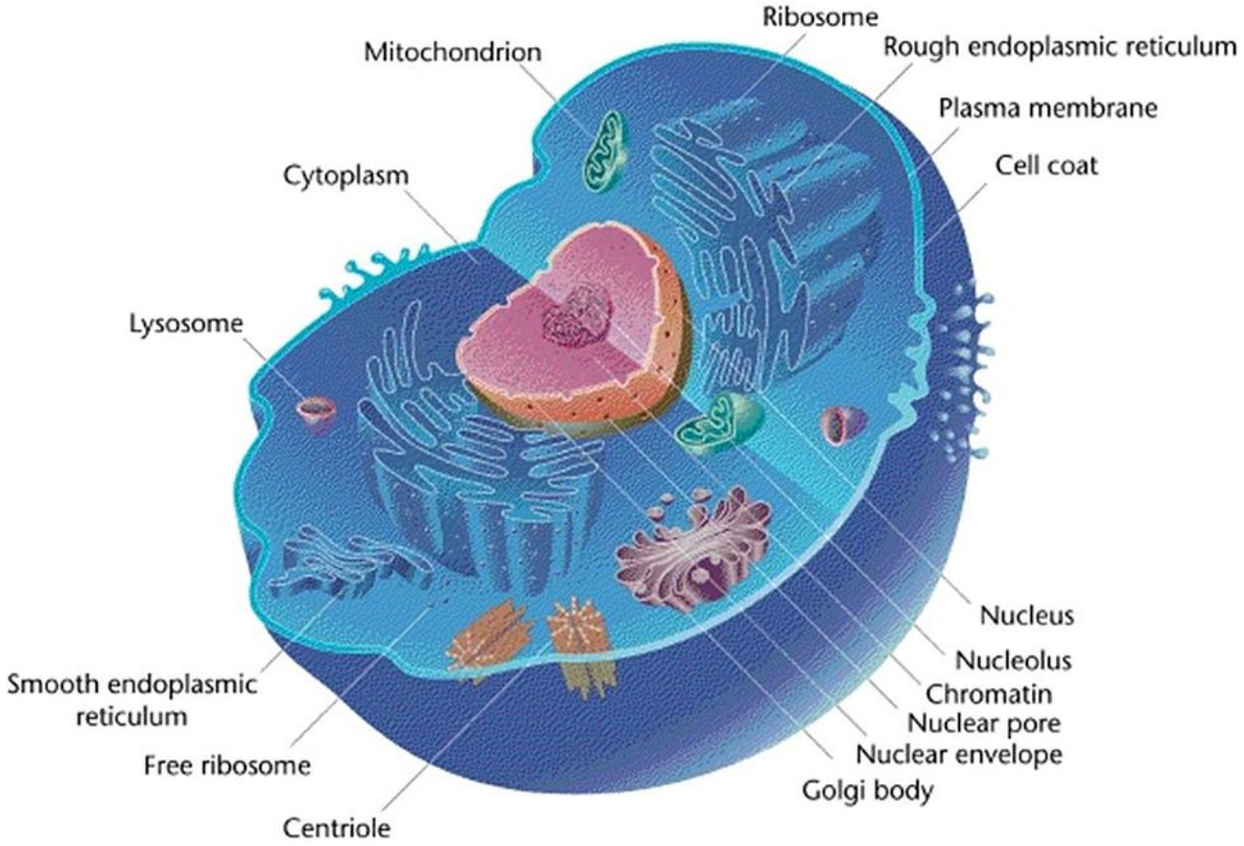
waag society

institute for art, science and technology

BioHack Academy
Genetics

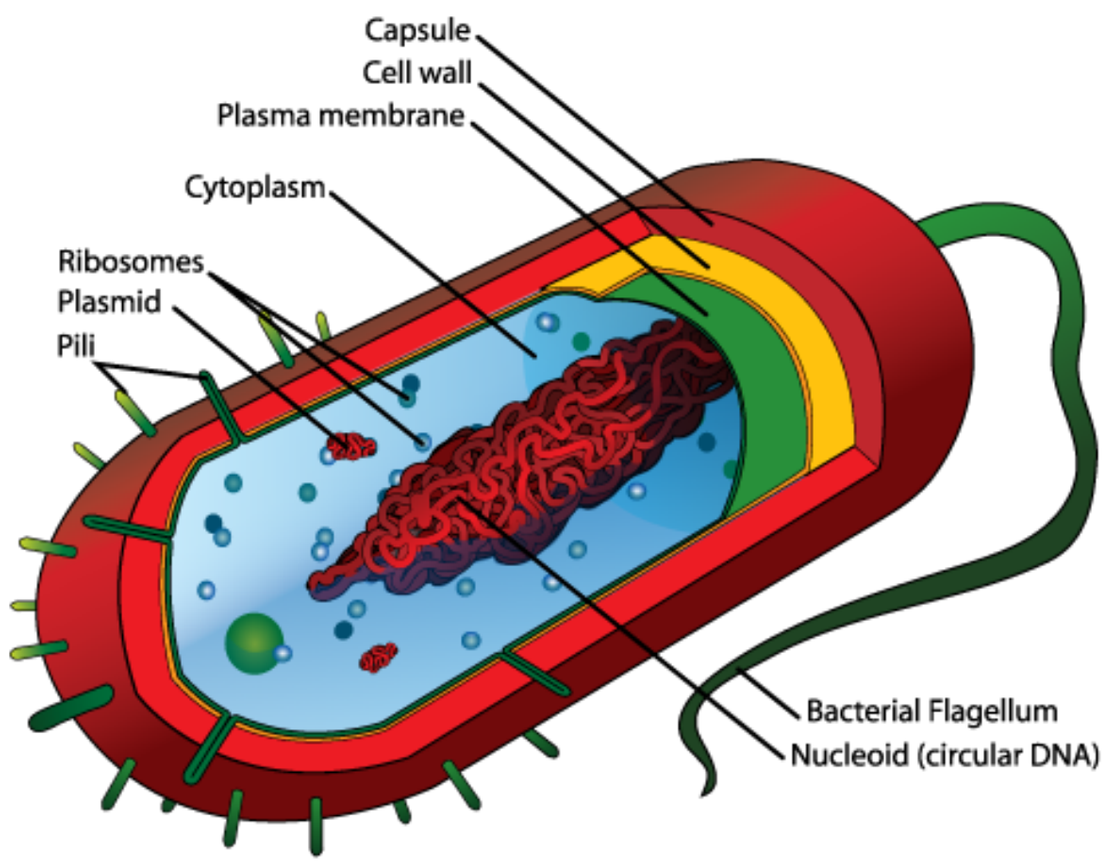
DNA in cells

Eukaryotic cell



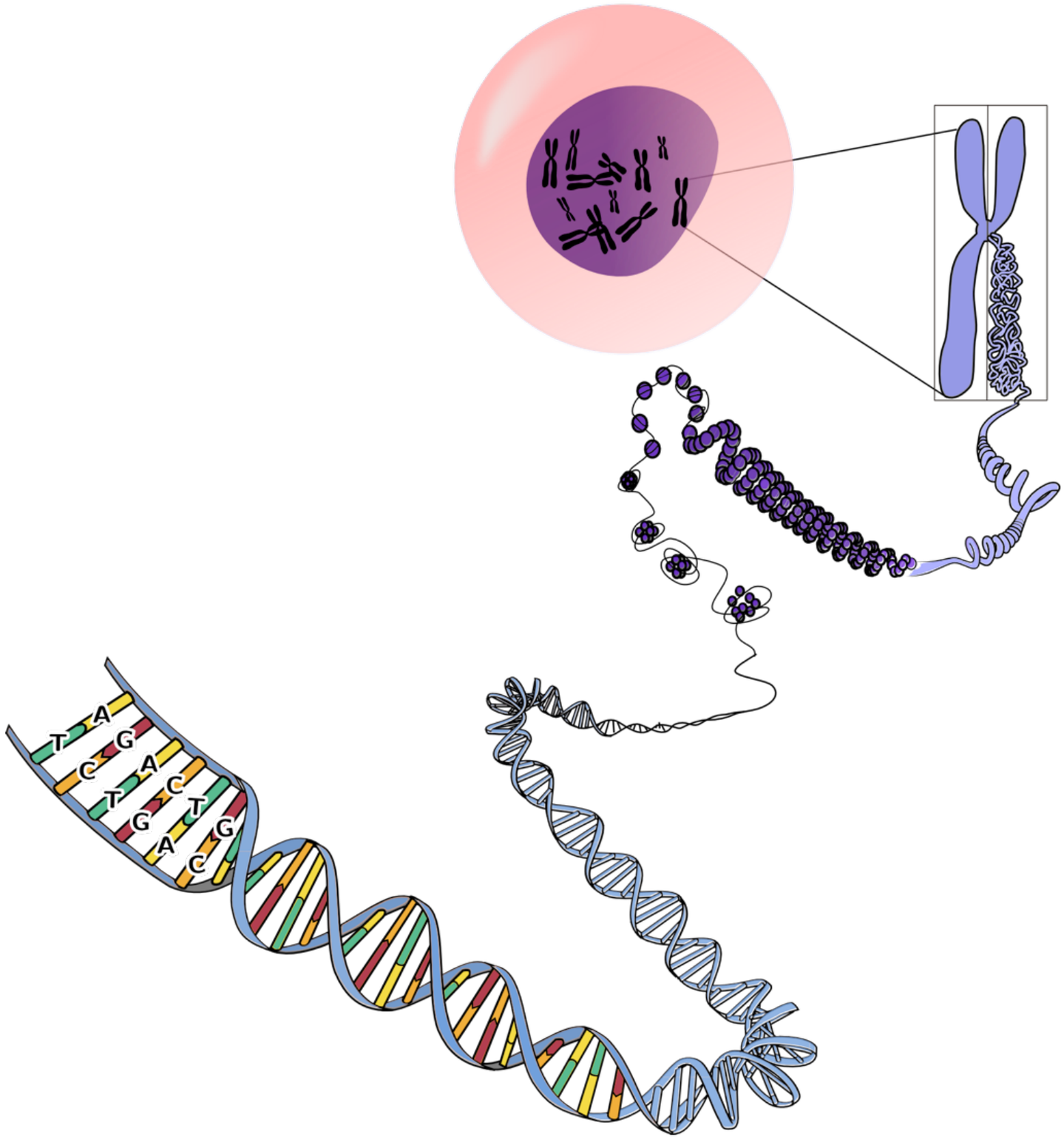
Marion - CC-BY-SA 3.0

Prokaryotic cell



Public Domain

DNA in the cell



10^{1} meter

10^0 meter

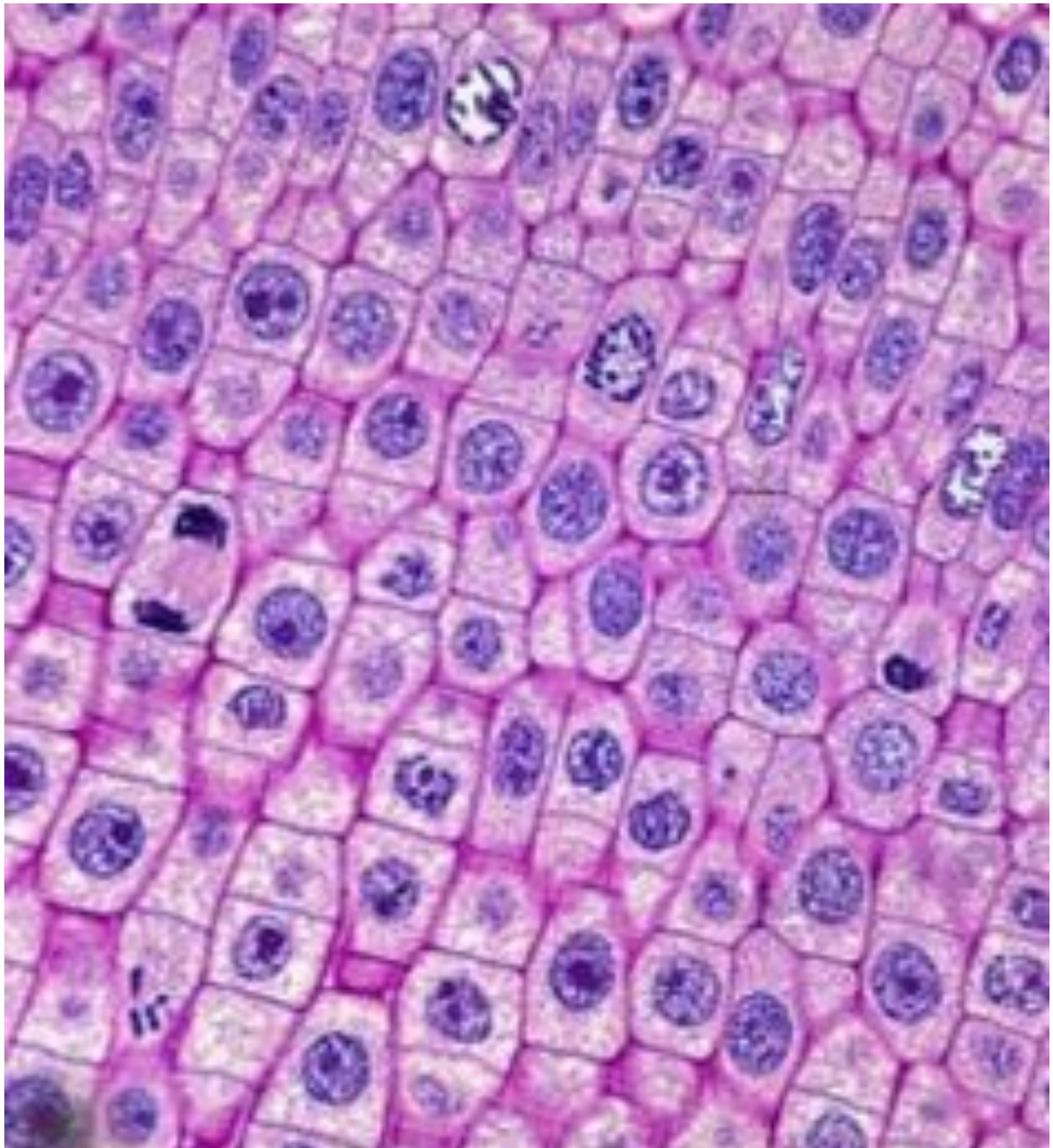
10^{-1} meter

10^{-2} meter

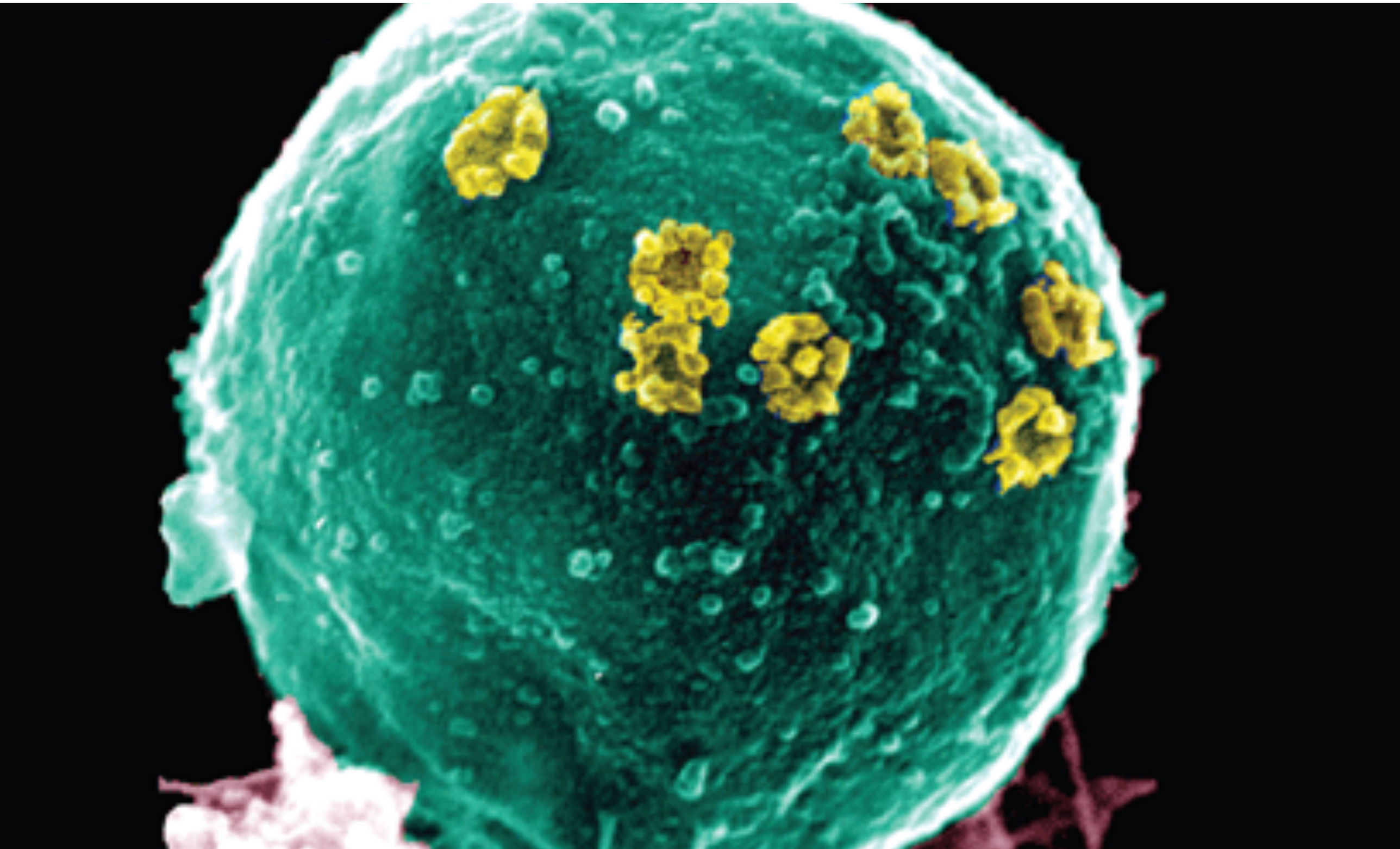
10^{-3} meter

10^{-4} meter

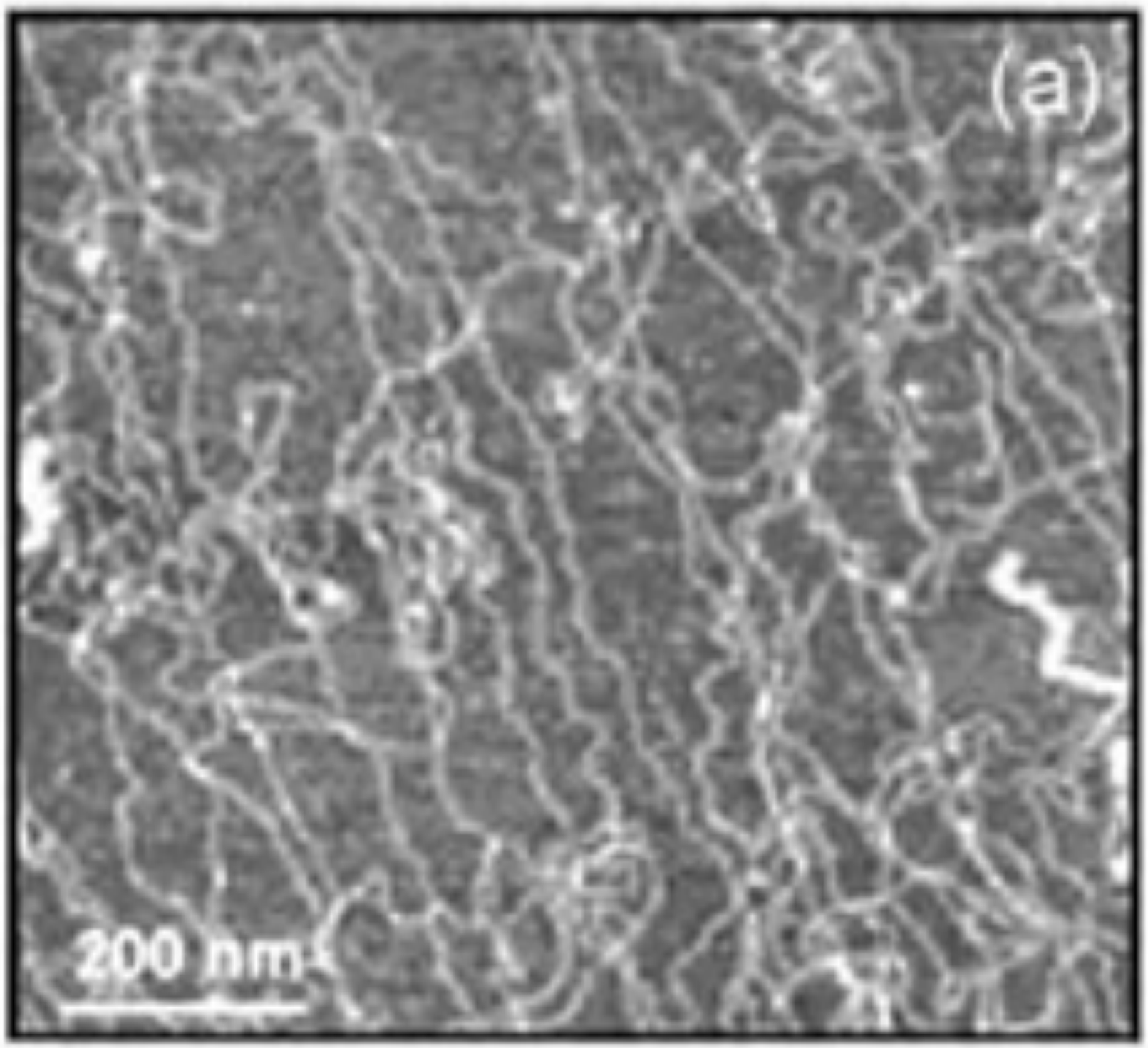
10^{-5} meter



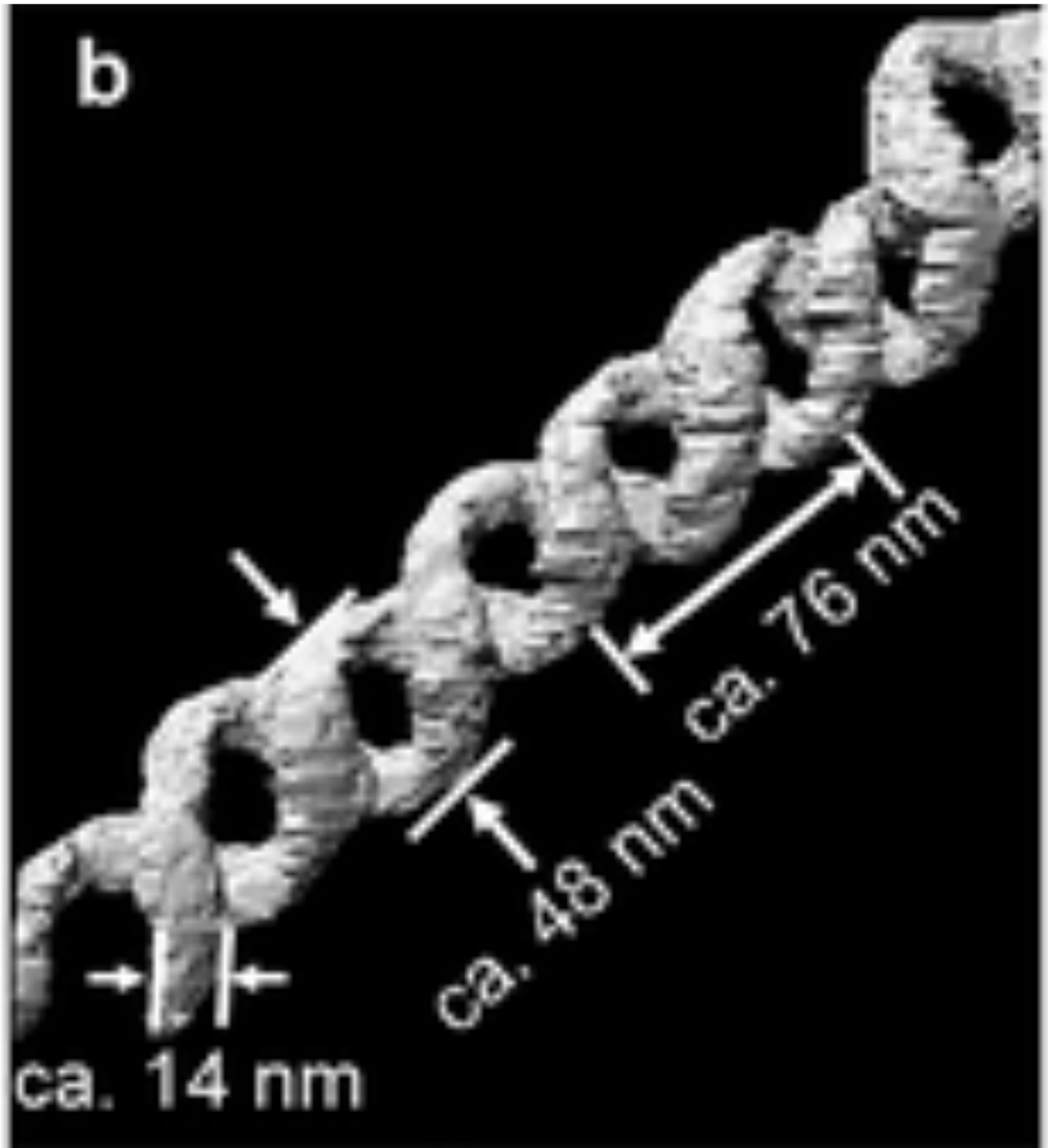
10^{-6} meter



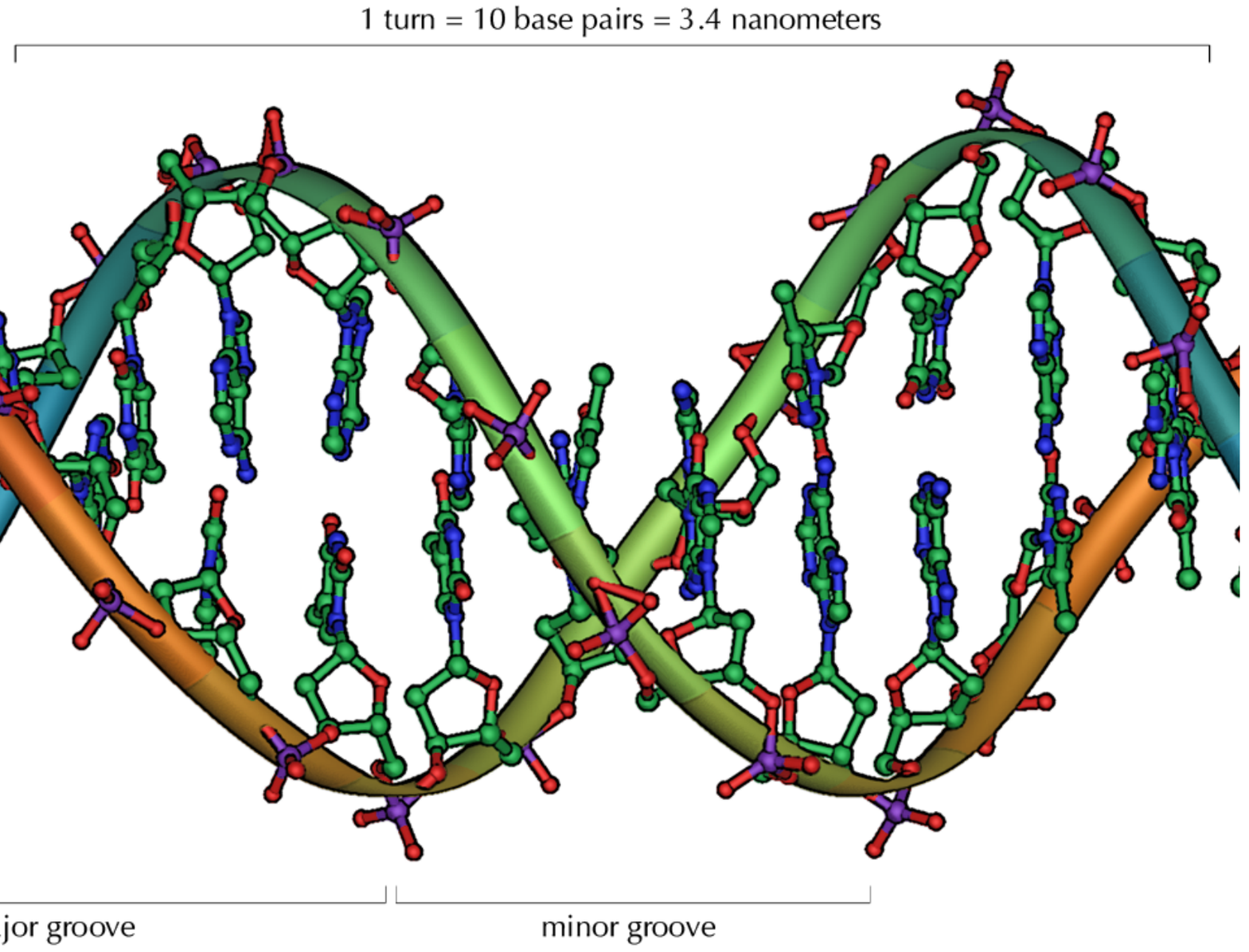
10^{-7} meter



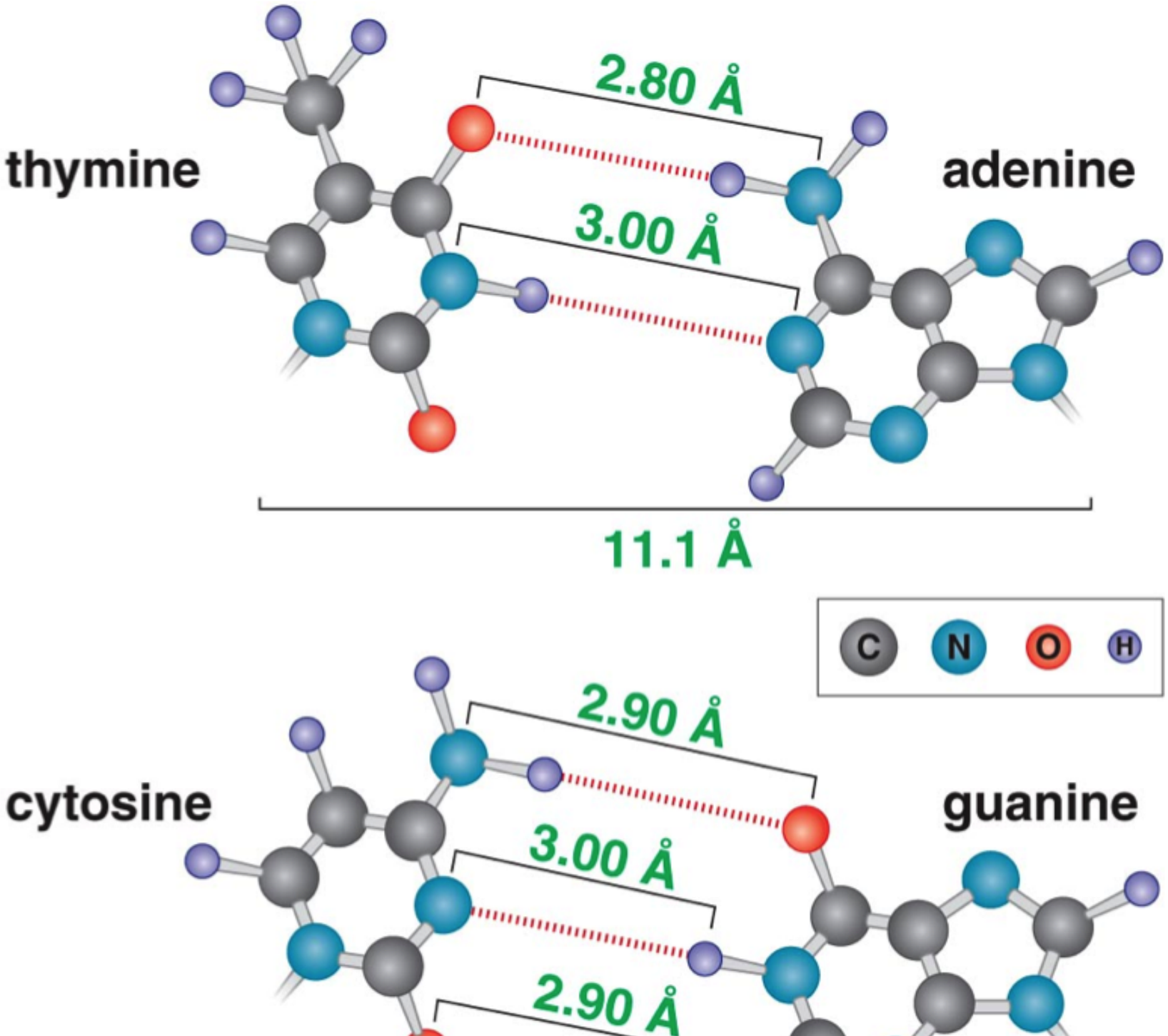
10^{-8} meter



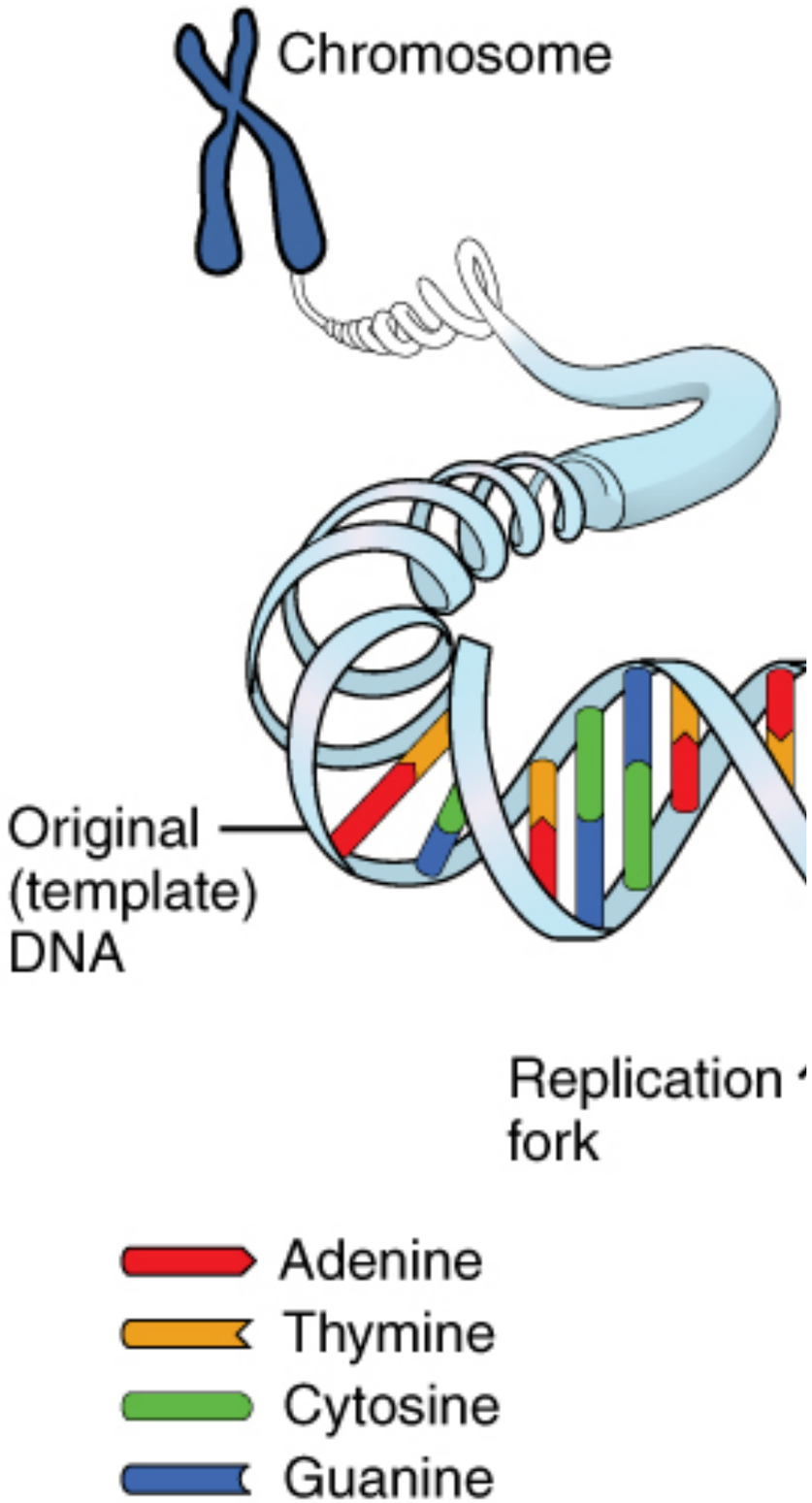
10–9 meter



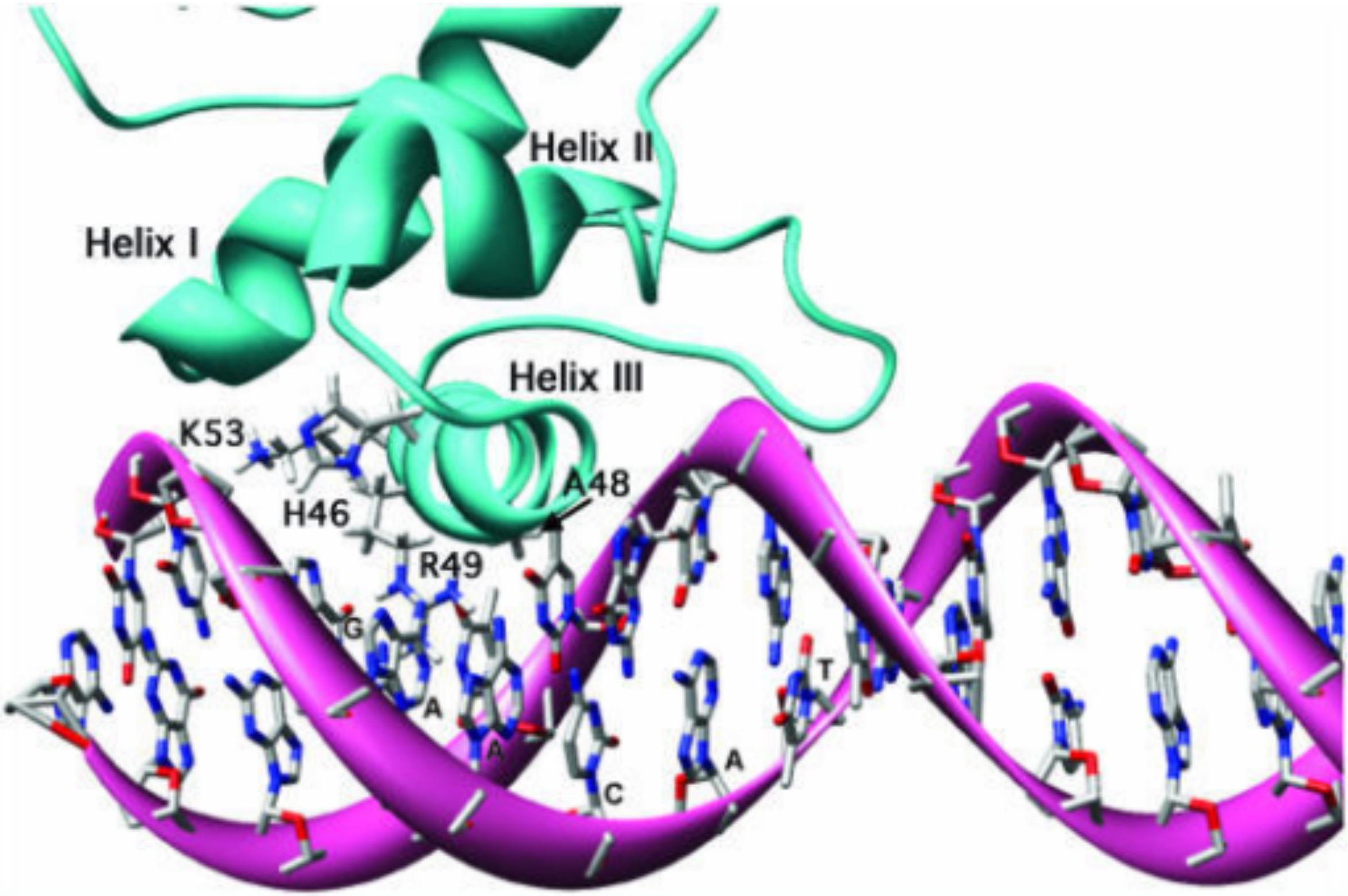
10^{-10} meter


thymine
adenine
2.80 Å
3.00 Å
11.1 Å
C
N
O
H
cytosine
guanine
2.90 Å
3.00 Å
2.90 Å

DNA Replication



DNA docking



DNA probe

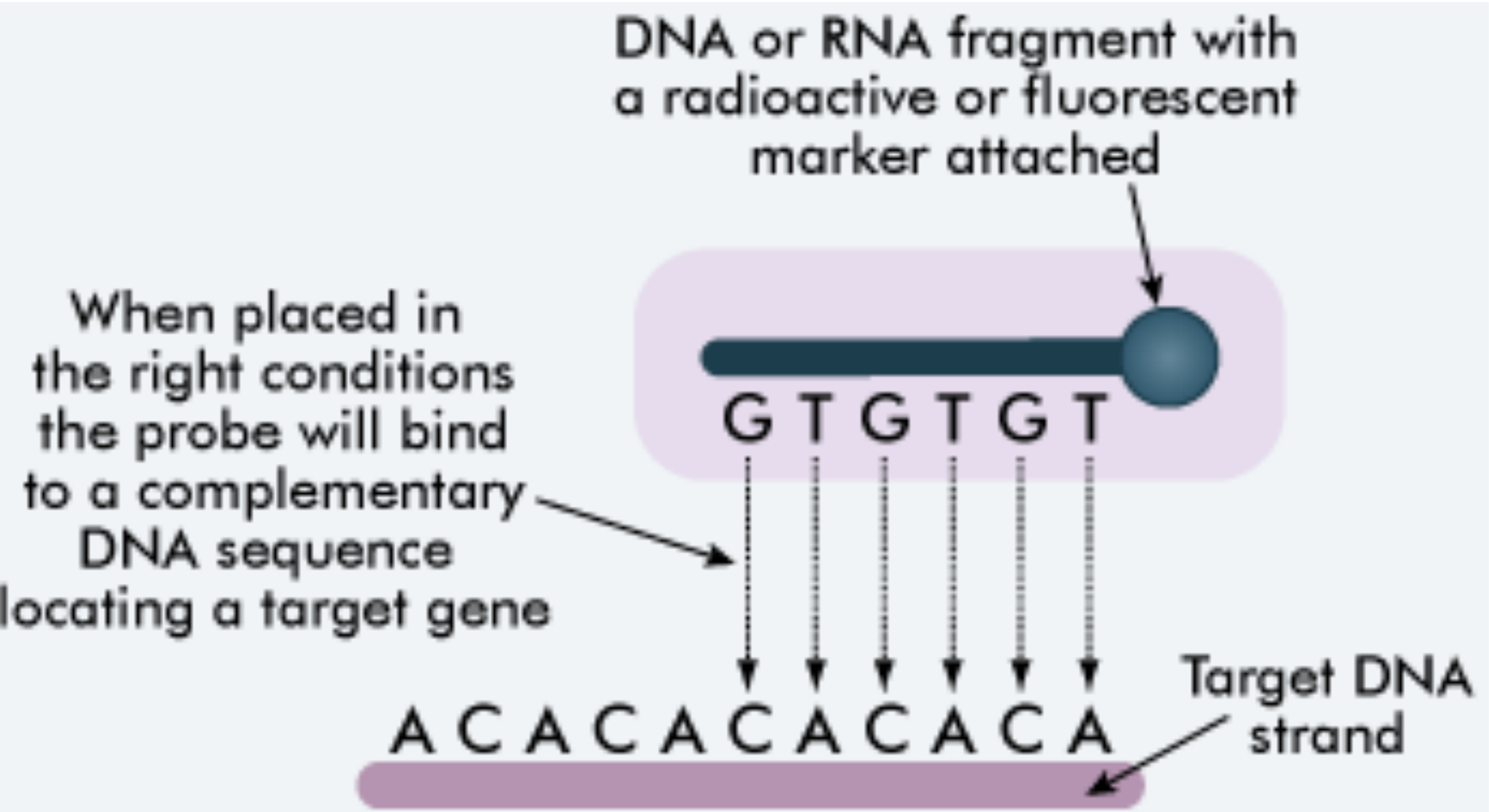
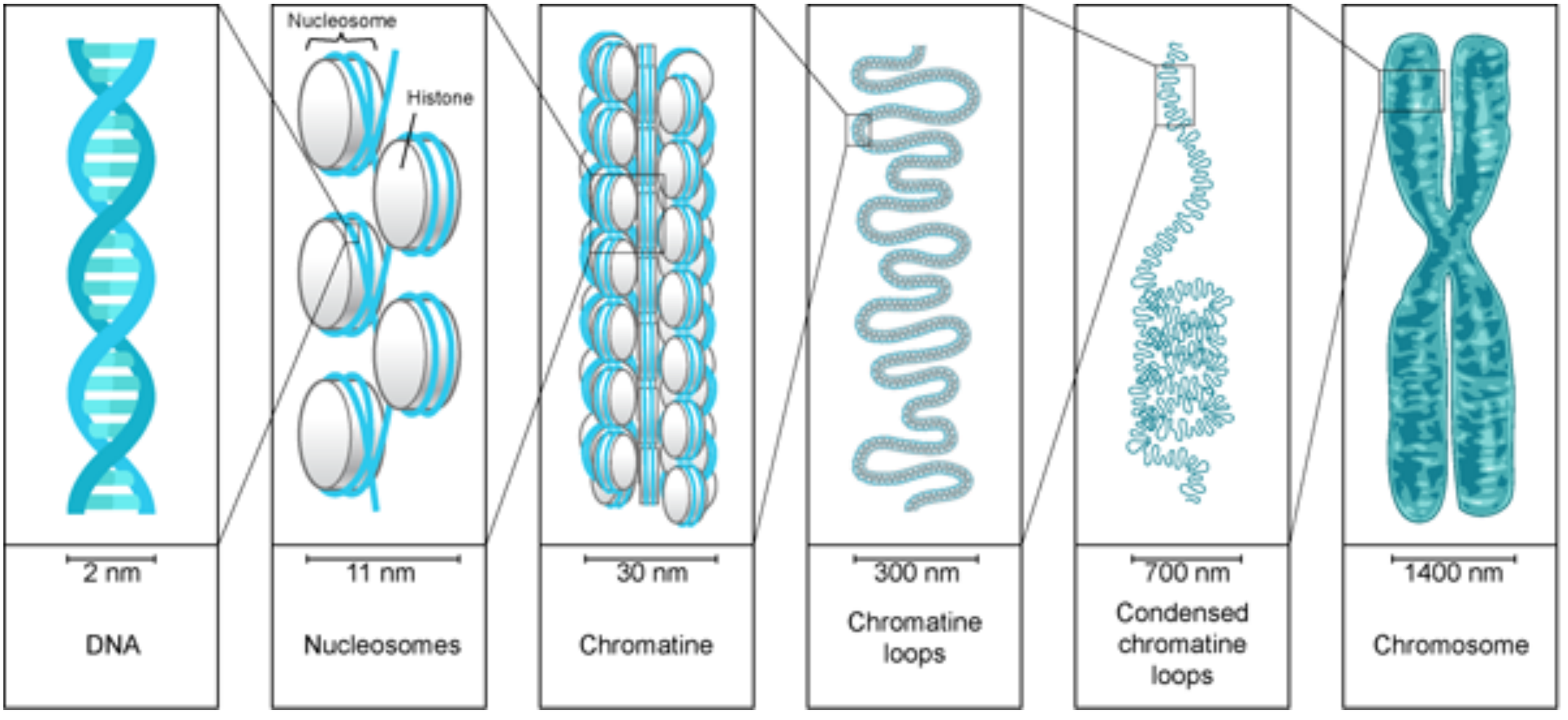
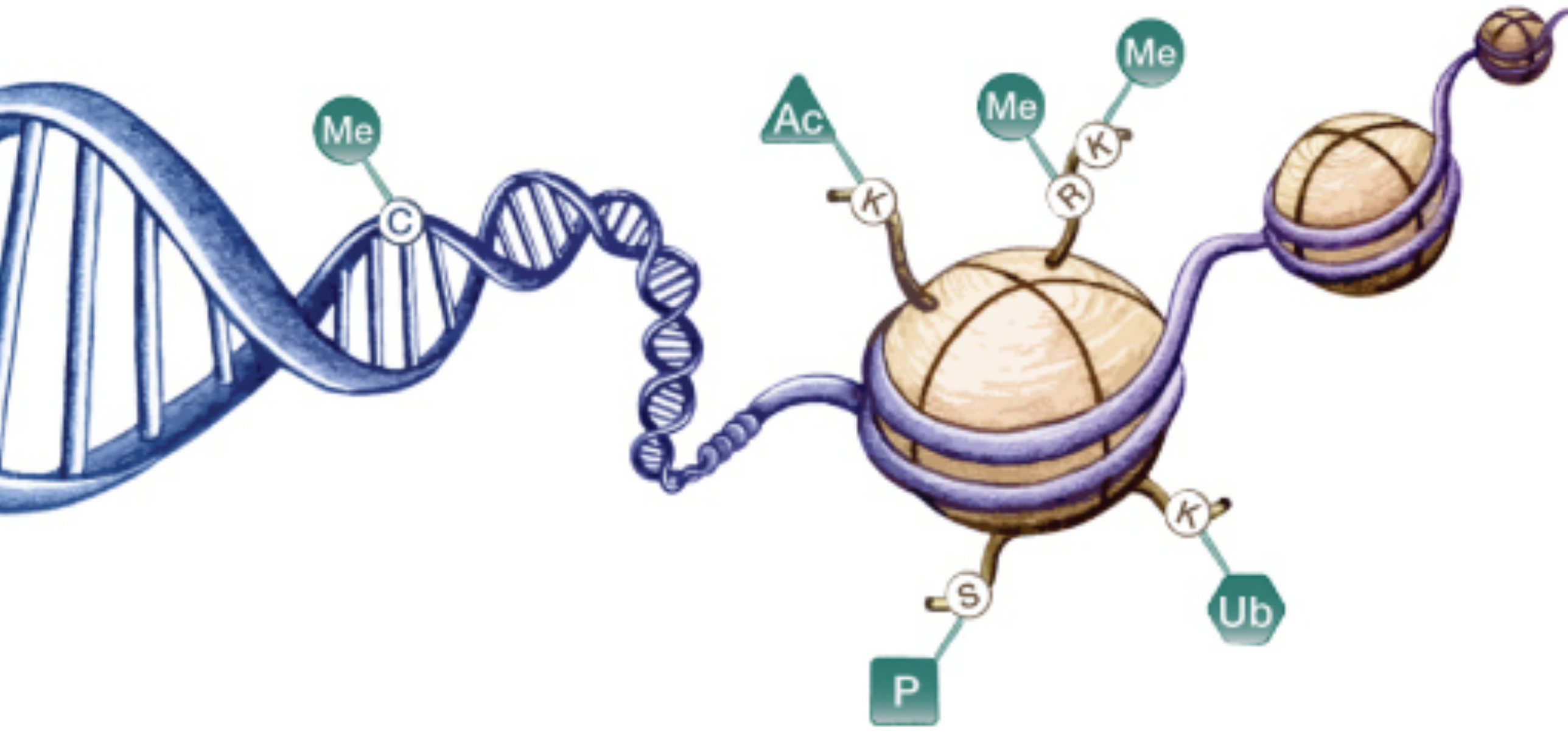


Diagram of a gene probe

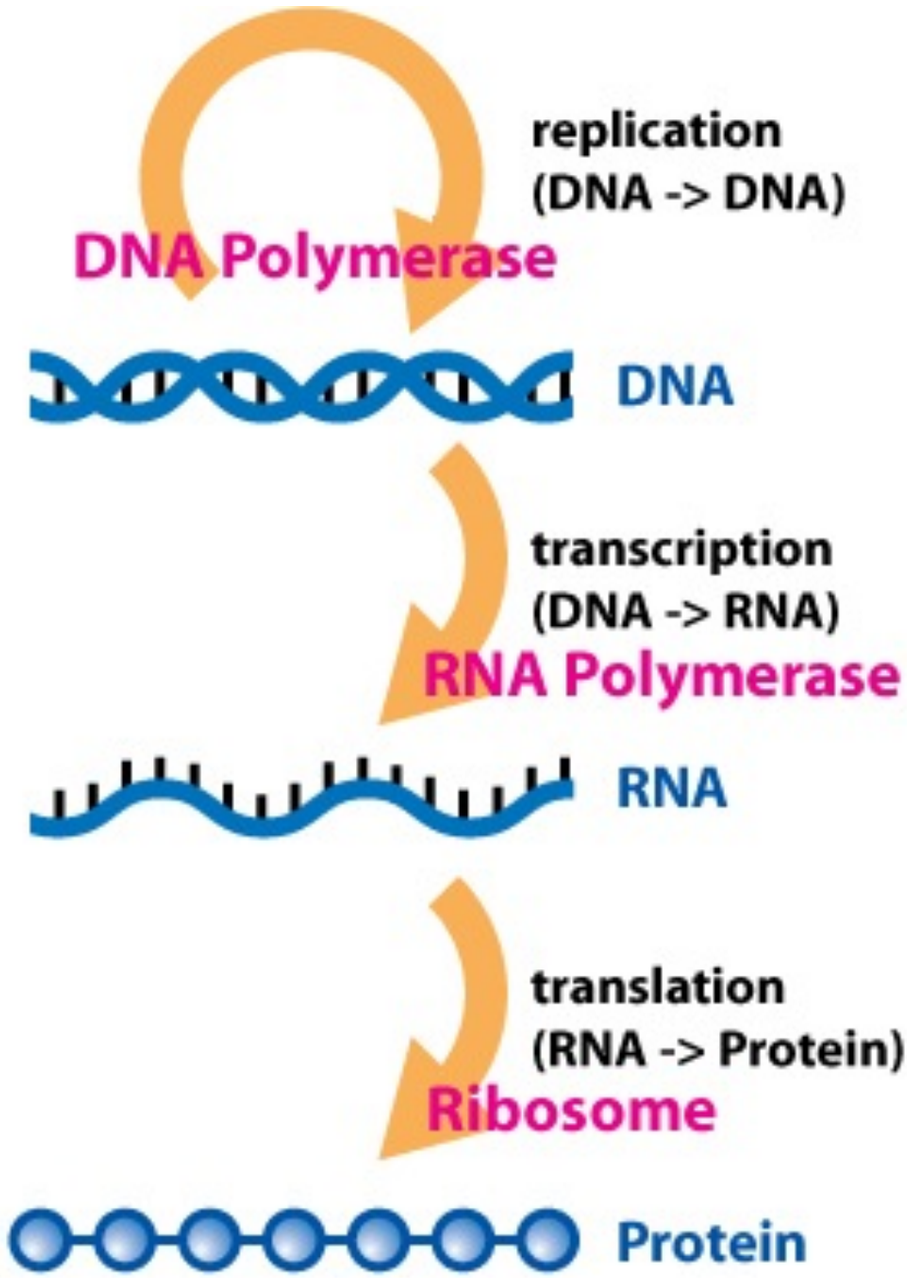
DNA condensation



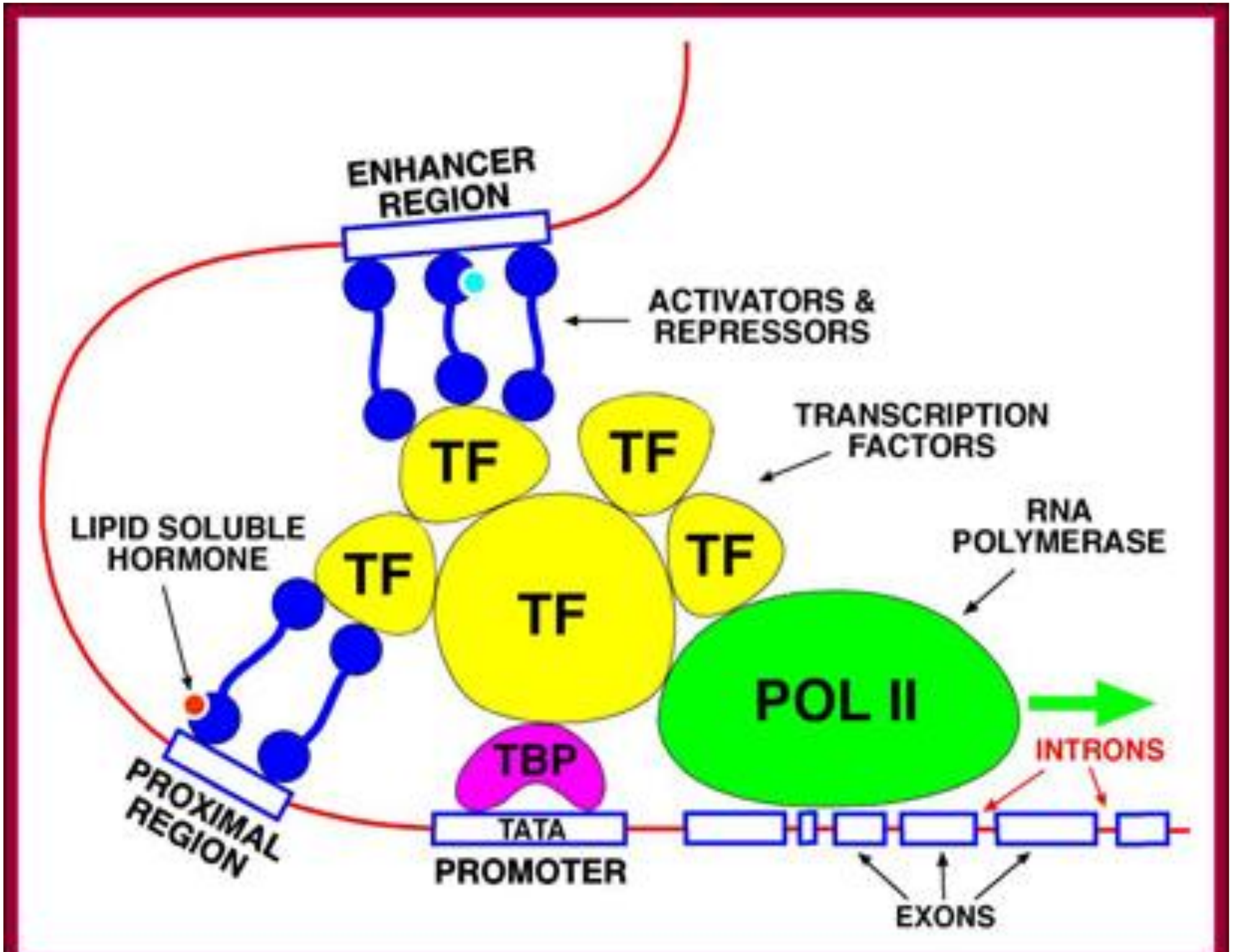
Epigenetics



Central Dogma



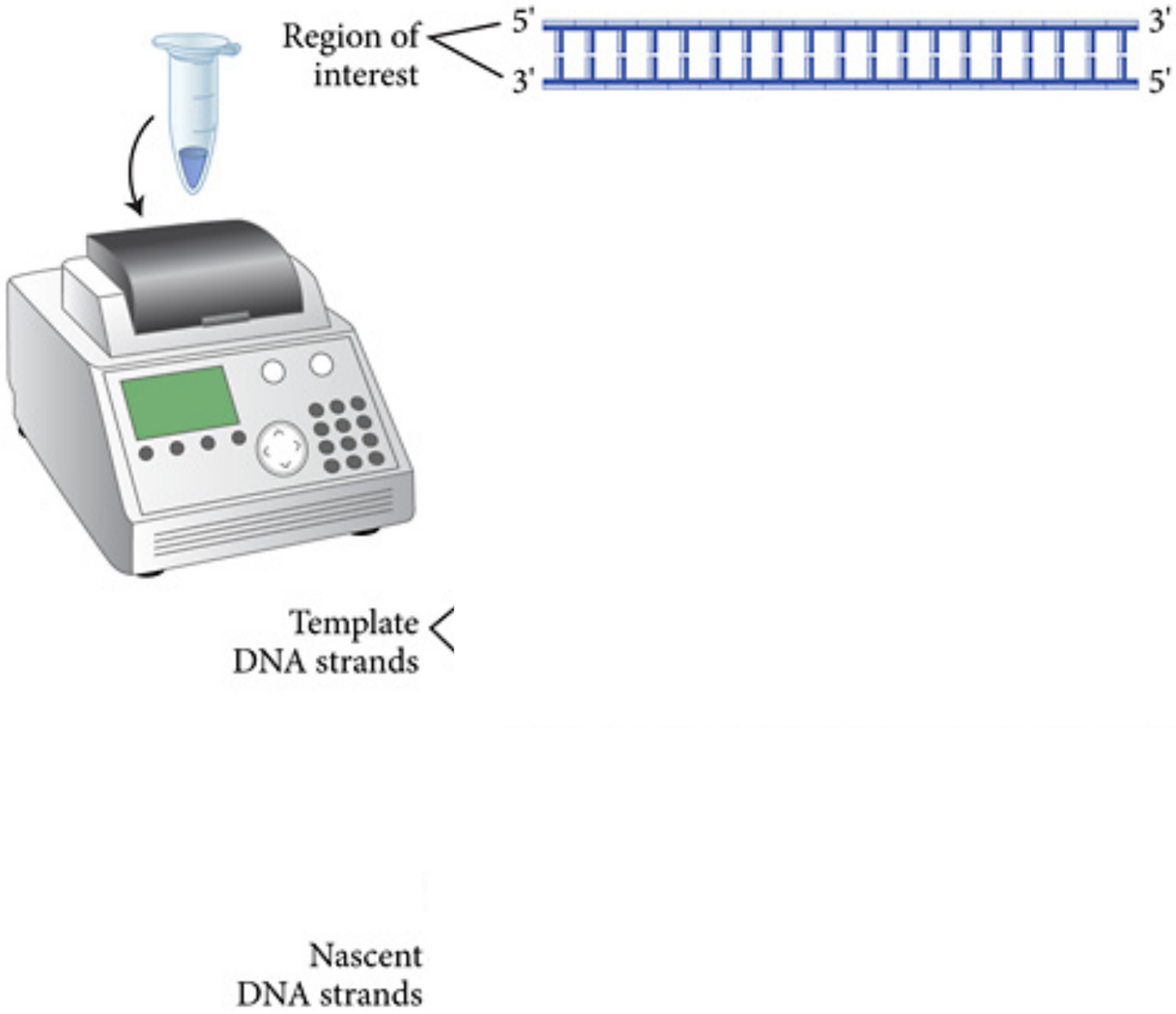
DNA expression - RNA polymerase



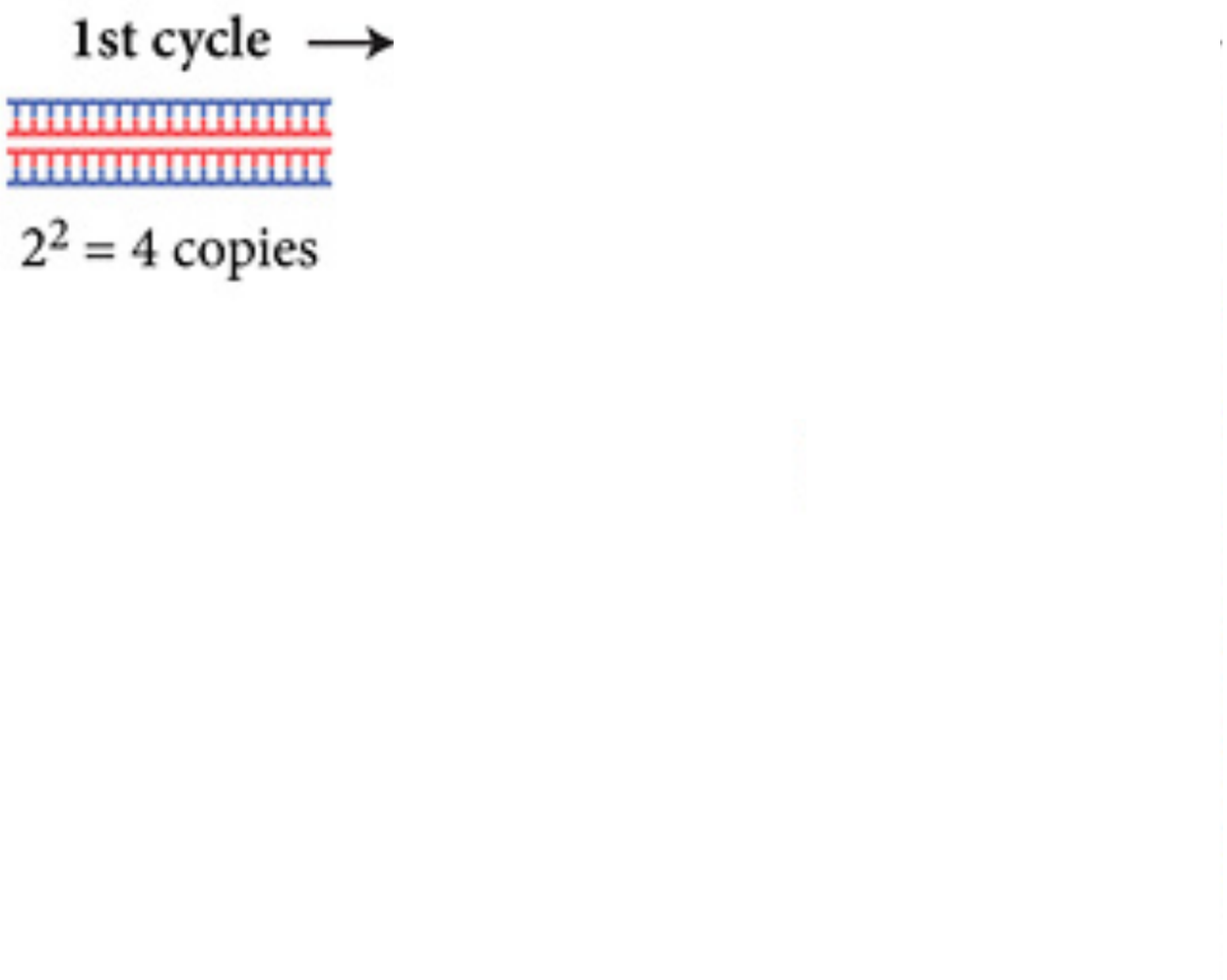
Polymerase Chain Reaction, 1983

Kary Mullis

Polymerase Chain Reaction



Polymerase Chain Reaction

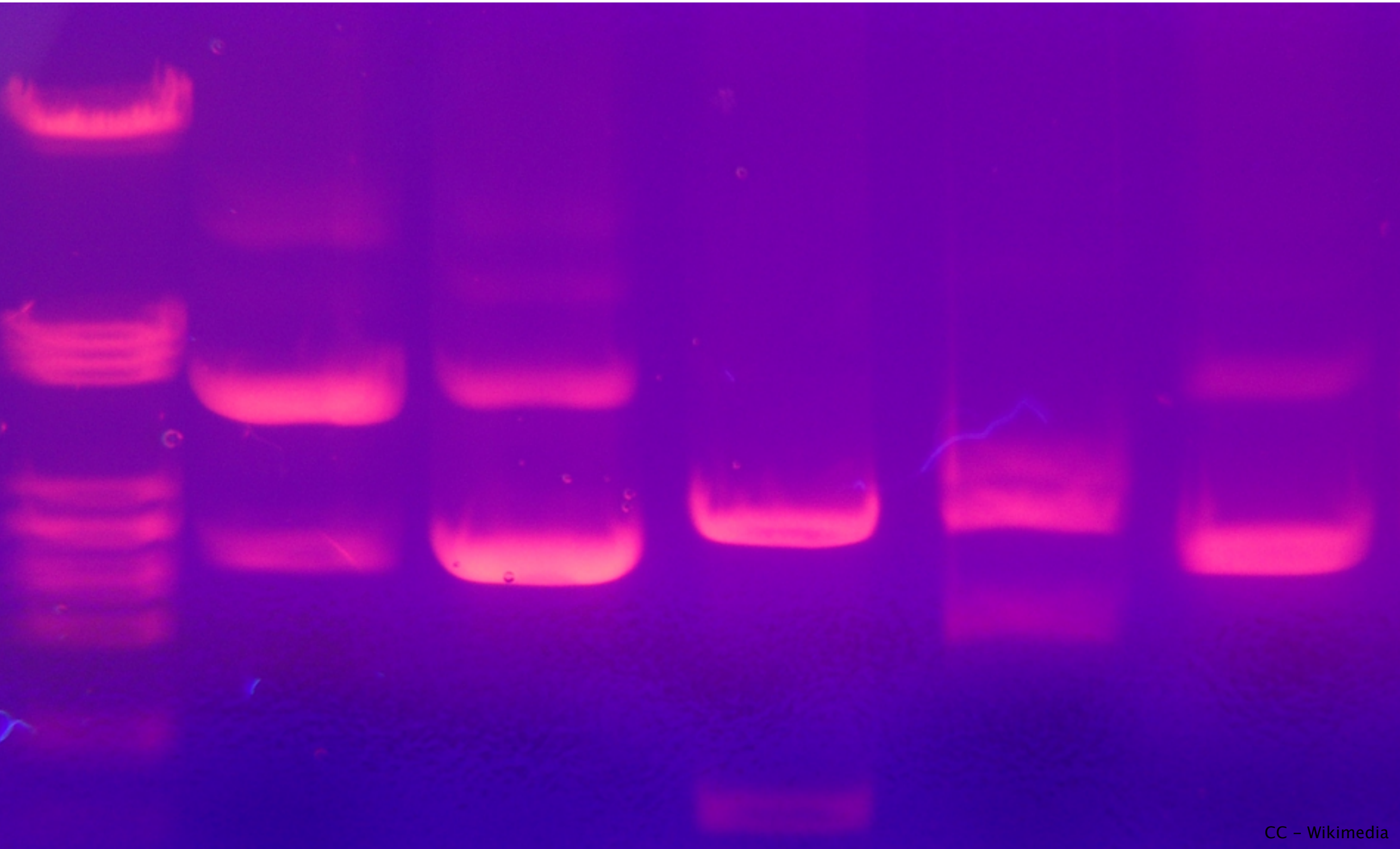


waag society

institute for art, science and technology

DNA fingerprinting

DNA fingerprint



CC – Wikimedia

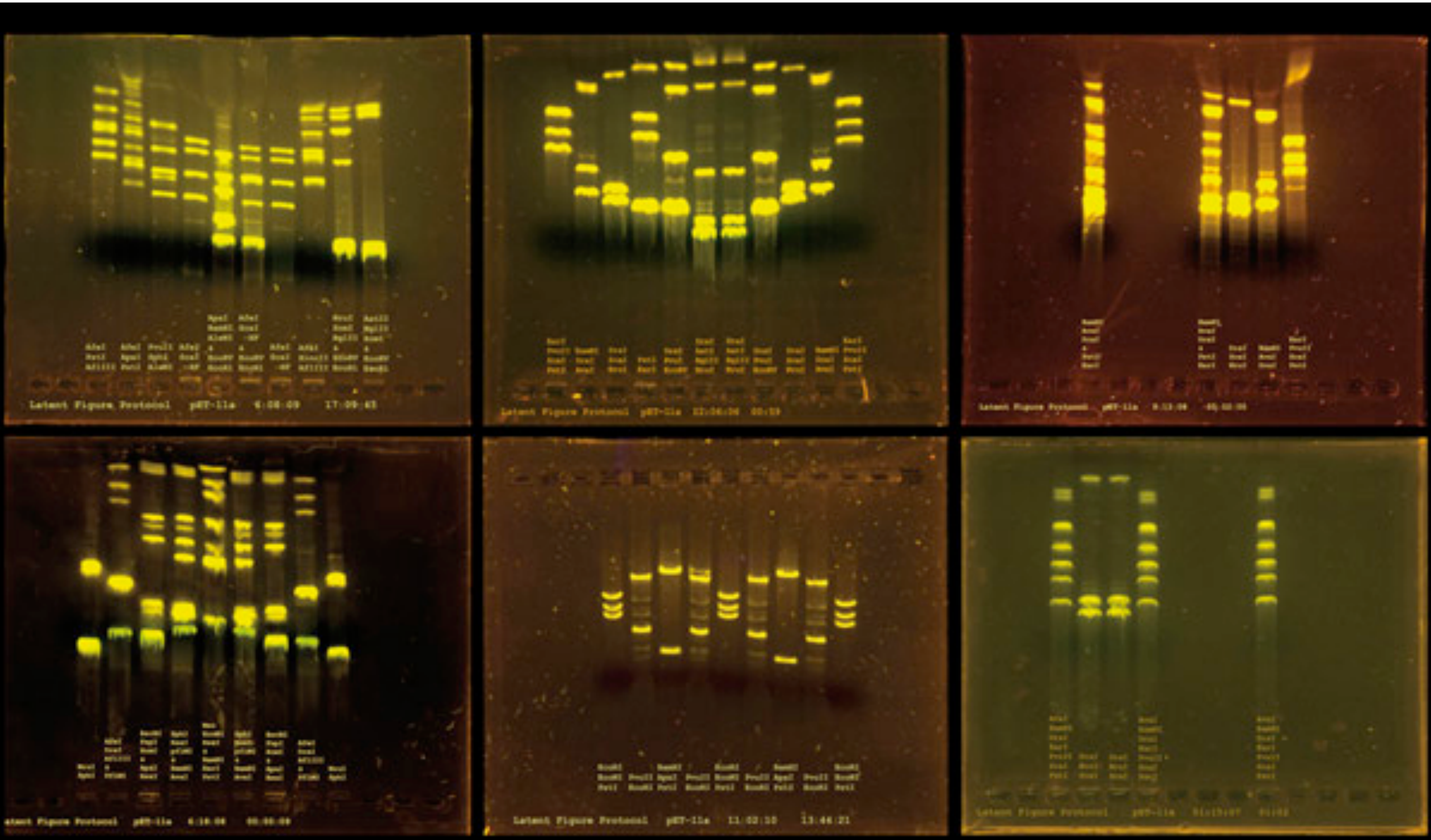
Sushi test

PooPrints

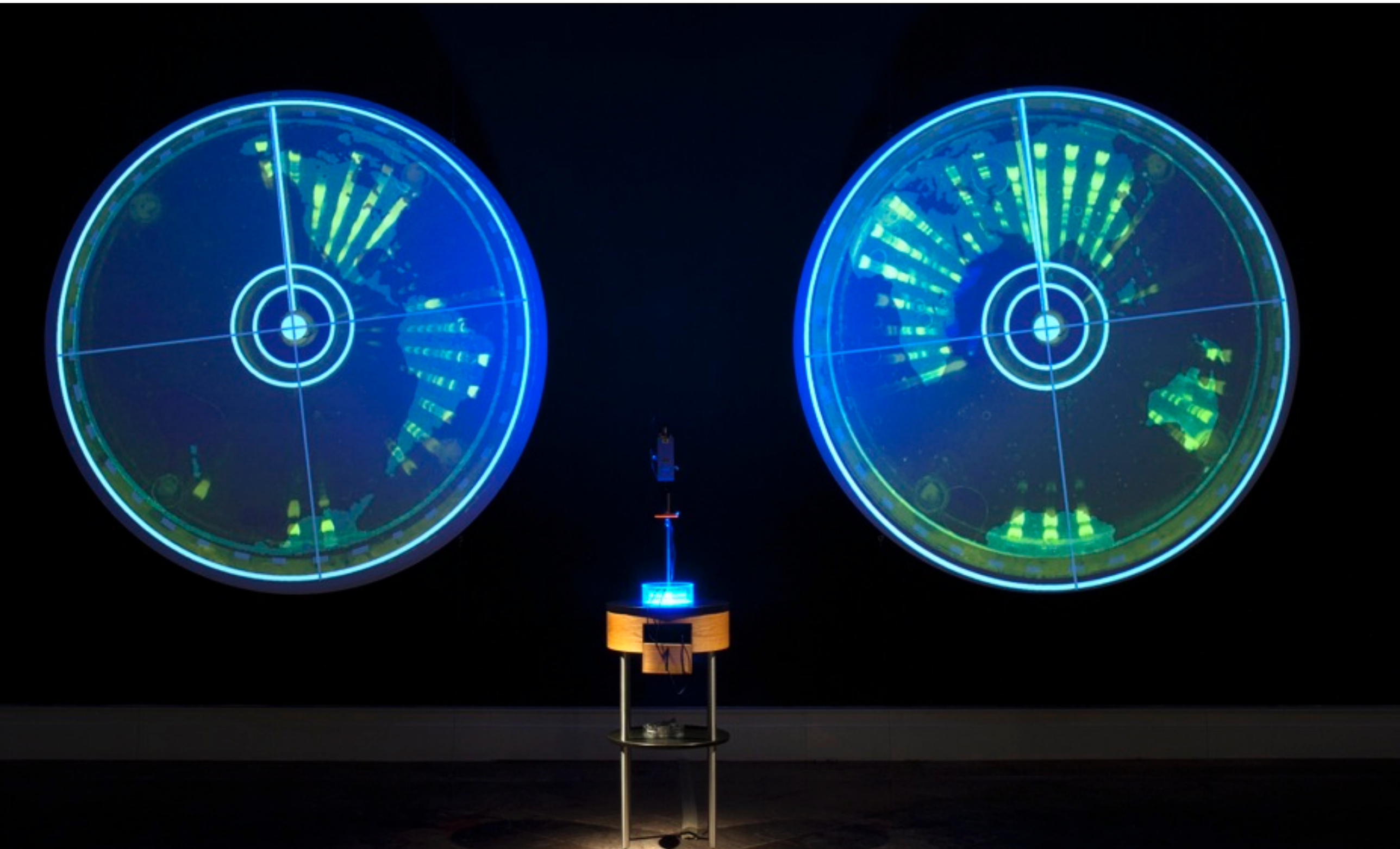

PooPrints™
Match The Mess Through DNA
DNA Collection Kit
D305-520
PET Identification Card
BioPet
Vet Lab
1-866-883-7389
Customer Information Card
*Required Information
Account Information
*Country:
*Email:
*Your Name:
*Address:
*City, State, Zip
Phone:
Pet Information
Apply Barcode Sticker Here
*Pet's Name:
*Pet's Species: Dog Cat
Where did you purchase your DNA Pet ID Kit?
Company:
D305-250
DNA World Pet Registry
Affix barcode sticker OR write dog's name here
Affix barcode sticker OR write dog's name here

Barcode

Paul Vanouse



Paul Vanouse



waag society

institute for art, science and technology

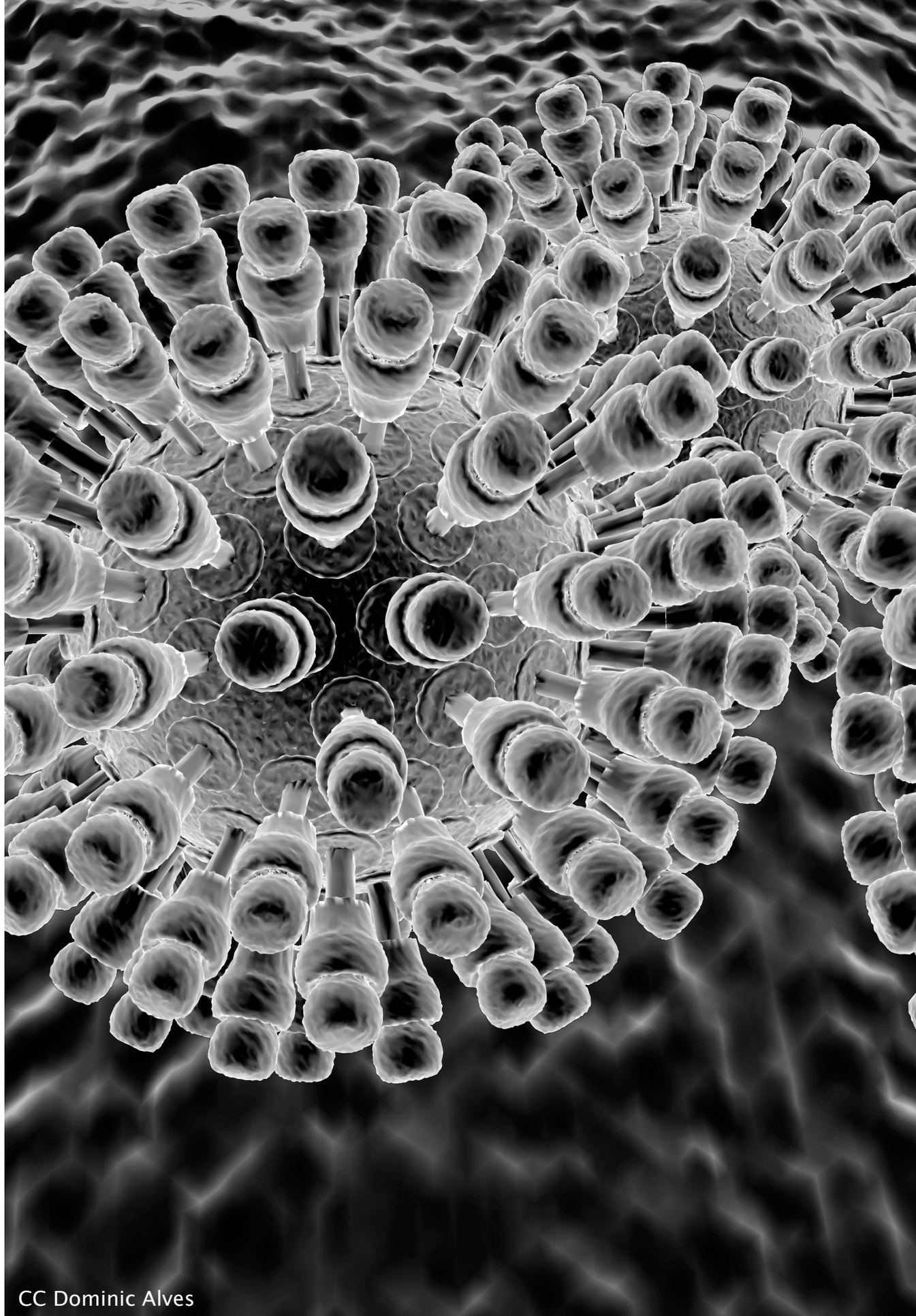
DNA restriction

a.k.a cutting DNA

DNA restriction enzymes

- Protect against viral infections

- Over 3000 types known

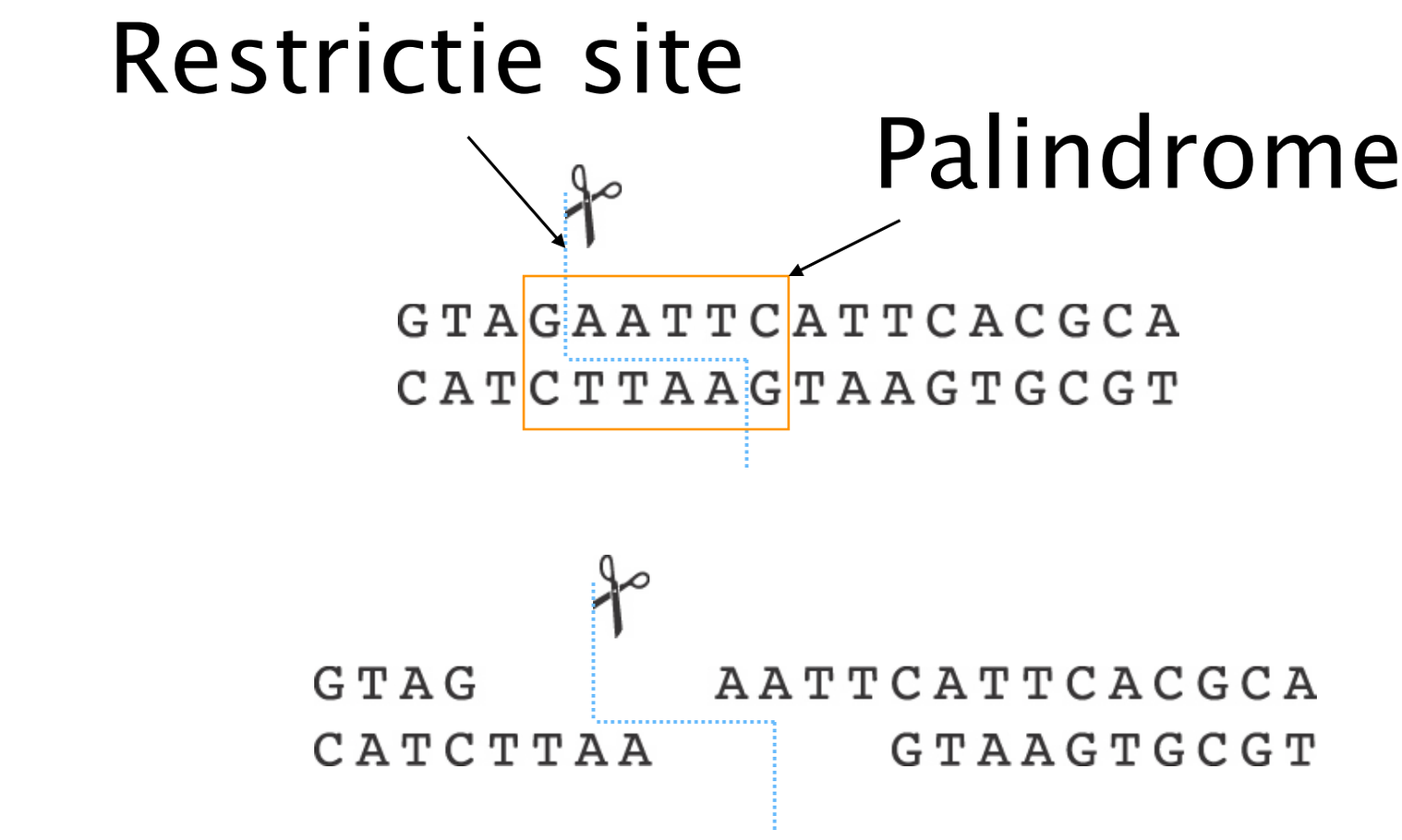


EcoRI en PstI

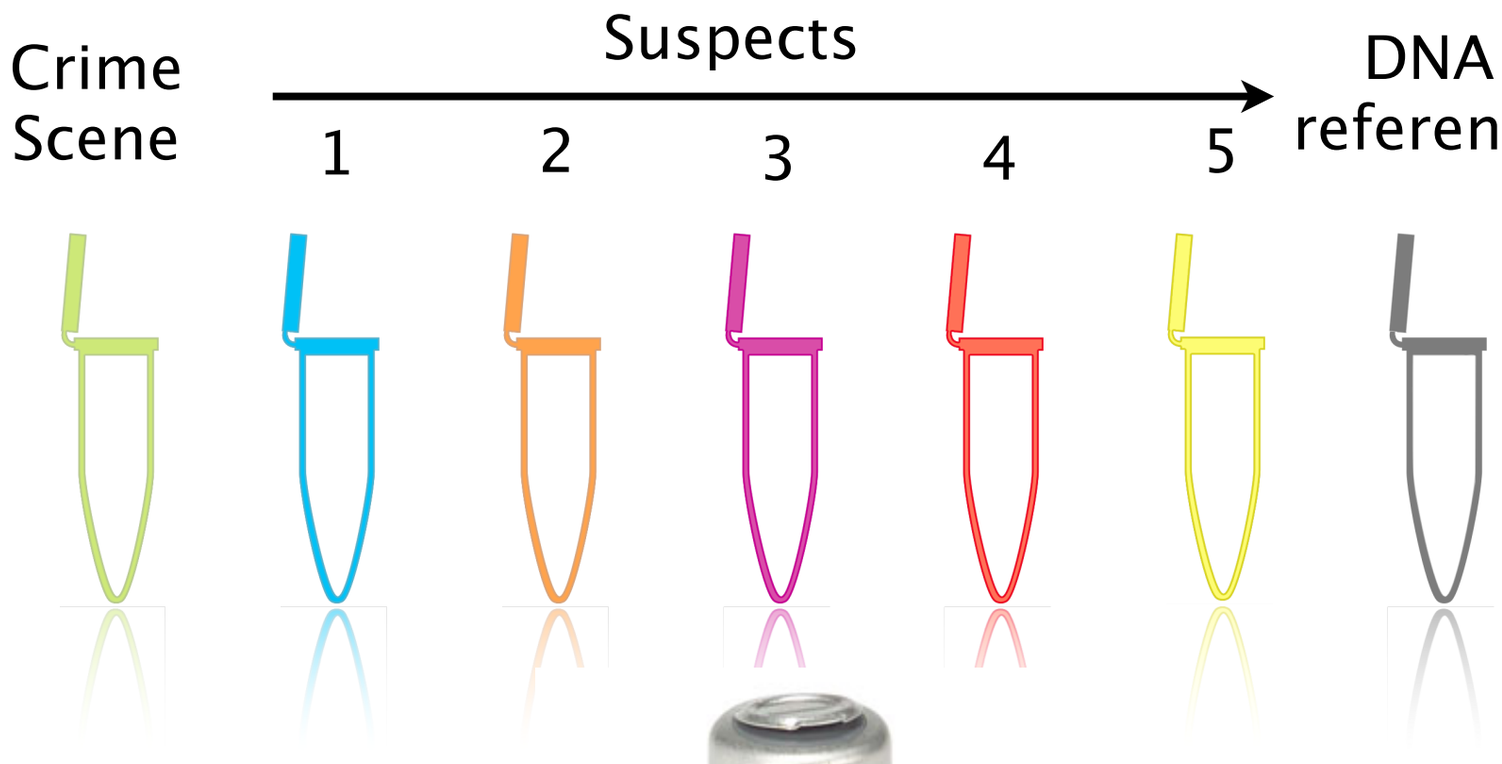
EcoRI
- Eschericha coli
- 5 prime overlap

PstI
- Providencia stuartii
- 3 prime overlap

Sequence specific cuts



Step 1: samples and enzymes



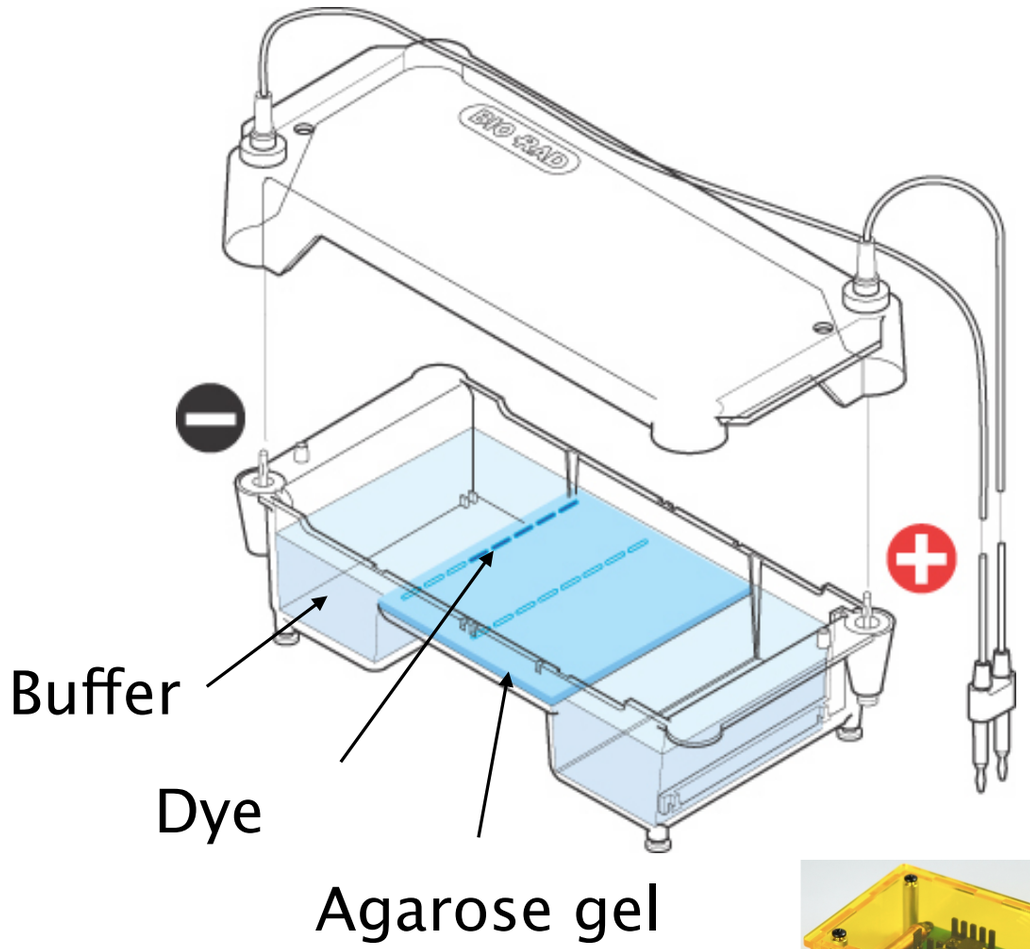
Take the 5 samples

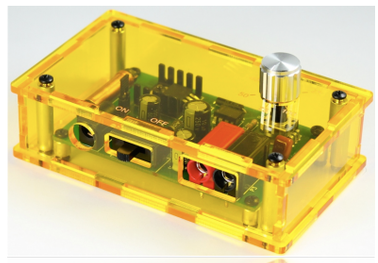
Cut it using a EcoRI/ PstI restriction-enzyme mix

Incubate 45 minutes at 37 degrees

Step 2: Gel electrophoreses

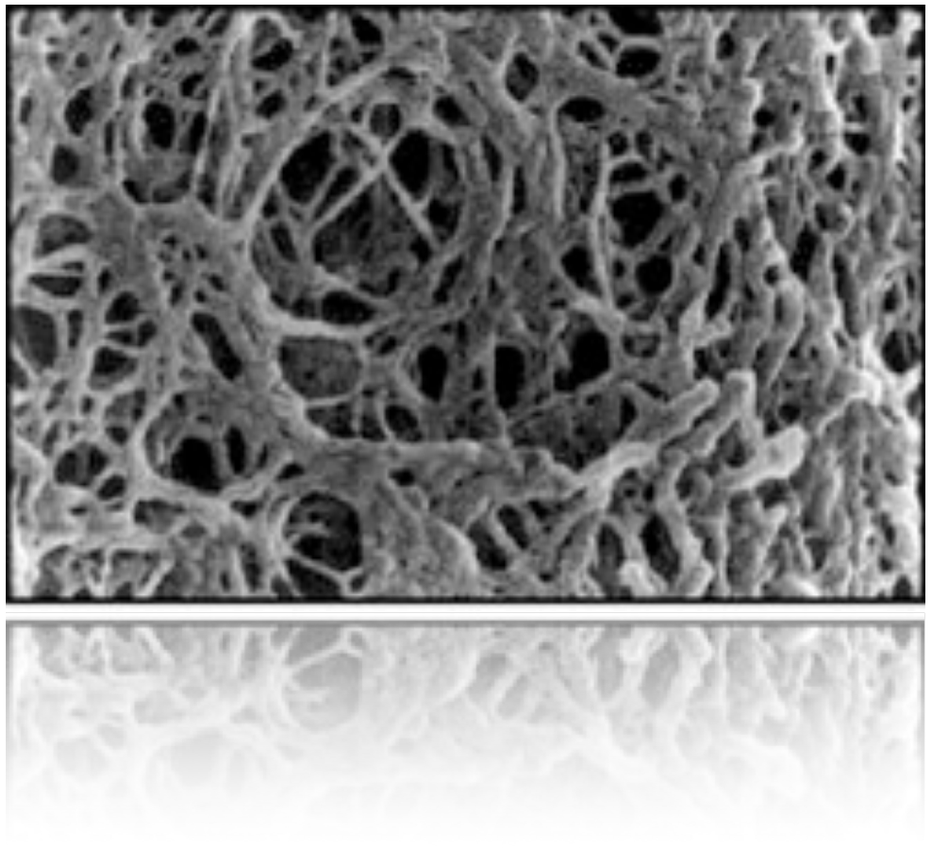
DNA is attracted by the cathode (+)

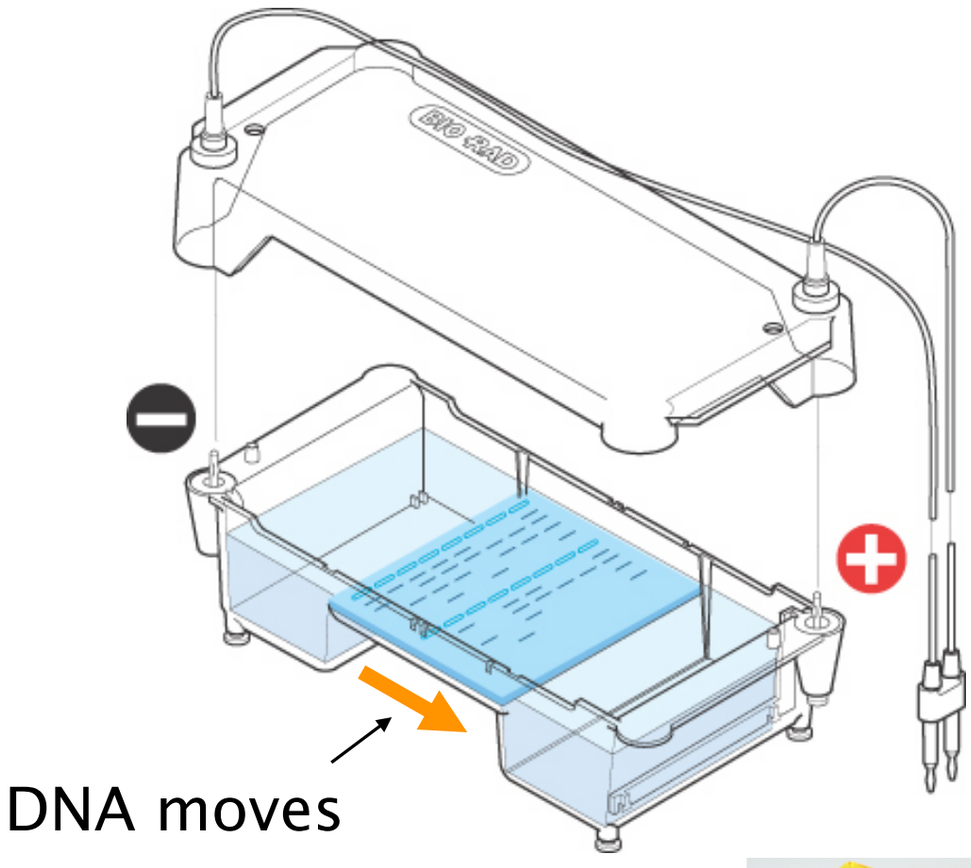


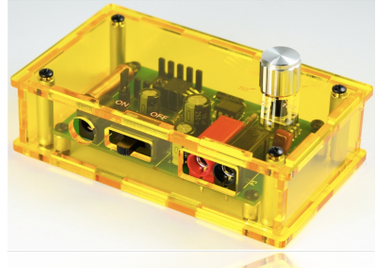


Step 2: Gel electrophoreses

Short pieces move faster
than long pieces





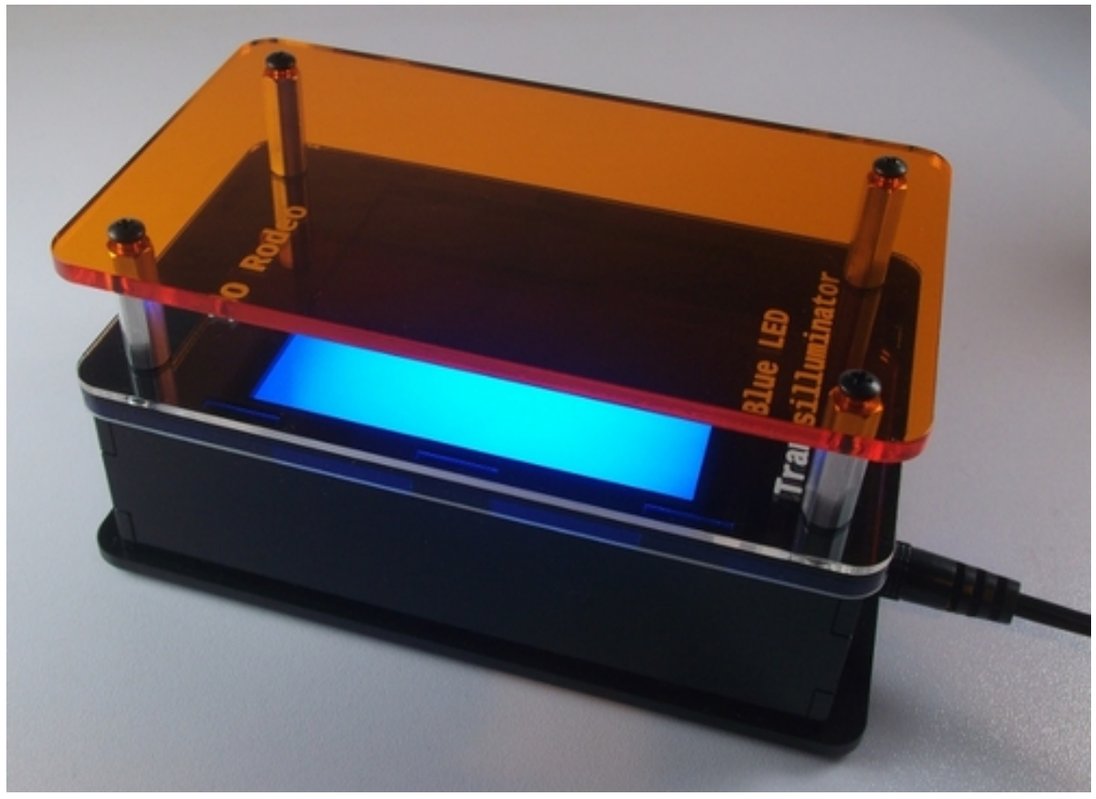


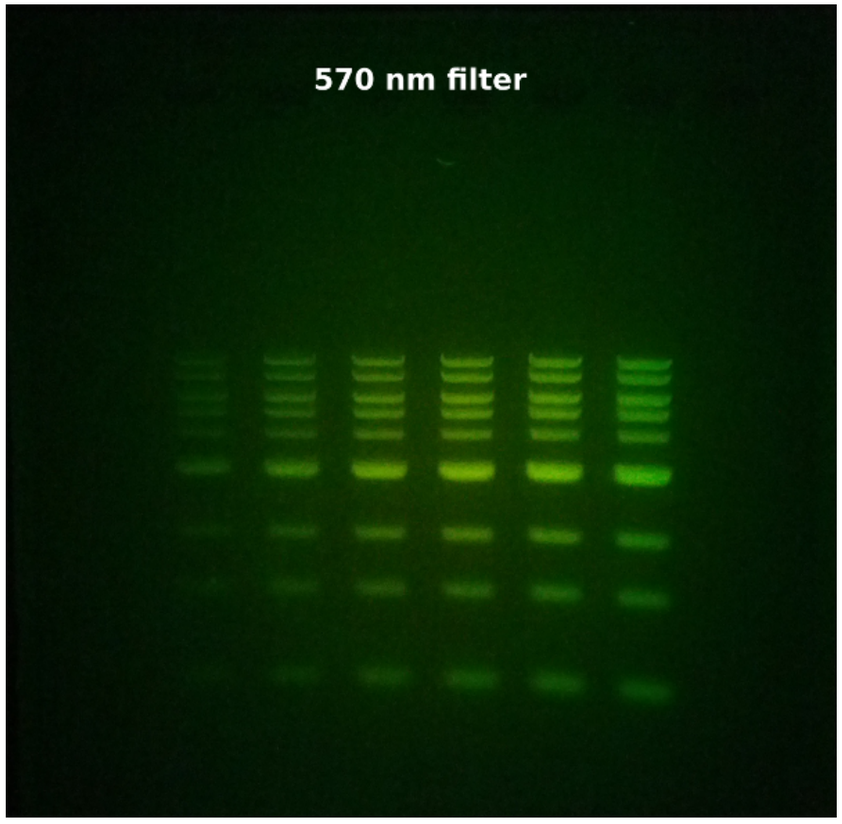
Transillumination

- Fluorescent DNA dye

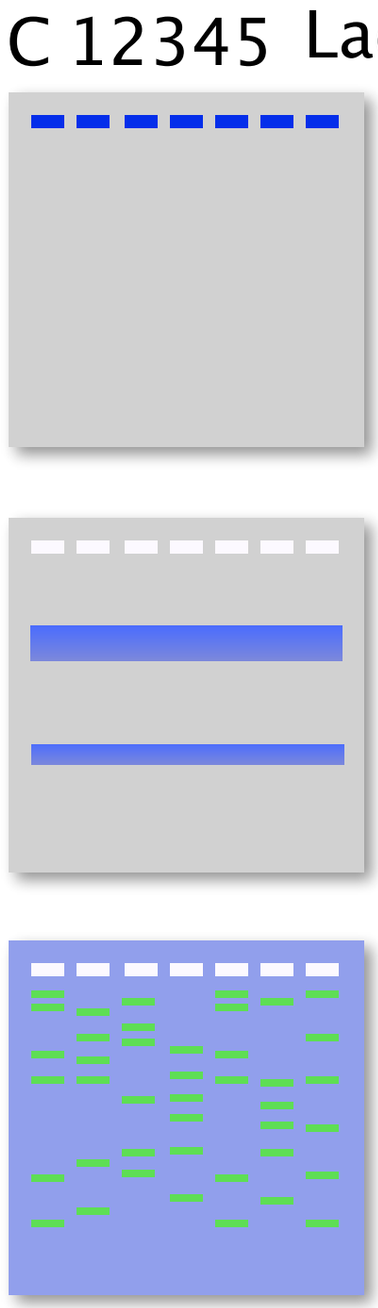
- Sensitive to blue light
- Emits green light

- Orange filter blocks blue light





Step 2: Gel electrophoreses



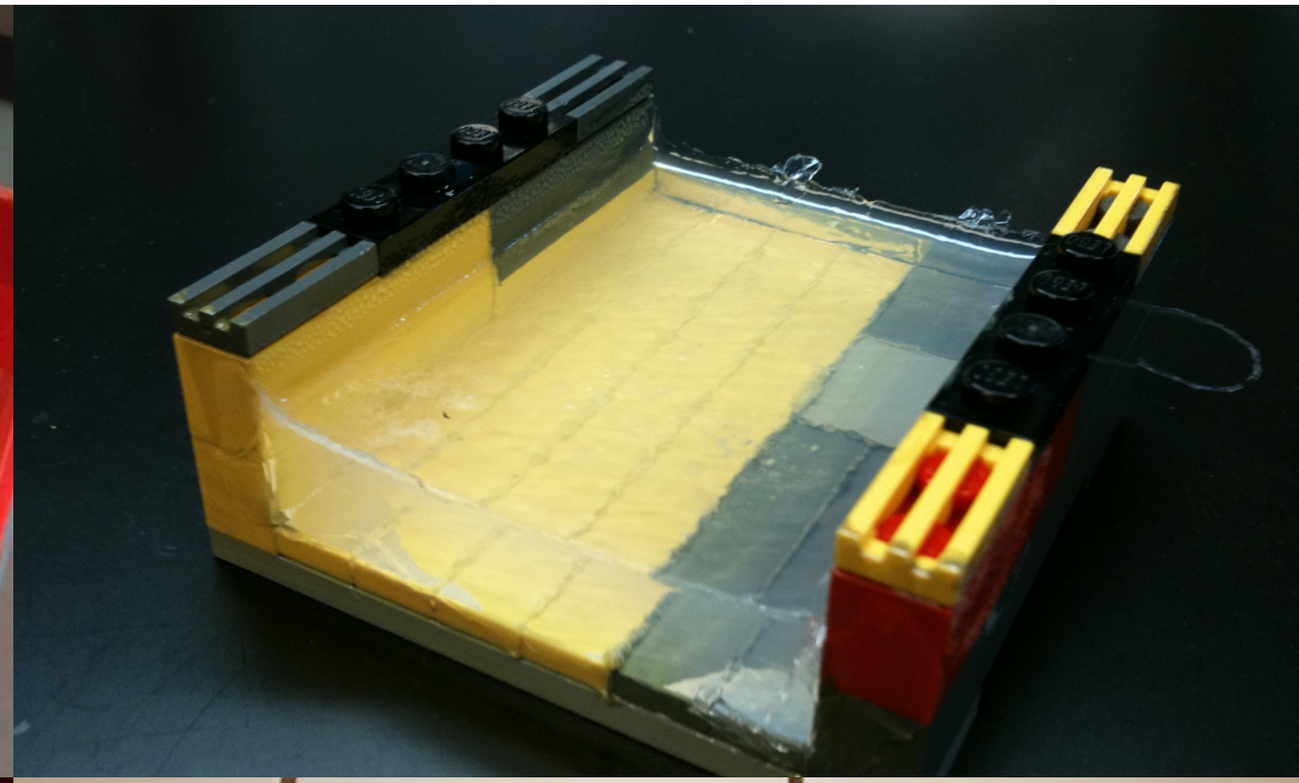
Load the samples in a gel

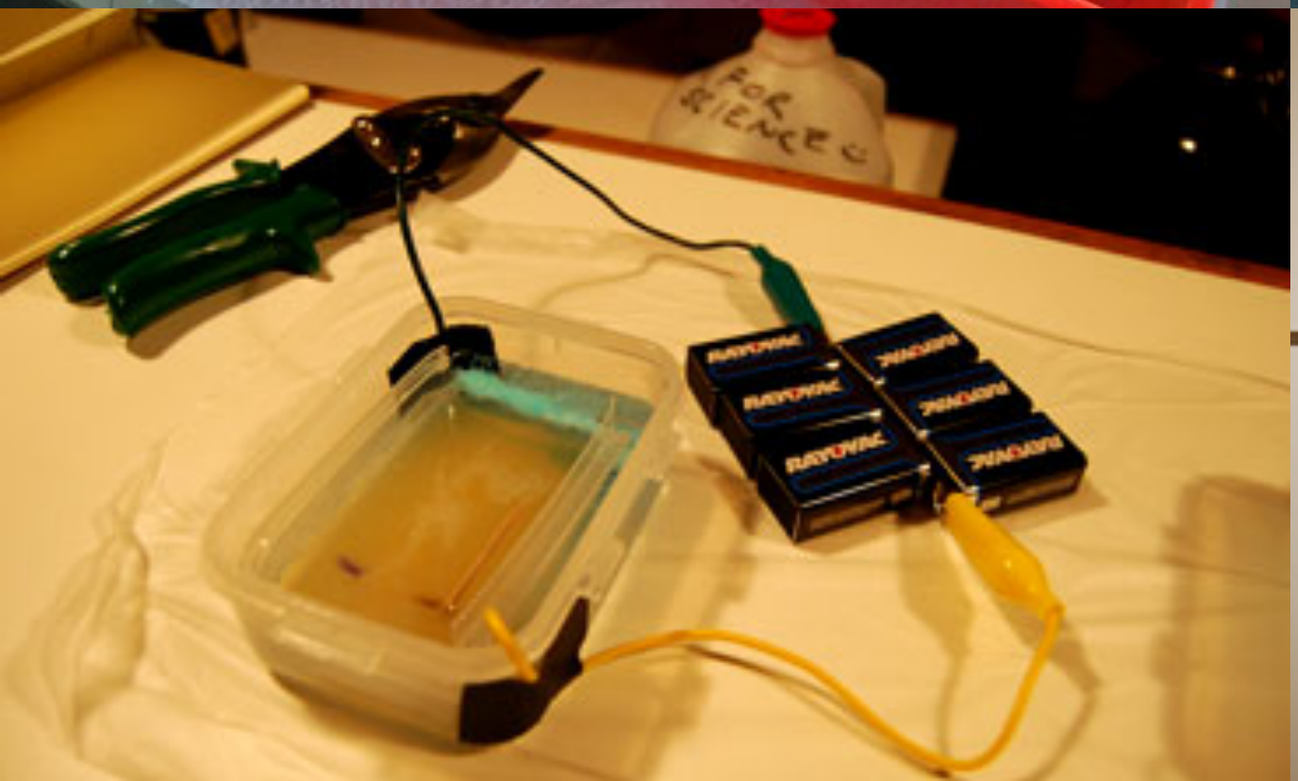
Apply current

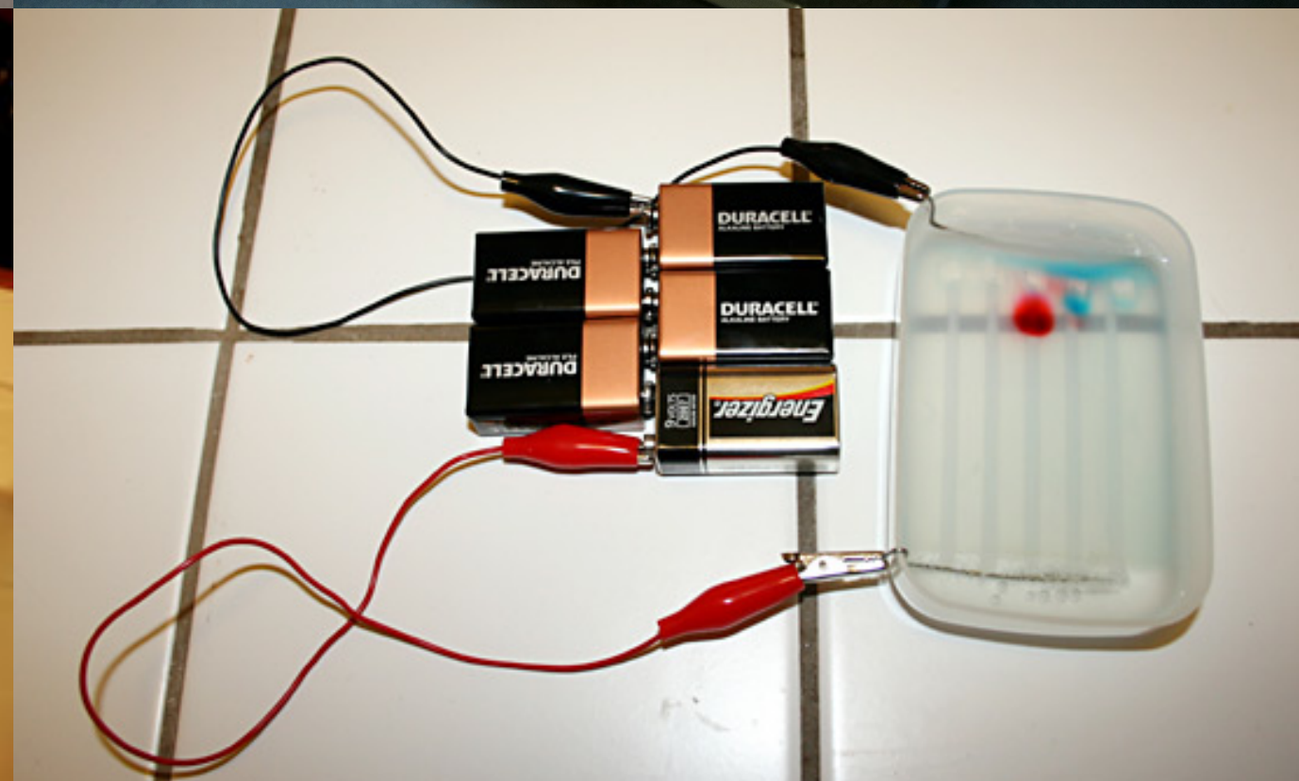
Read the pattern

DIY Electrophoresis

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





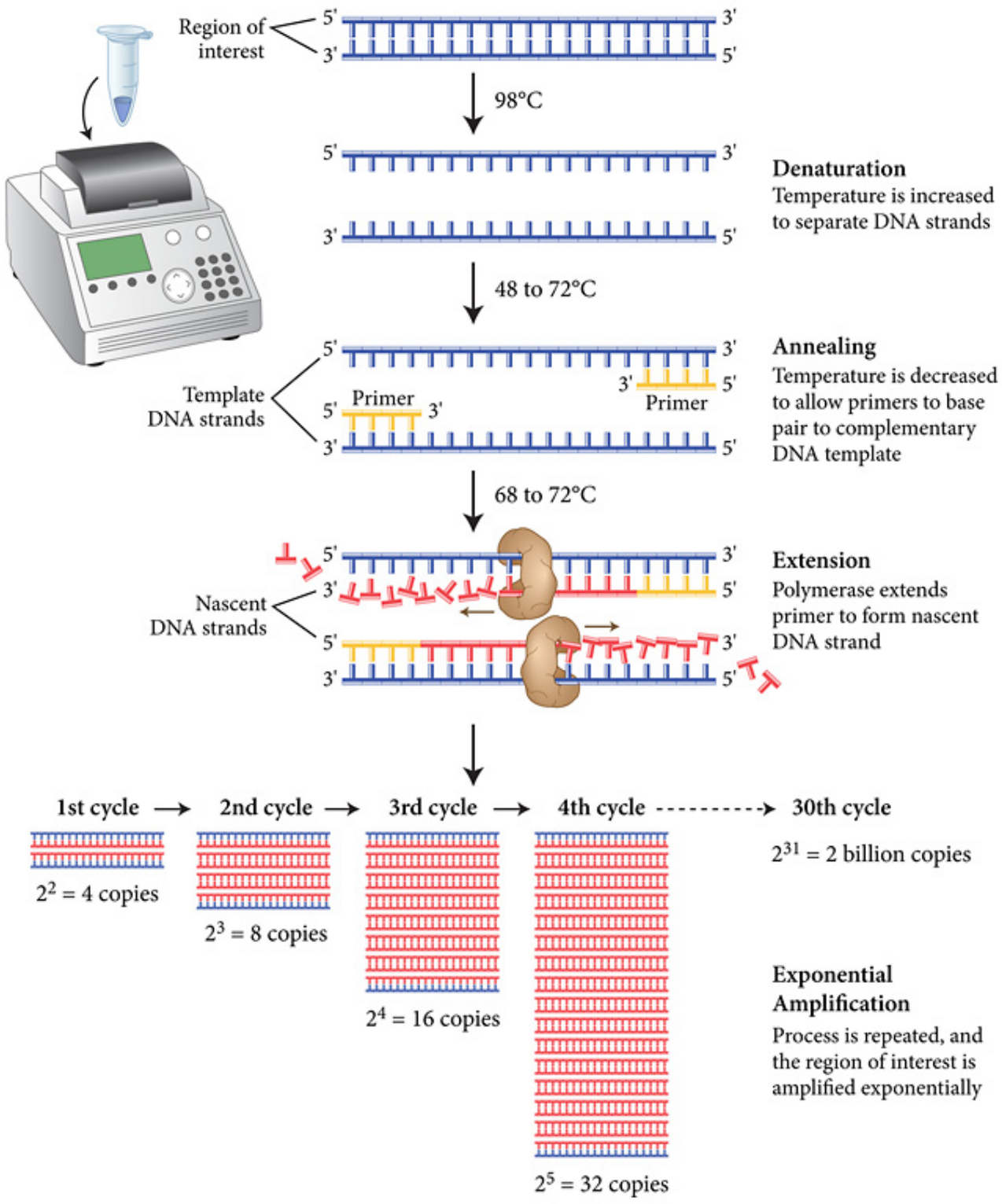


waag society

institute for art, science and technology

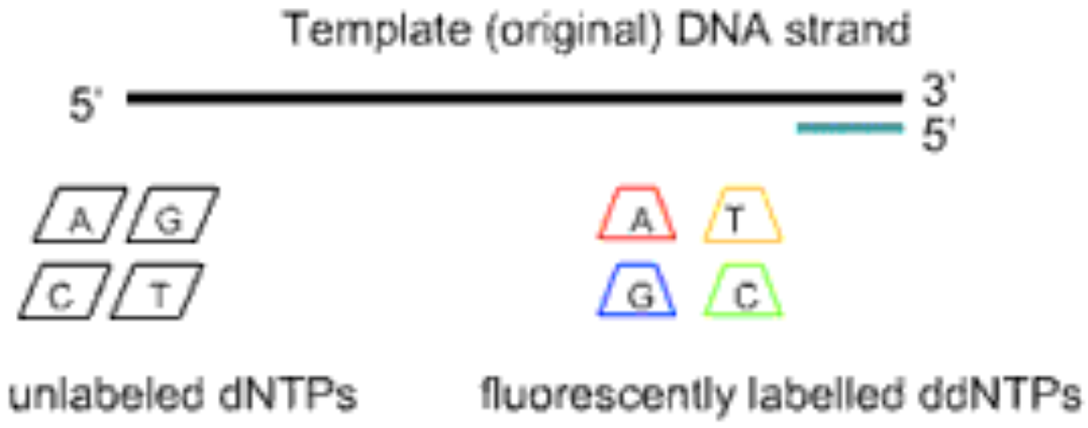
DNA analytics

Polymerase Chain Reaction

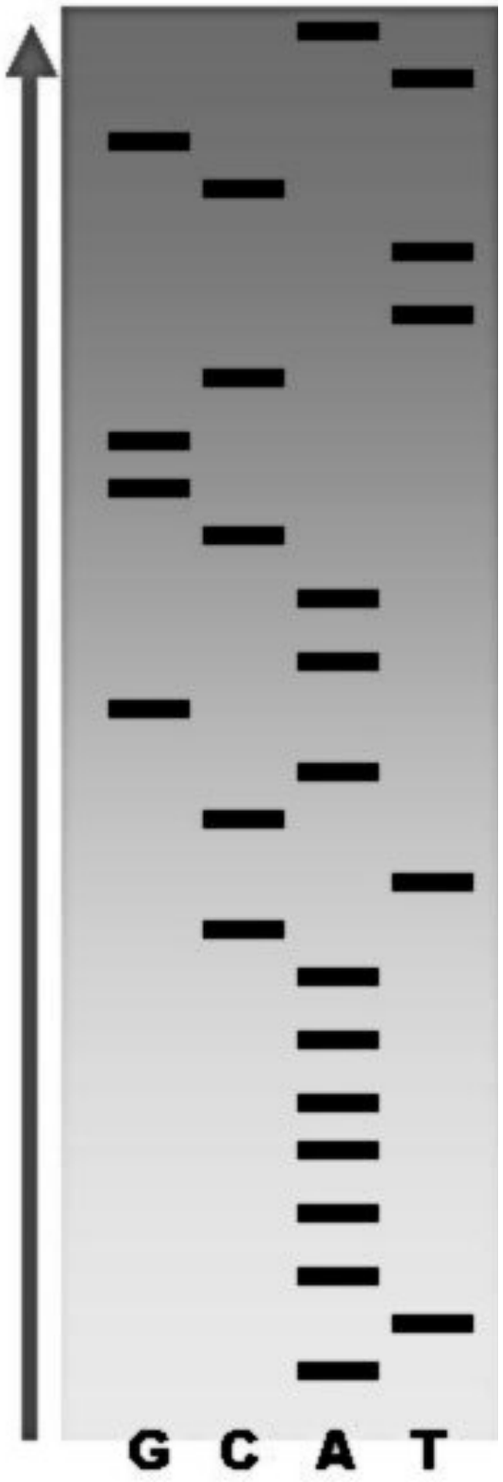


New England Biolabs

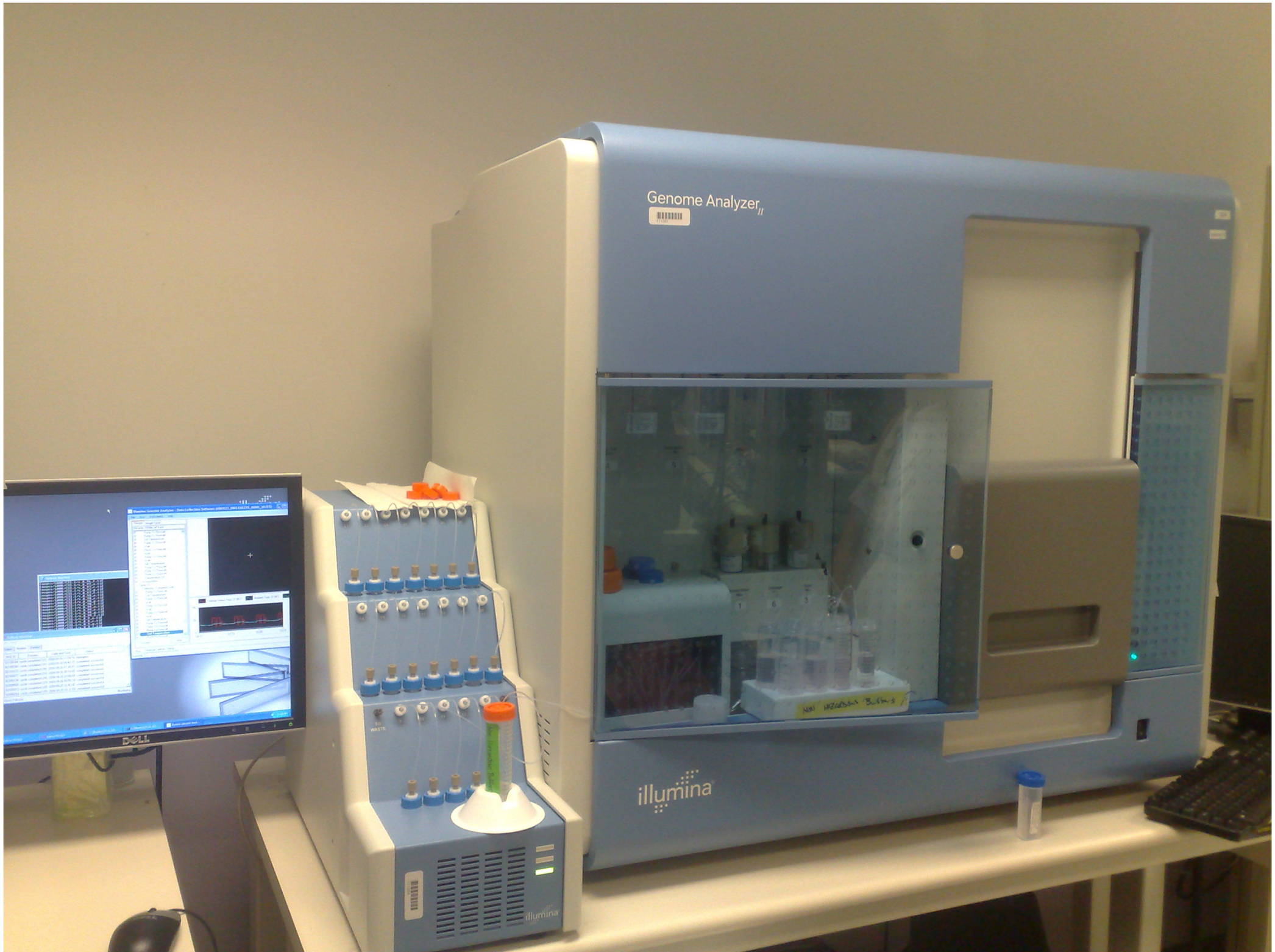
Sanger Sequencing – chain termination



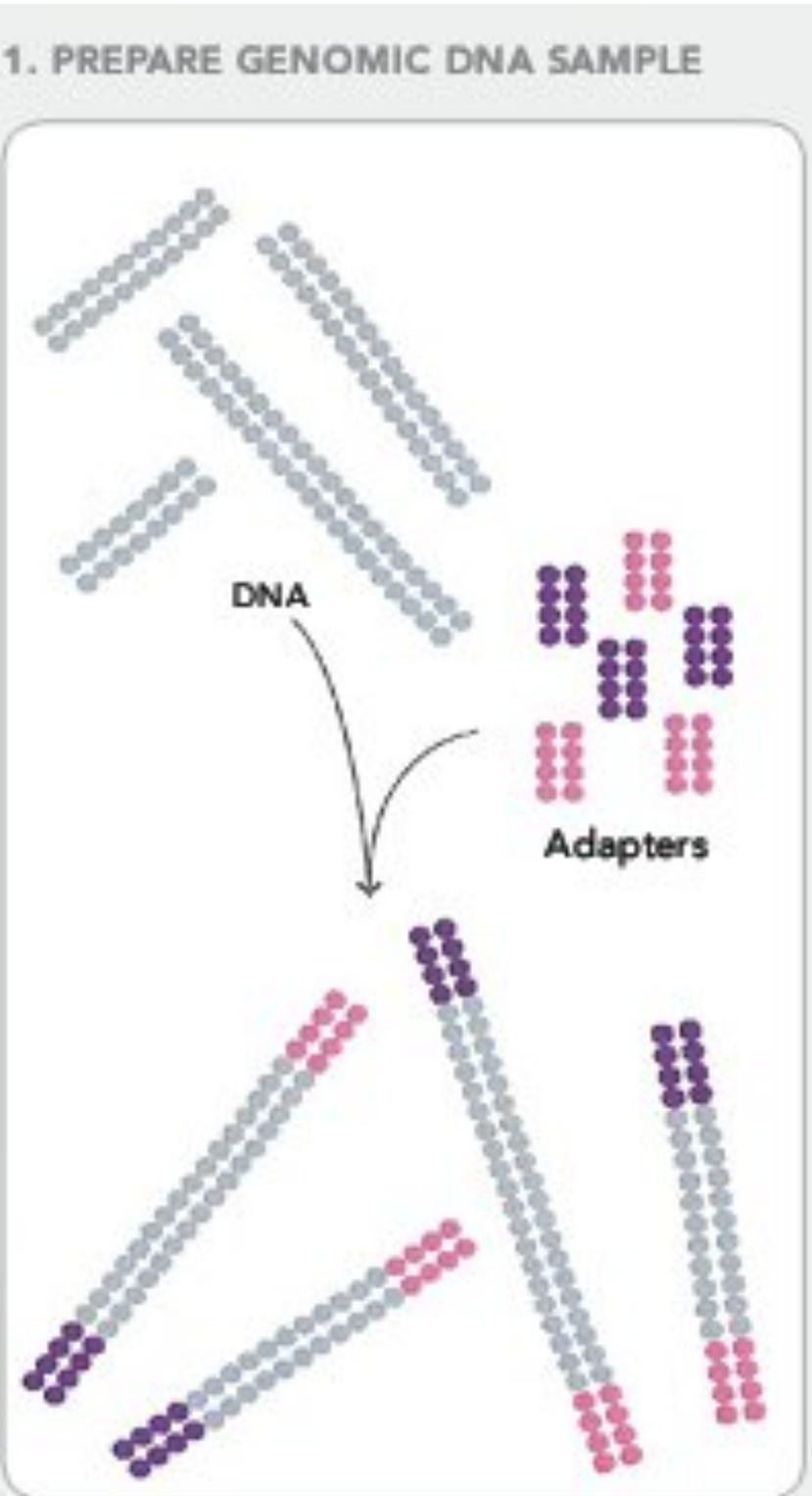
Sanger sequencing



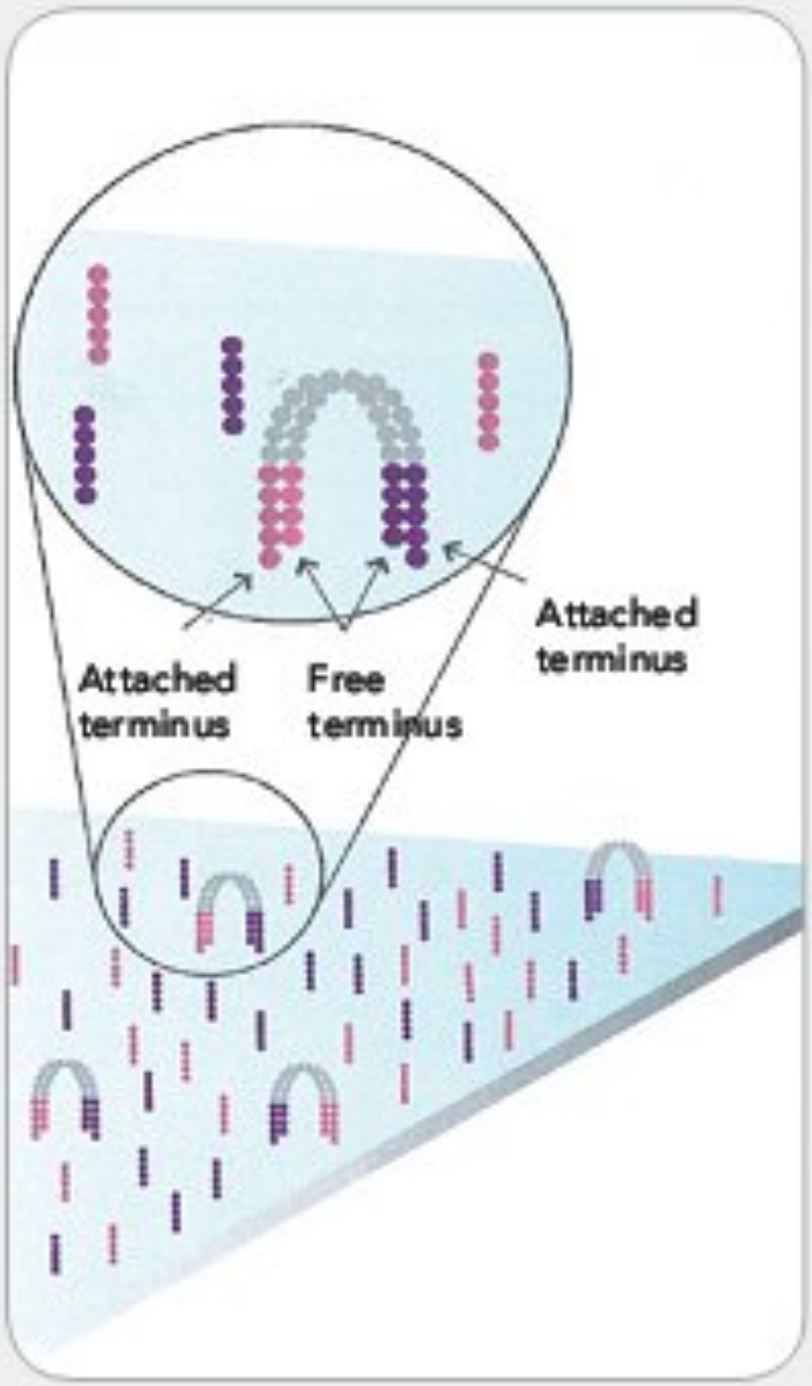
Illumina - Solexa



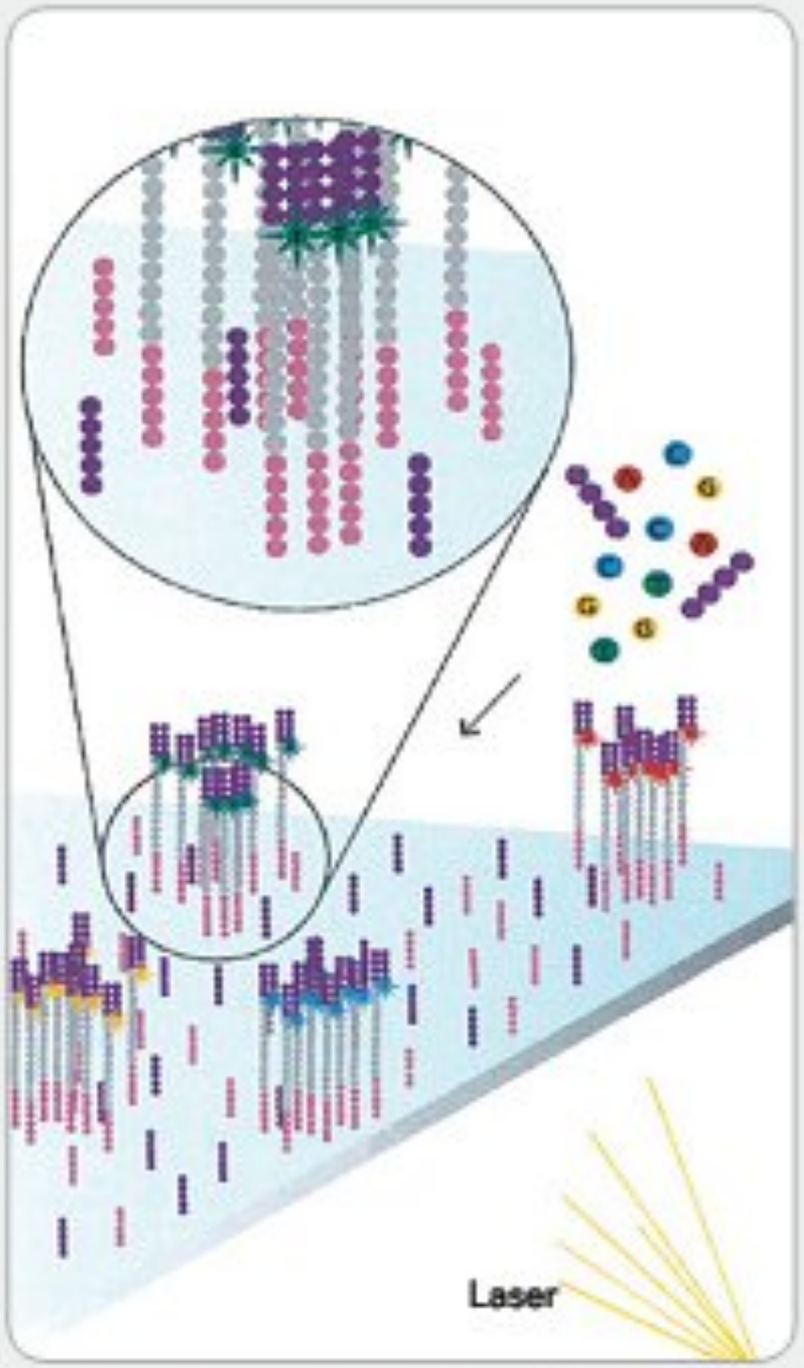
Solexa – Illumina sequencing



4. FRAGMENTS BECOME DOUBLE STRANDED

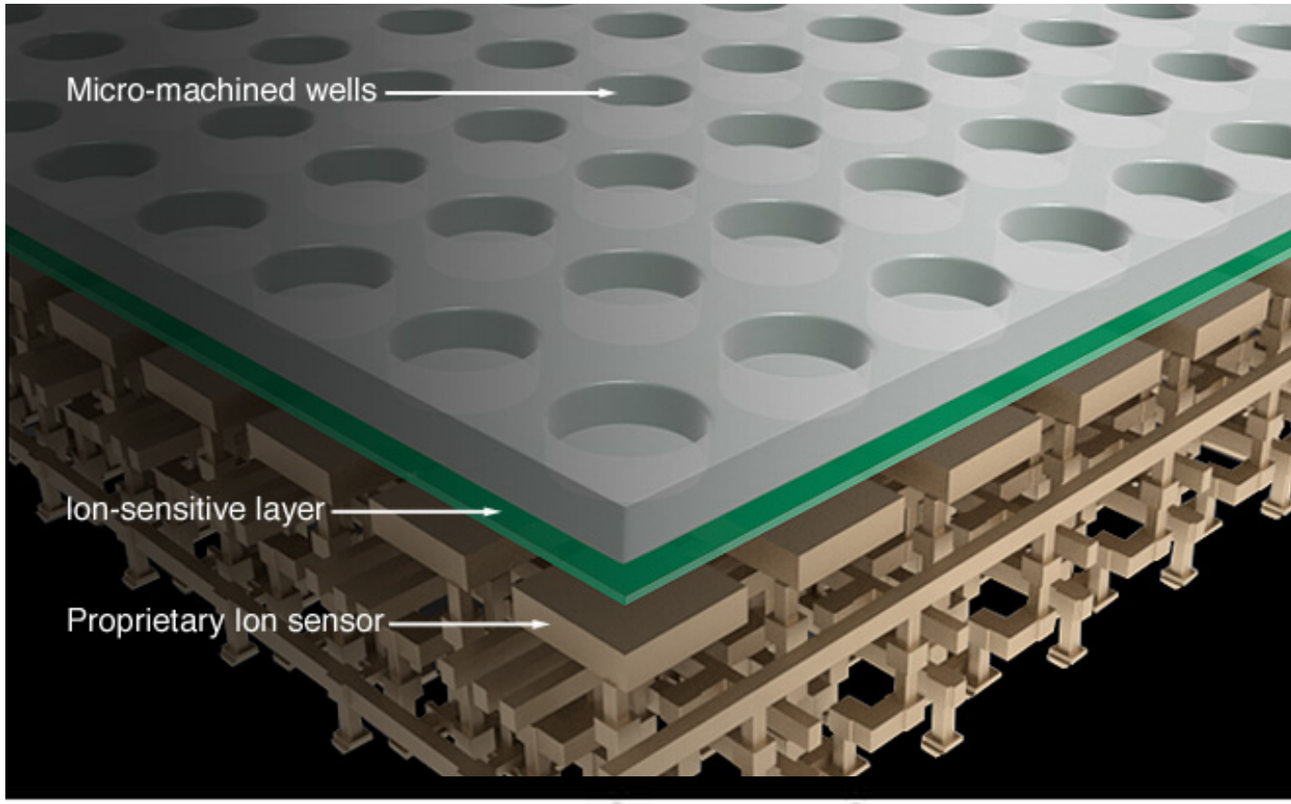


7. DETERMINE FIRST BASE

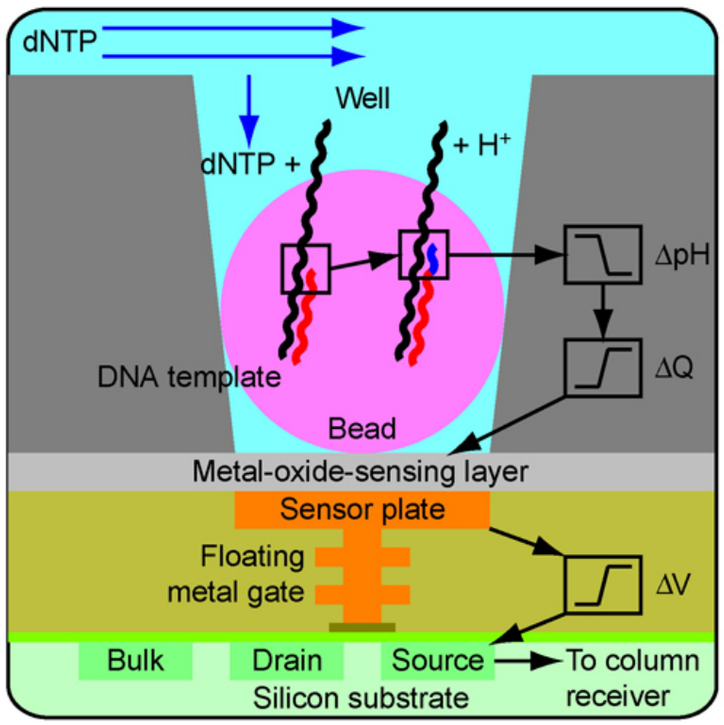


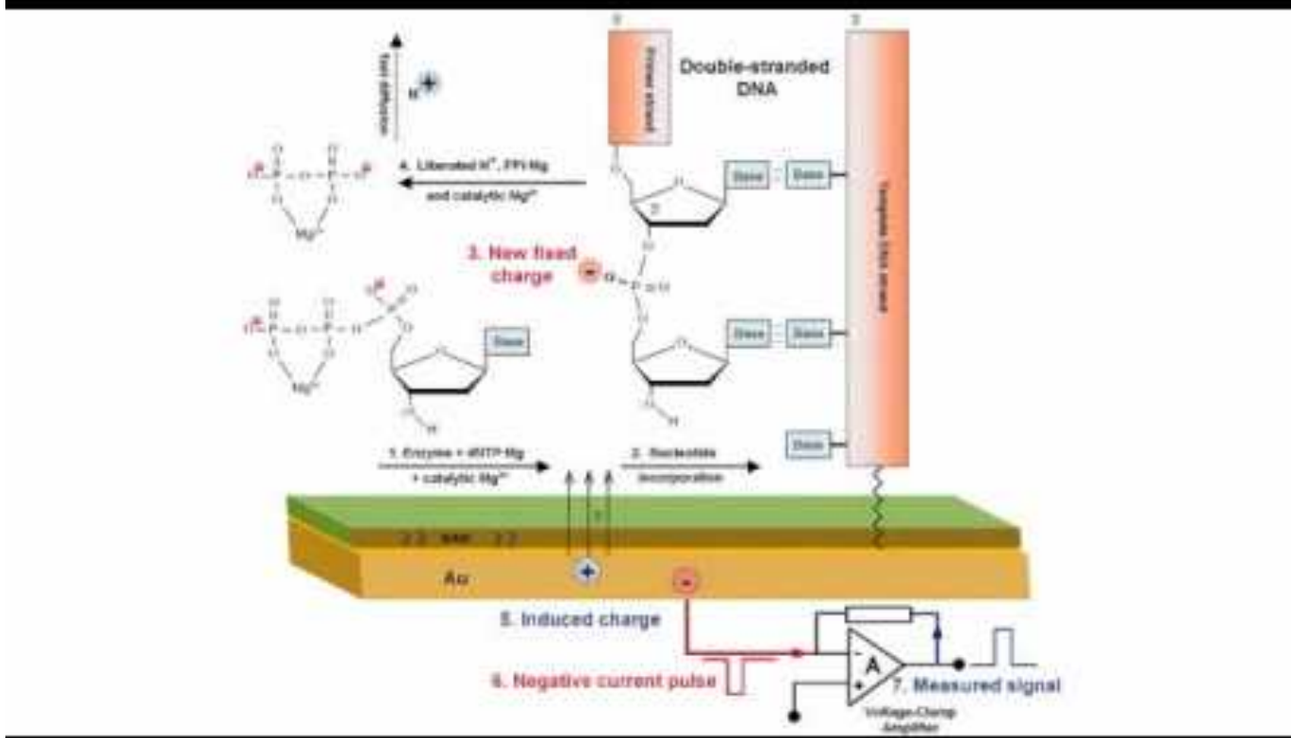
10. IMAGE SECOND CHEMISTRY CYCLE

IonTorrent sequencing

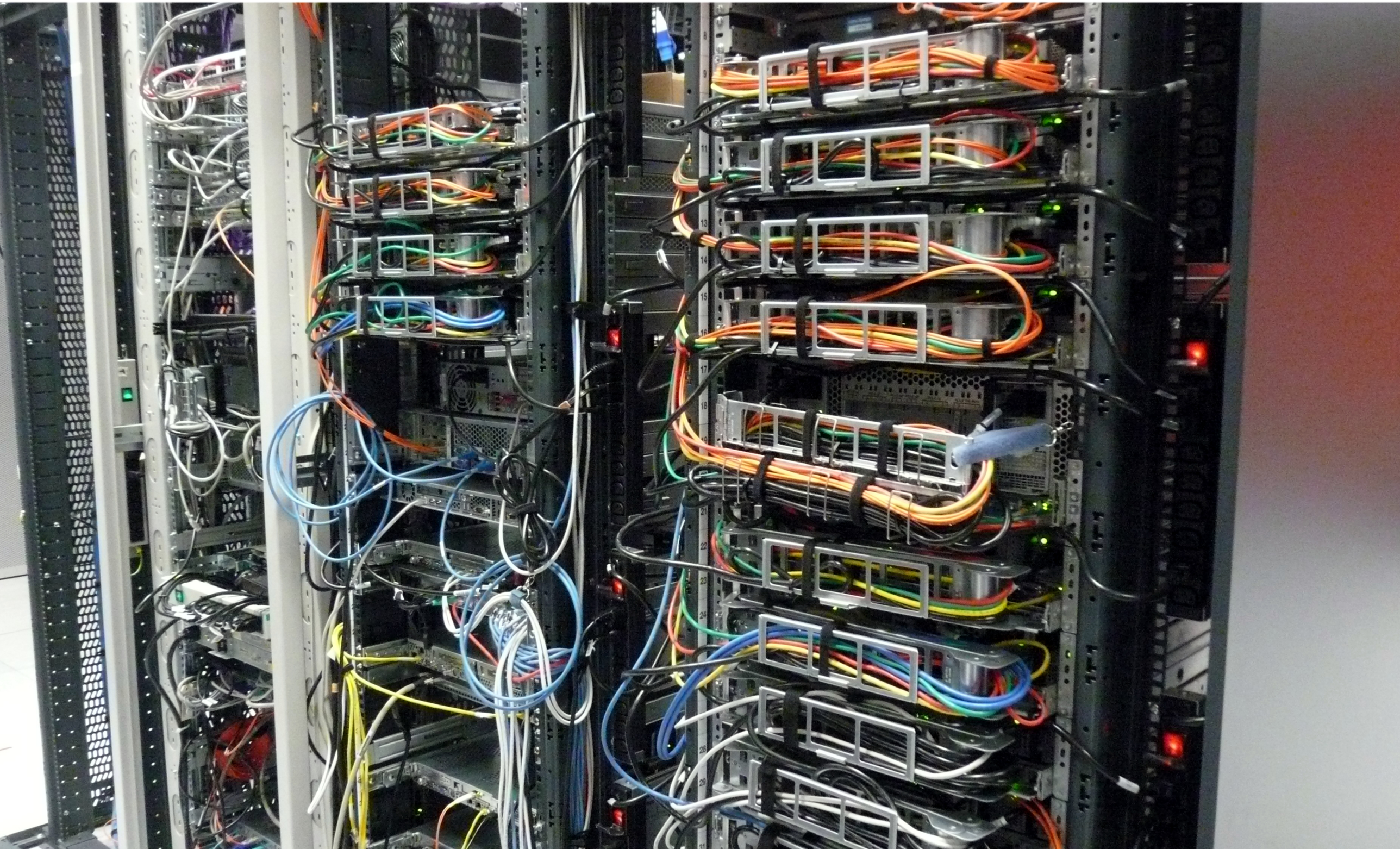


a

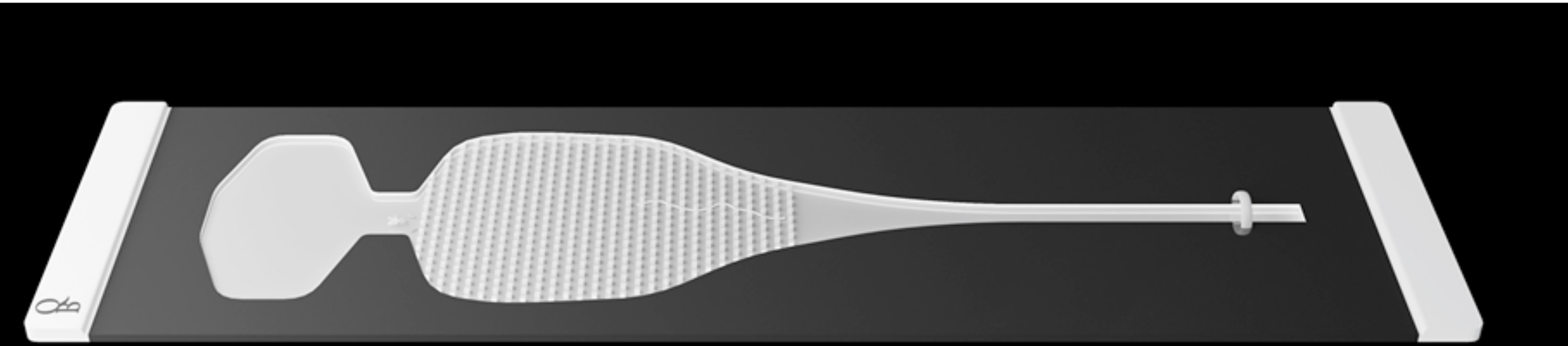


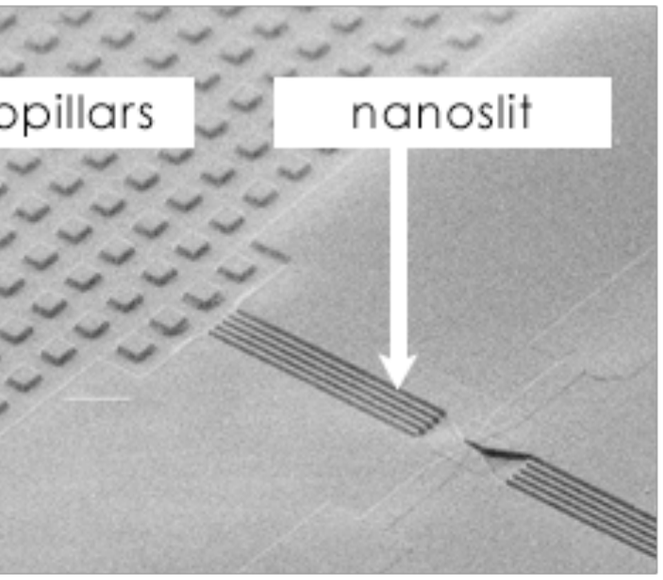


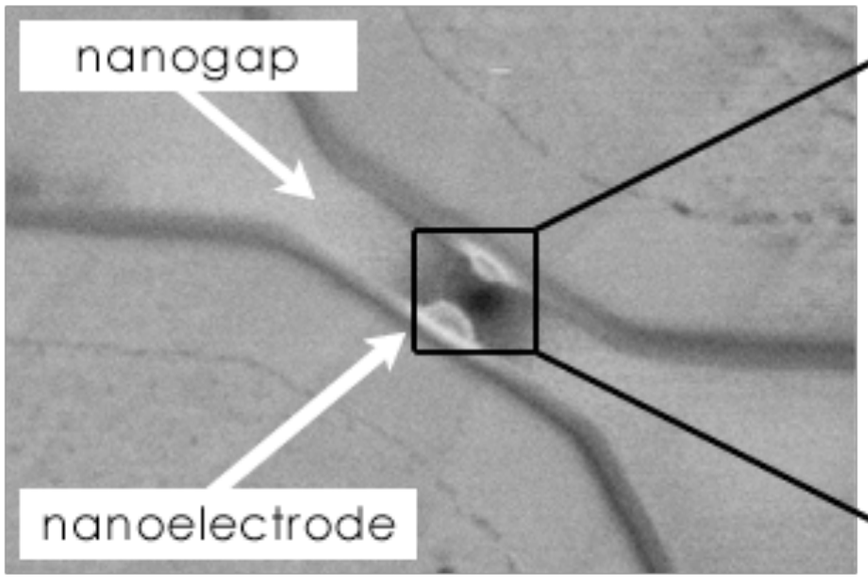
Bioinformatics

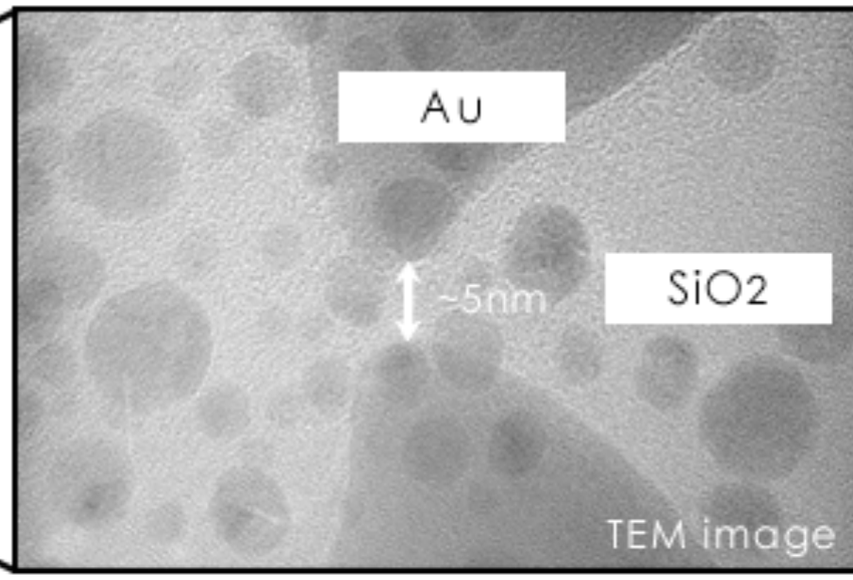


Nanopore sequencing









Quantum Biosystems

Oxford Nanopore MinION

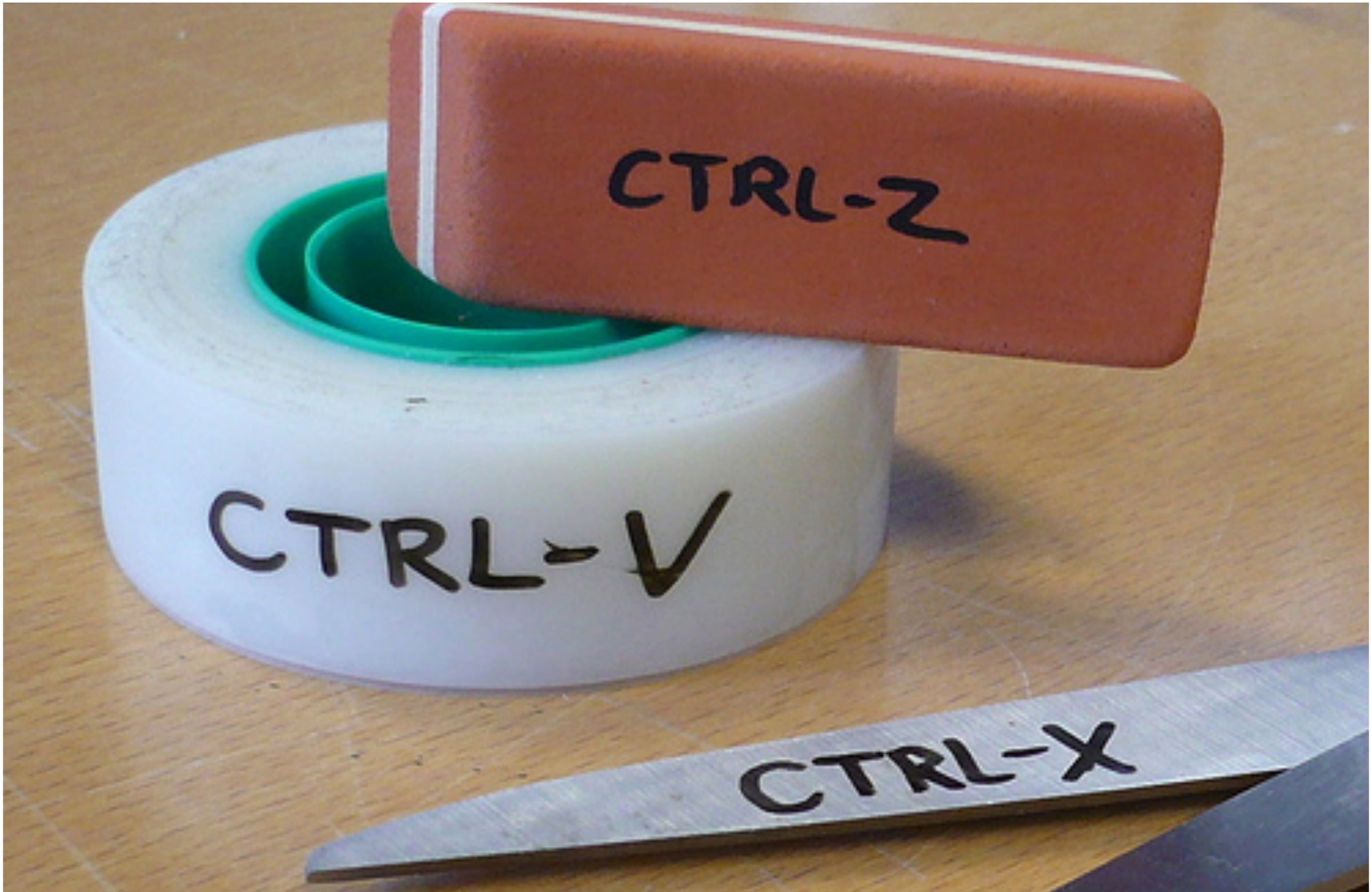
Oxford nanopore

waag society

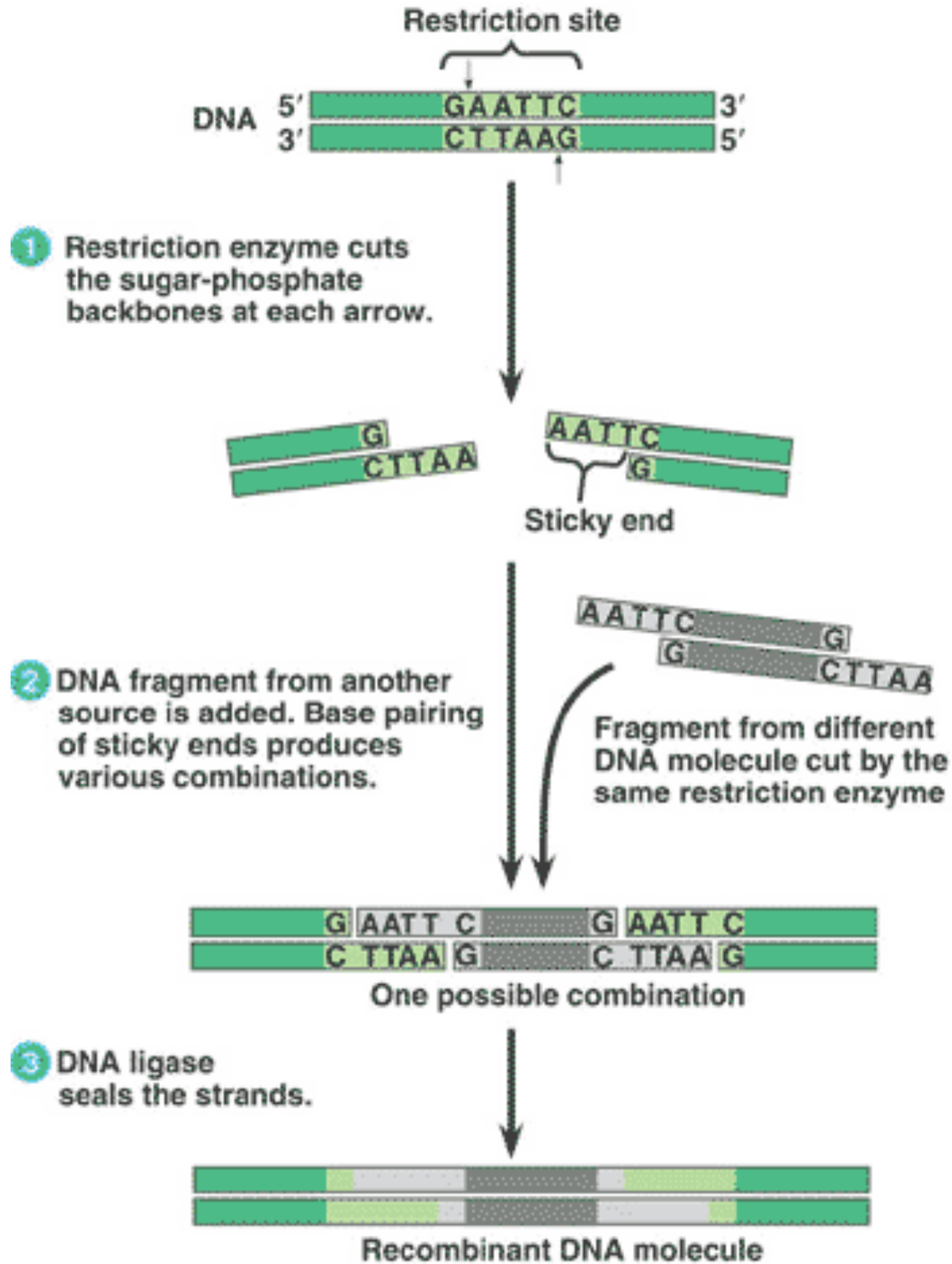
institute for art, science and technology

DNA editing

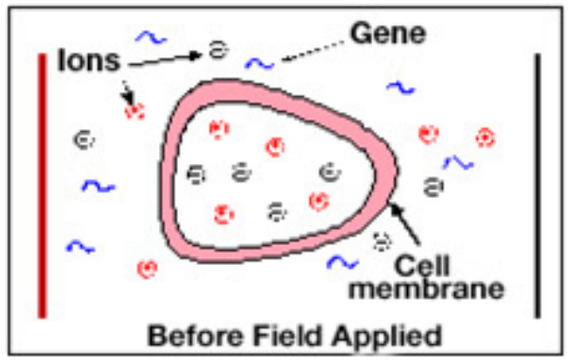
Cutting & Pasting

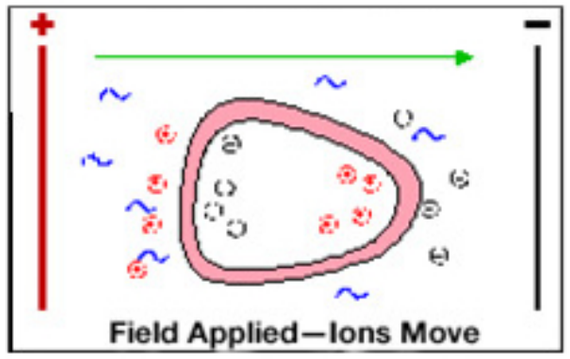


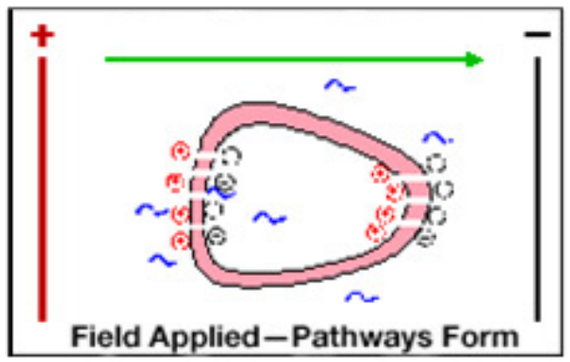
DNA Restriction Ligation



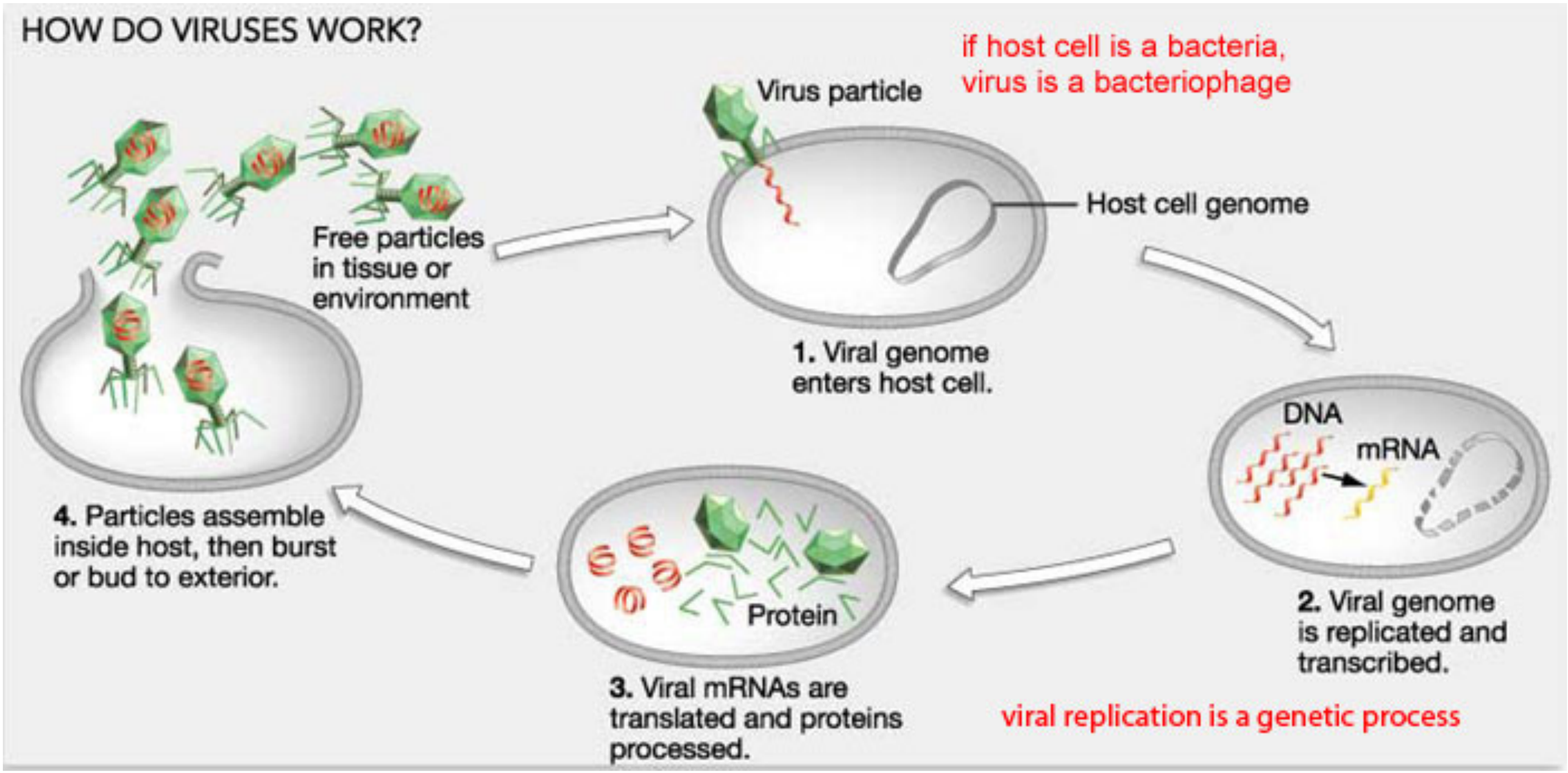
GeneGun – Electroporation



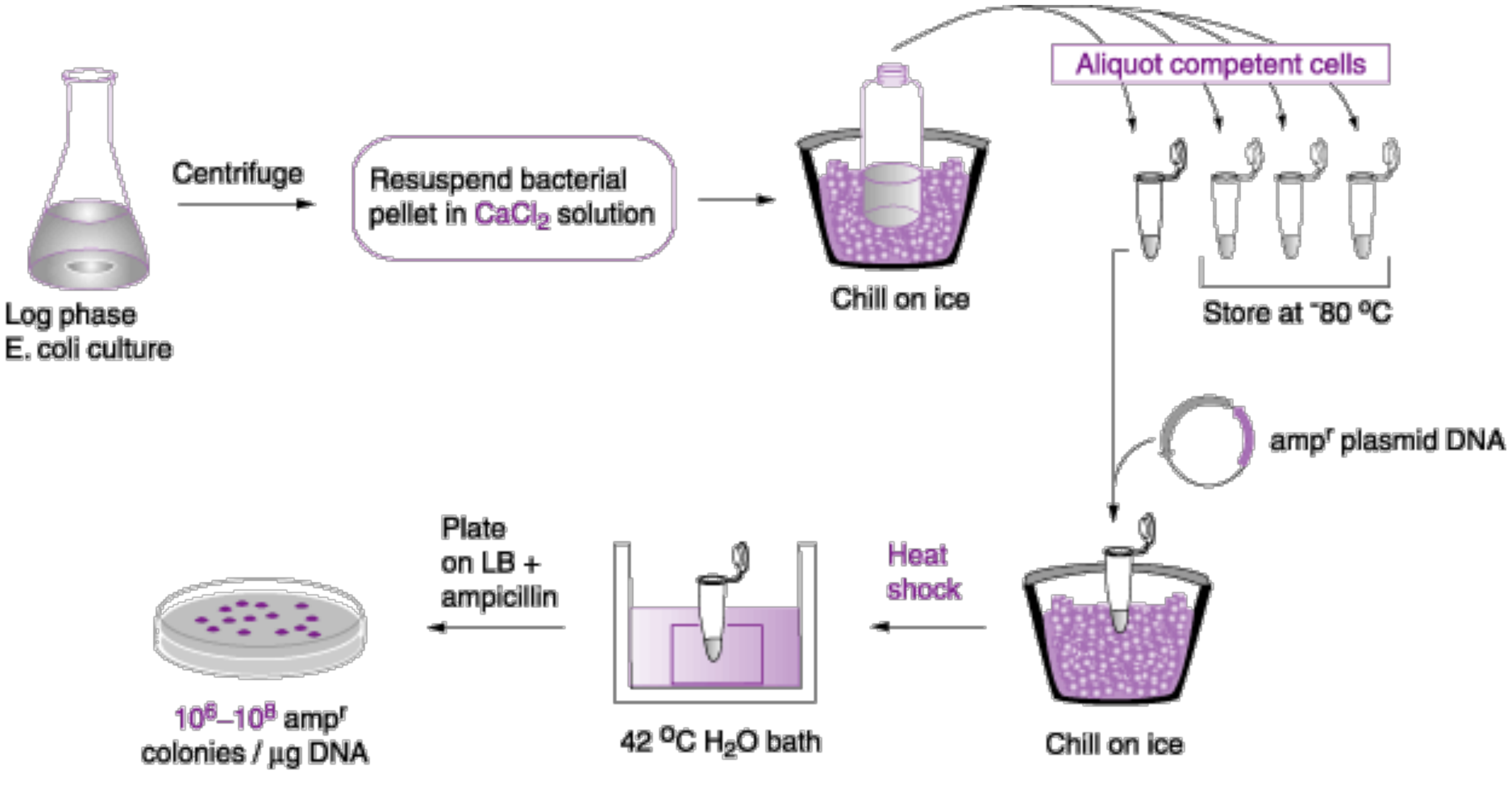




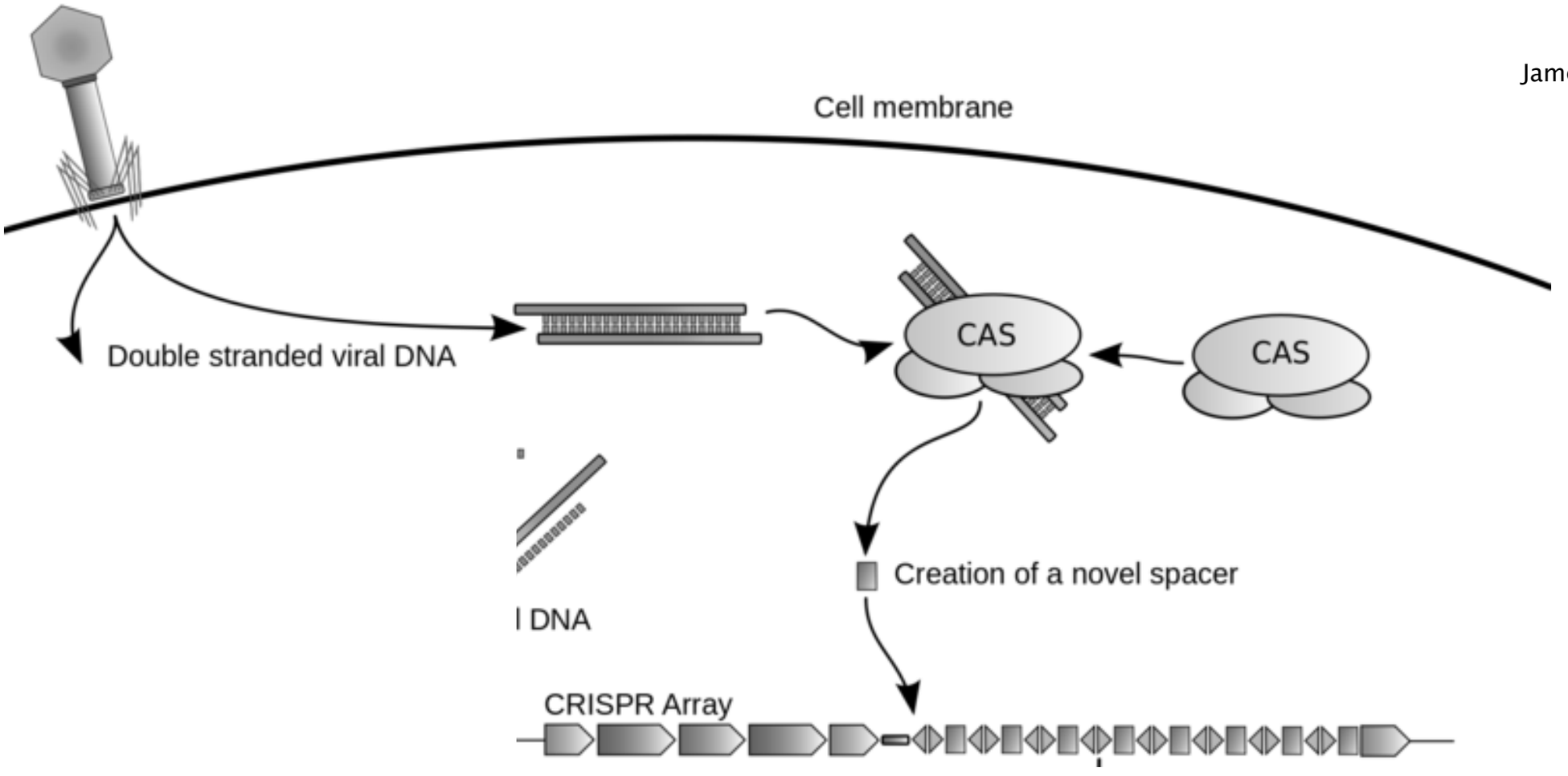
Viral Transformation



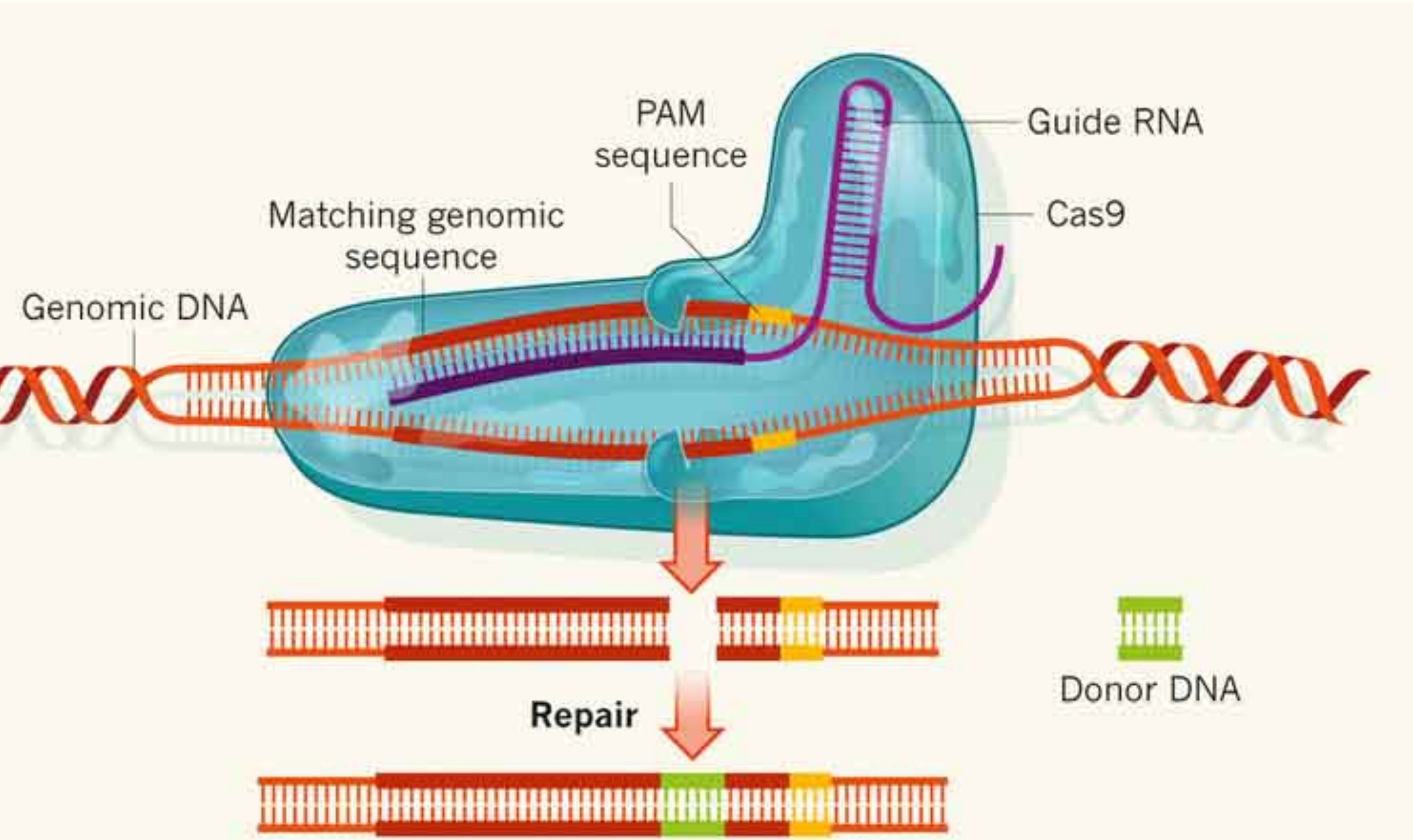
Heat Shock Transformation



CRISPR - Cas9



CRISPR


PAM
sequence
Guide RNA
Cas9
Matching genomic
sequence
Genomic DNA
Repair
Donor DNA

The ODIN CRISPR kit

THE ODIN | ALL PRODUCTS | PLASMIDS | STRAINS | BEGINNER KITS | GENE ENGINEERING KITS | ACCESSORIES | Search our store

USD

My Account | Wish Lists | Order Status | Gift Certificates | Sign

Home › **All Products** › DIY Bacterial Gene Engineering CRISPR Kit

Home › **Gene Engineering Kits** › DIY Bacterial Gene Engineering CRISPR Kit

DIY Bacterial Gene Engineering CRISPR Kit

$150.00

Shipping: Calculated at checkout Pin it

★★★★★ 3 product reviews

Quantity:

1

Add To Cart | Add to Wishlist

Product Description

There is currently ~1 week time till shipment.

Due to the overwhelming number of emails we will not respond to emails asking when you

Understand we are doing our best to get it to you.

Comes with an example experiment that teaches you many molecular biology and gene en

Return to Dilmun - Guenter Seyfried, Roland van Dierendonk, Hansjoerg Petschko & Federico Muffatto

bull1_2o4 | bull1_1o4 | Untitled Consens... | Bull4 | Bull2 | Bull3-Fusions | Total overview

SEQUENCE MAP | LINEAR MAP | DESCRIPTION | METADATA

Create | Copy | BLAST | PDF

AclI

ACTAAACTCATCCGAACGTTCAGAAGCCACGCAGCAACGTACCGATTGTTACTTAGAGCACACGCAAAGTGGTCTTTC
TGATTTGAGTAGGCTTGCAAGTCTTCGGTGCGTCGTTGCATGGCTAACAATGAATCTCGTGTGCGTTTCACCAGAAAG

001
1of4

630 640 650 660 670 680 690 700

GTATTGGCCTGAAGCTAACGGGGACCTCCGTGCTTCGCAAGCGACAGAGTAATAATTTAACATCCCTTGAAGGCCTTA
CATAACCGGACTTCGATTGCCCCTGGAGGCACGAAGCGTTCGCTGTCTCATTATTAAATTGTAGGGAACTTCCGGAAT

001
1of4

710 720 730 740 750 760 770 780

PvuI

TGCCTTCTAAAGTTAATTATACAGACACACCATGAGAGTAAGGATTGCATAGATTGACCGATCGAAGGATCTCAGACA
ACGGAAGATTTCAATTAATATGTCTGTGTGGTACTCTCATTCCTAACGTATCTAACTGGCTAGCTTCCTAGAGTCTGT

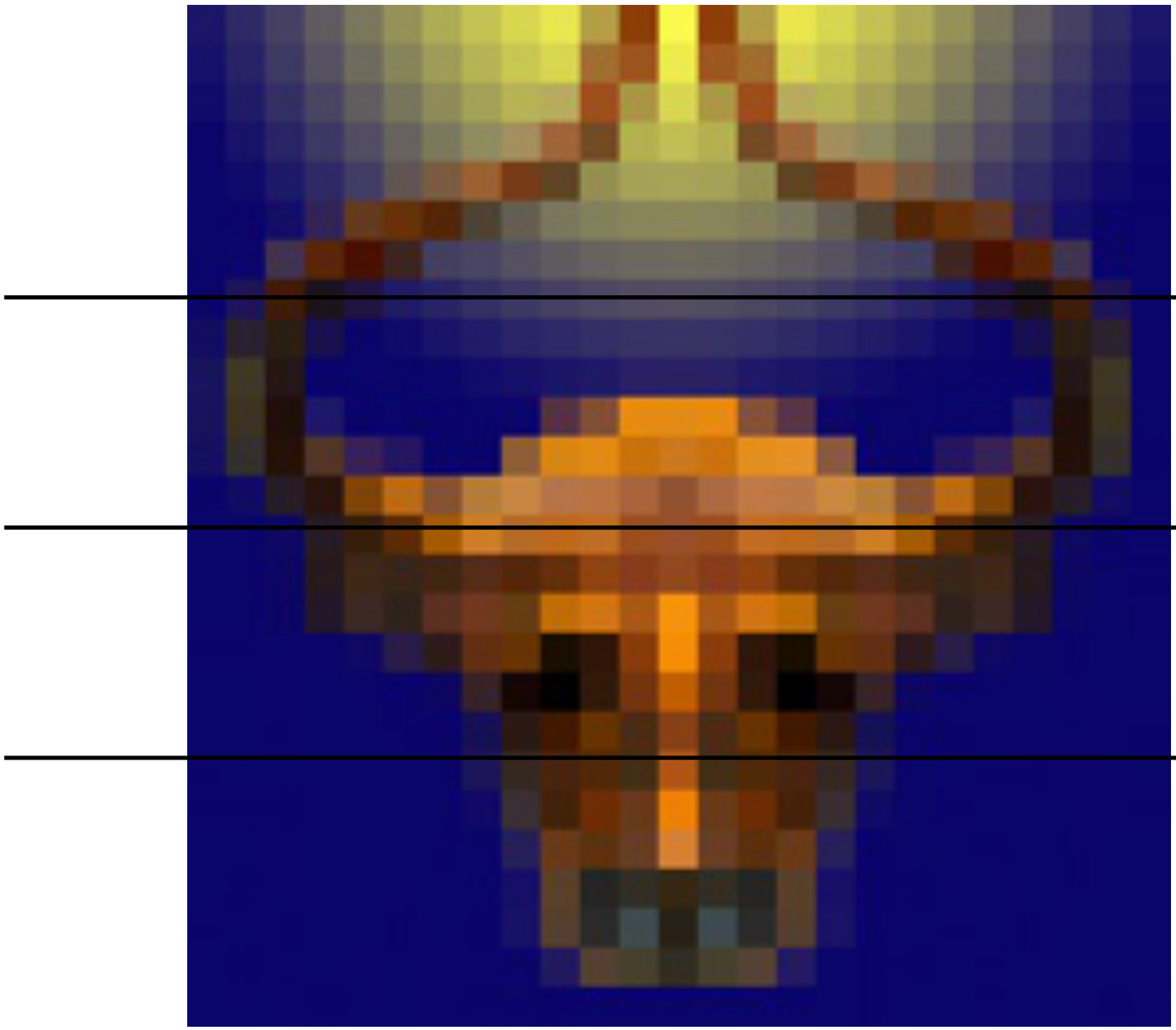
001
1of4

Total overview (7800 bp)

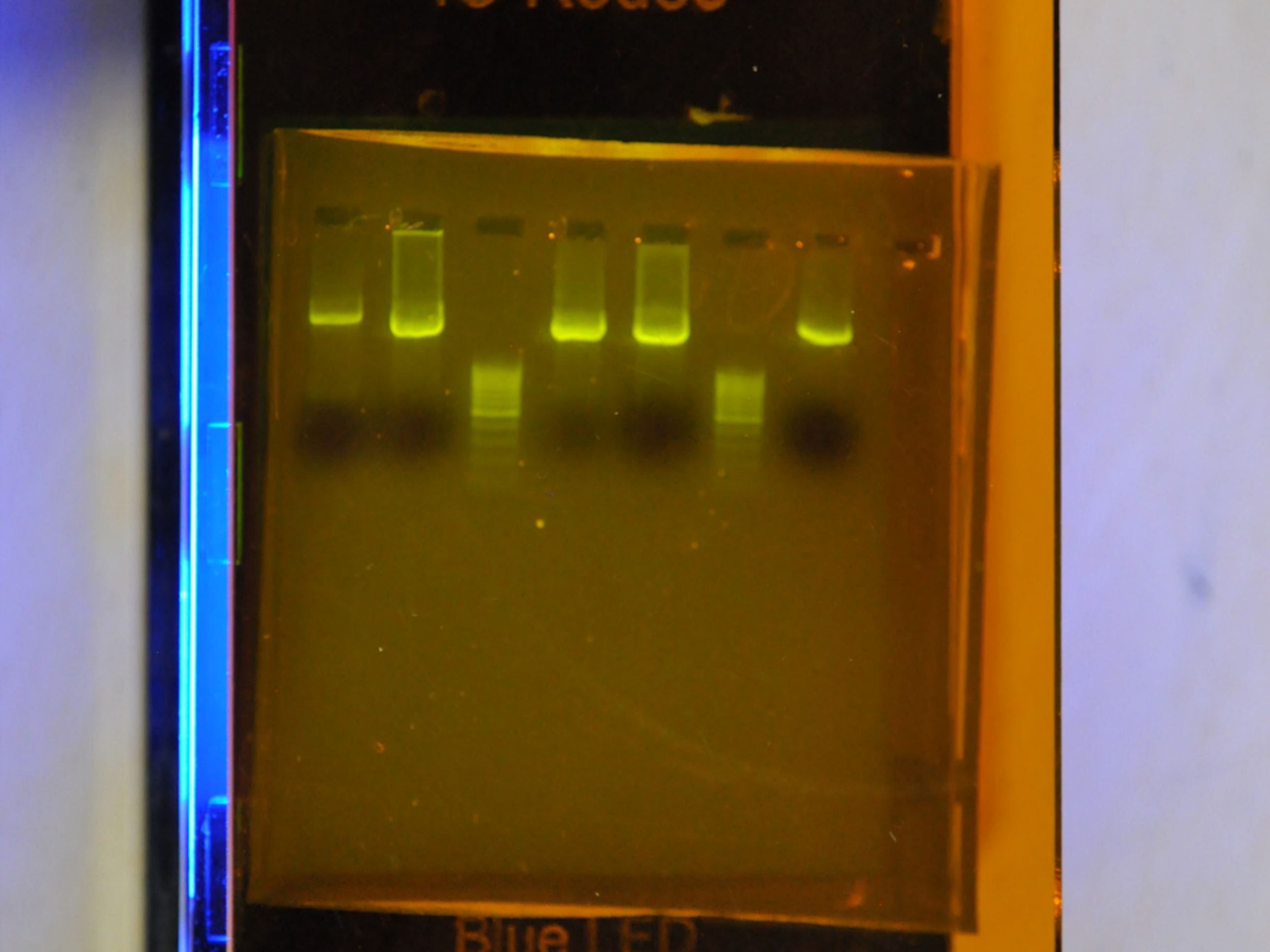
BcgI
Tth111I PasI
AatII BplI PspXI
BsaXI BplI HincII
Tth111I Bsu36I BglII
ApaLI PflFI AatII PmlI
AfeI SexAI BbsI BspQI PstI PvuI
PspXI BtsαI ZraI ScaI SapI PasI EcoP15I ScaI
MluI BstXI XbaI PflFI PshAI BpuEI EarI BbsI BseRI BstBI
CspCI SspI BglII AgeI EcoRV MscI SacI MscI BtsαI AvrII
AflII EagI BsaXI FspI AbaLI AseI PmlI Eco53kI FspI EarI AclI
PciI PvuI BsmI BsrGI AflII PshAI ZraI AvrII PflMI BtsI SacII PsiI
BaeI AclI BtgZI BbvCI BtsI DrdI BglI BglI MfeI EcoP15I FseI HindIII
EciI BssHII EagI BaeI BcgI PsiI BstXI AseI EcoRI BamHI DrdI SexAI BsmI

1,000 2,000 3,000 4,000 5,000 6,000 7,000

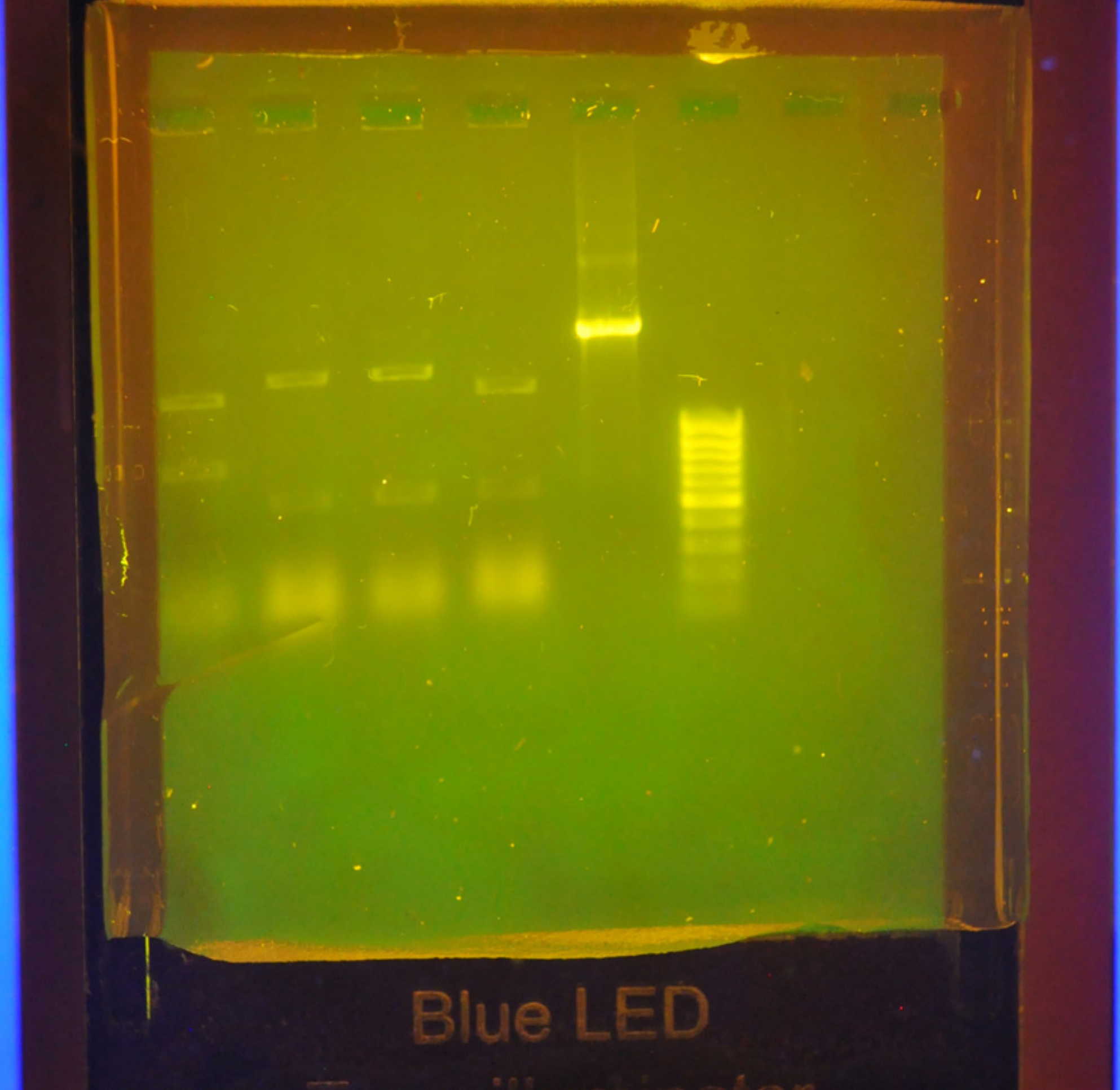
001 002 003
1of4 2o4 3of4 4o4




STOCK
Gloves
Desinfectant


Blue LED


Nuclease
Nuclease Buffer


Blue LED

bull1_2o4 | bull1_1o4 | Untitled Consens... | Bull4 | Bull2 | Bull3-Fusions | Total overview

SEQUENCE MAP | LINEAR MAP | DESCRIPTION | METADATA

Create | Copy | BLAST | PDF

AclI

ACTAAACTCATCCGAACGTTCAGAAGCCACGCAGCAACGTACCGATTGTTACTTAGAGCACACGCAAAGTGGTCTTTC
TGATTTGAGTAGGCTTGCAAGTCTTCGGTGCGTCGTTGCATGGCTAACAATGAATCTCGTGTGCGTTTCACCAGAAAG

001
1of4

630 640 650 660 670 680 690 700

GTATTGGCCTGAAGCTAACGGGGACCTCCGTGCTTCGCAAGCGACAGAGTAATAATTTAACATCCCTTGAAGGCCTTA
CATAACCGGACTTCGATTGCCCCTGGAGGCACGAAGCGTTCGCTGTCTCATTATTAAATTGTAGGGAACTTCCGGAAT

001
1of4

710 720 730 740 750 760 770 780

PvuI

TGCCTTCTAAAGTTAATTATACAGACACACCATGAGAGTAAGGATTGCATAGATTGACCGATCGAAGGATCTCAGACA
ACGGAAGATTTCAATTAATATGTCTGTGTGGTACTCTCATTCCTAACGTATCTAACTGGCTAGCTTCCTAGAGTCTGT

001
1of4

Total overview (7800 bp)

BcgI
Tth111I PasI
AatII BplI PspXI
BsaXI BplI HincII
Tth111I Bsu36I BglII
ApaLI PflFI AatII PmlI
AfeI SexAI BbsI BspQI PstI PvuI
PspXI BtsαI ZraI ScaI SapI PasI EcoP15I ScaI
MluI BstXI XbaI PflFI PshAI BpuEI EarI BbsI BseRI BstBI
CspCI SspI BglII AgeI EcoRV MscI SacI MscI BtsαI AvrII
AflII EagI BsaXI FspI AbaLI AseI PmlI Eco53kI FspI EarI AclI
PciI PvuI BsmI BsrGI AflII PshAI ZraI AvrII PflMI BtsI SacII PsiI
BaeI AclI BtgZI BbvCI BtsI DrdI BglI BglI MfeI EcoP15I FseI HindIII
EciI BssHII EagI BaeI BcgI PsiI BstXI AseI EcoRI BamHI DrdI SexAI BsmI

1,000 2,000 3,000 4,000 5,000 6,000 7,000

001 002 003
1of4 2o4 3of4 4o4

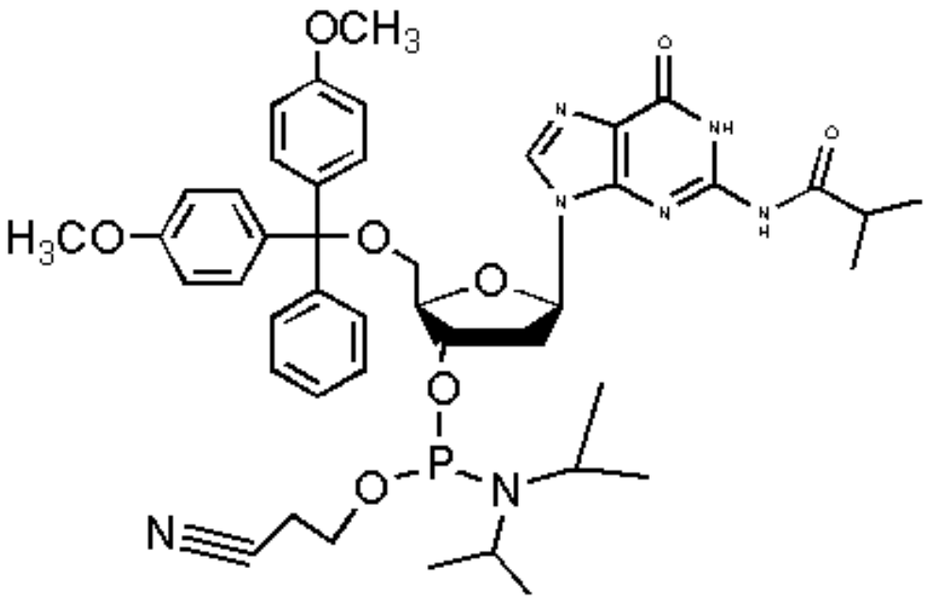
waag society

institute for art, science and technology

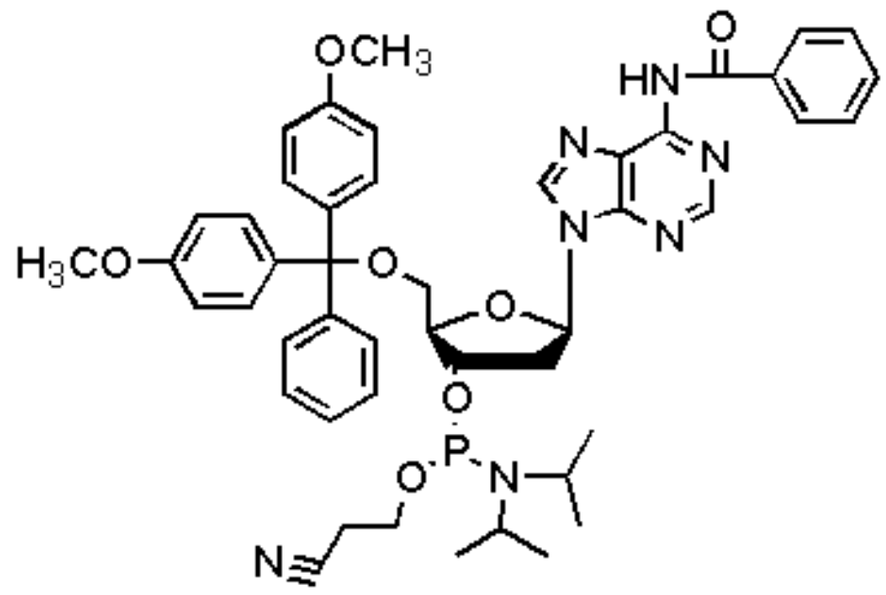
DNA synthesis

in 4 easy steps

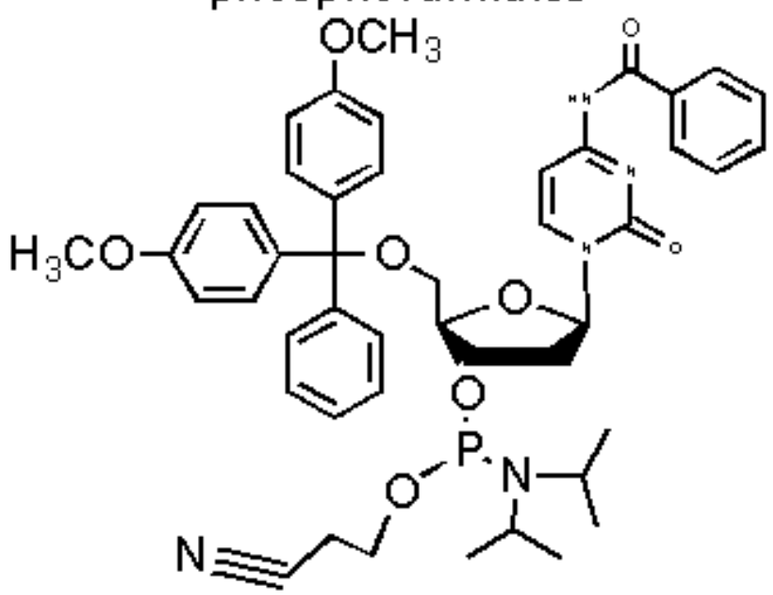
Deblocking



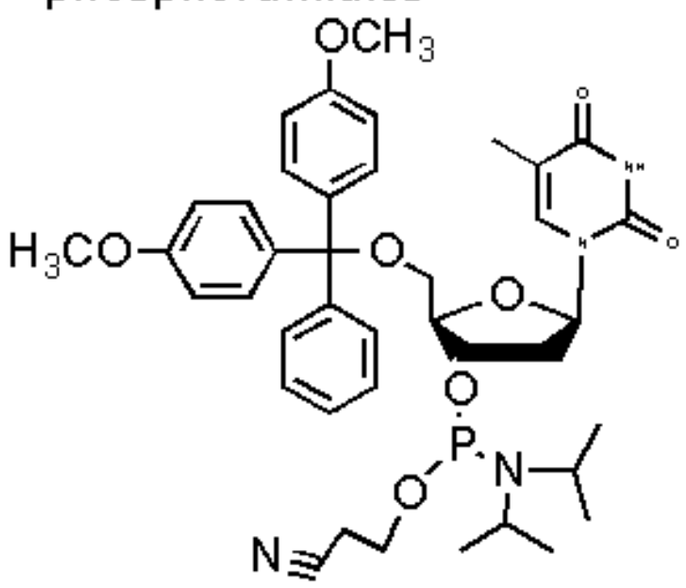
N-2-isobutryl deoxyguanosine phosphoramidite



N-6-benzoyl-deoxyadenosine phosphoramidite

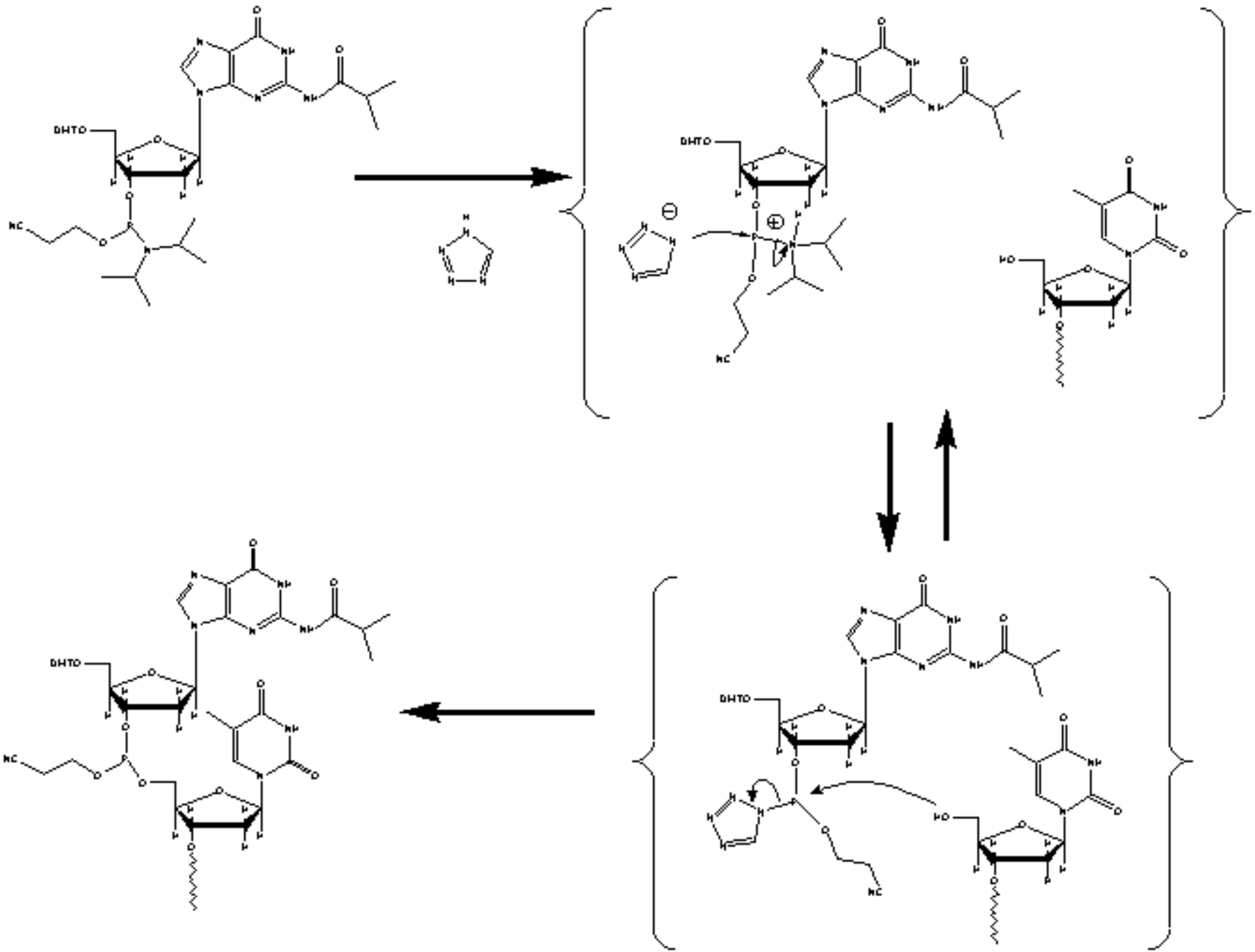


N-4-benzoyl-deoxycytidine phosphoramidite

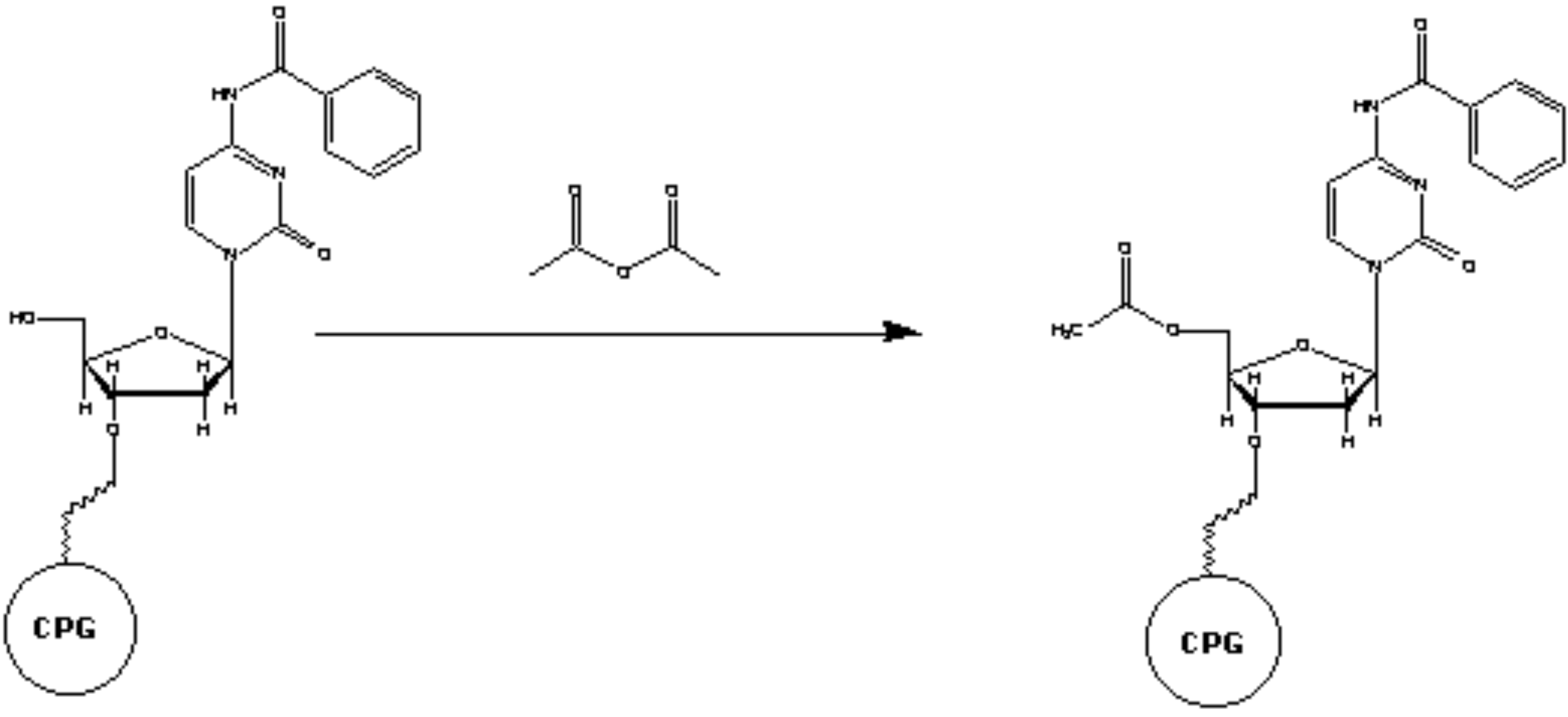


deoxythymidine phophoramidite

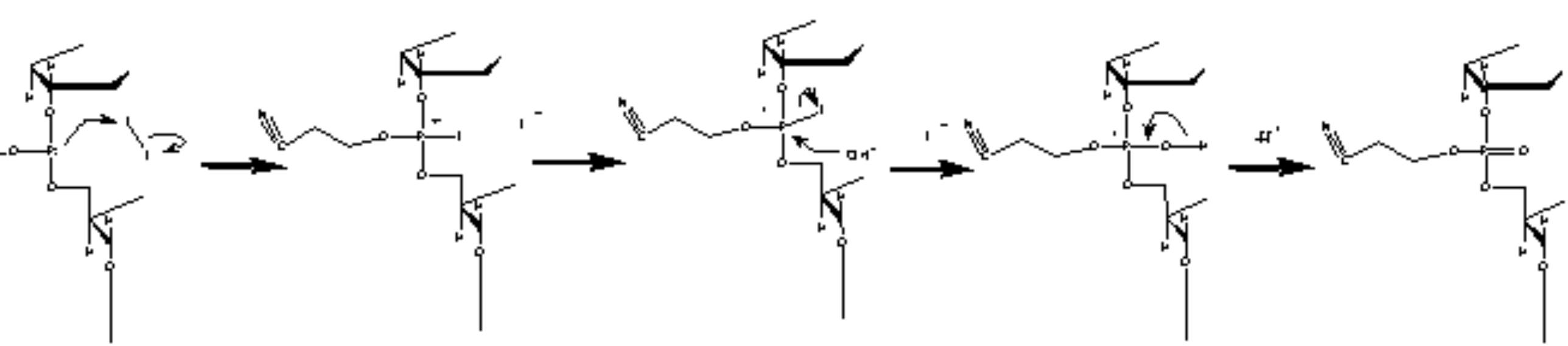
Condensation



Capping



Oxidating



Repeat