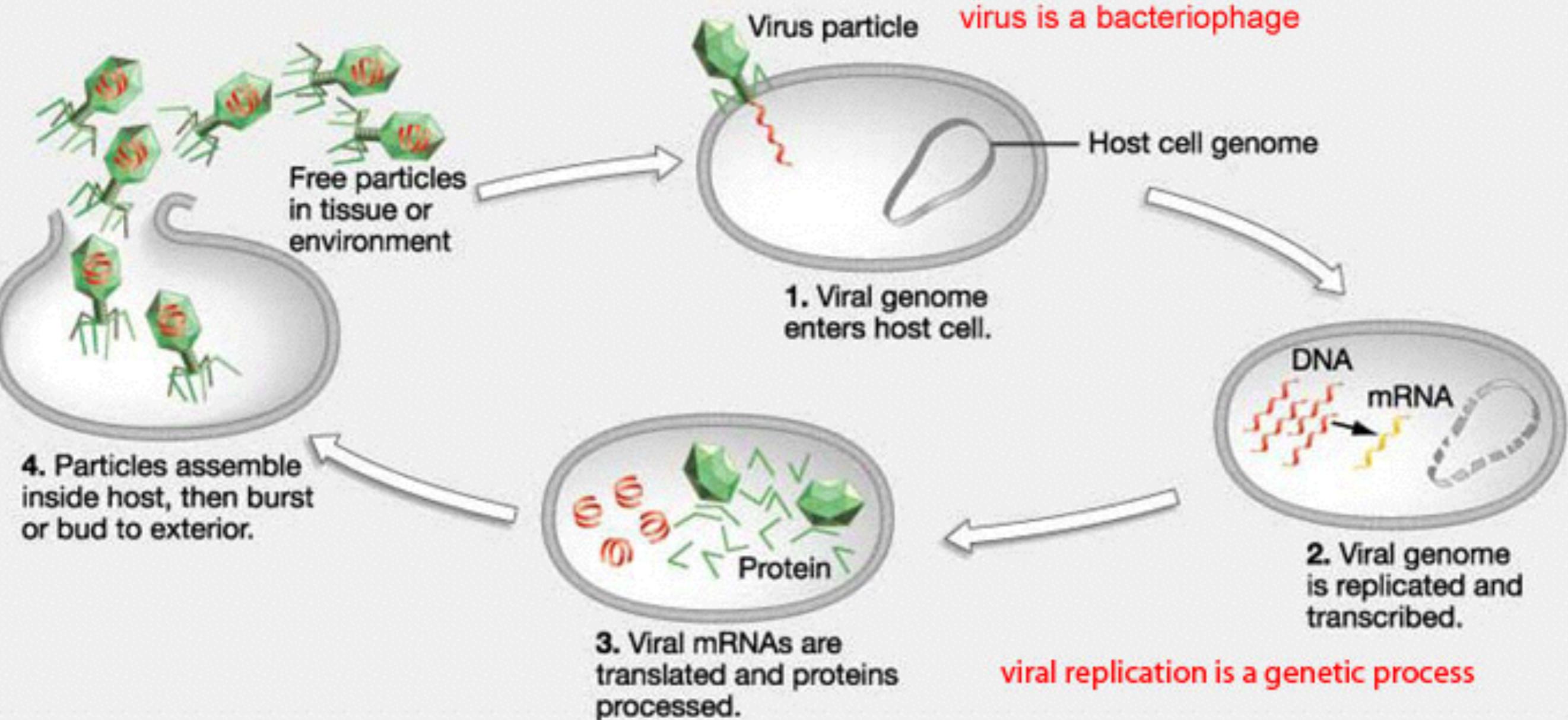
GeneGun – Electroporation





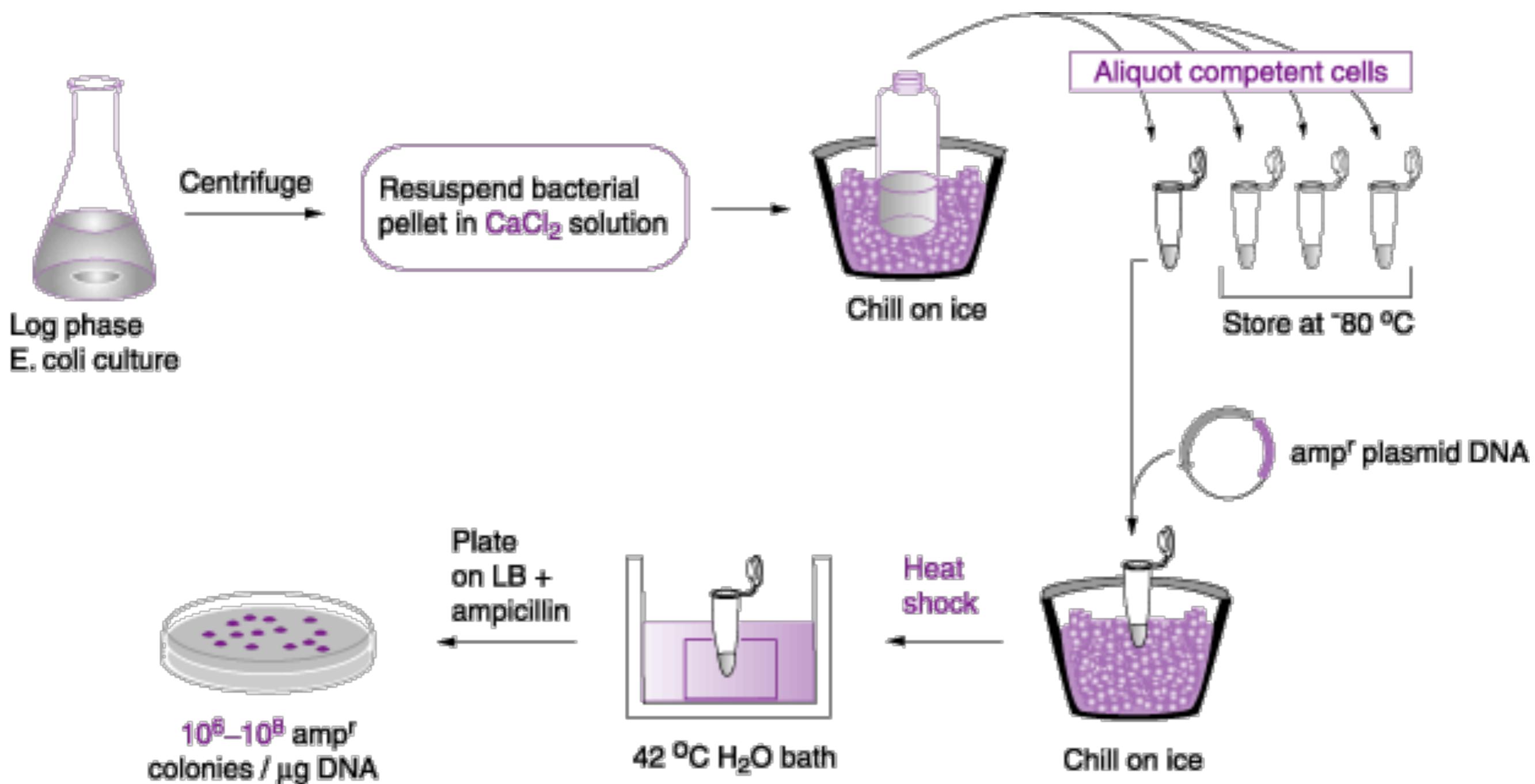
Viral Transformation

HOW DO VIRUSES WORK?





Heat Shock Transformation





some
rights
reserved