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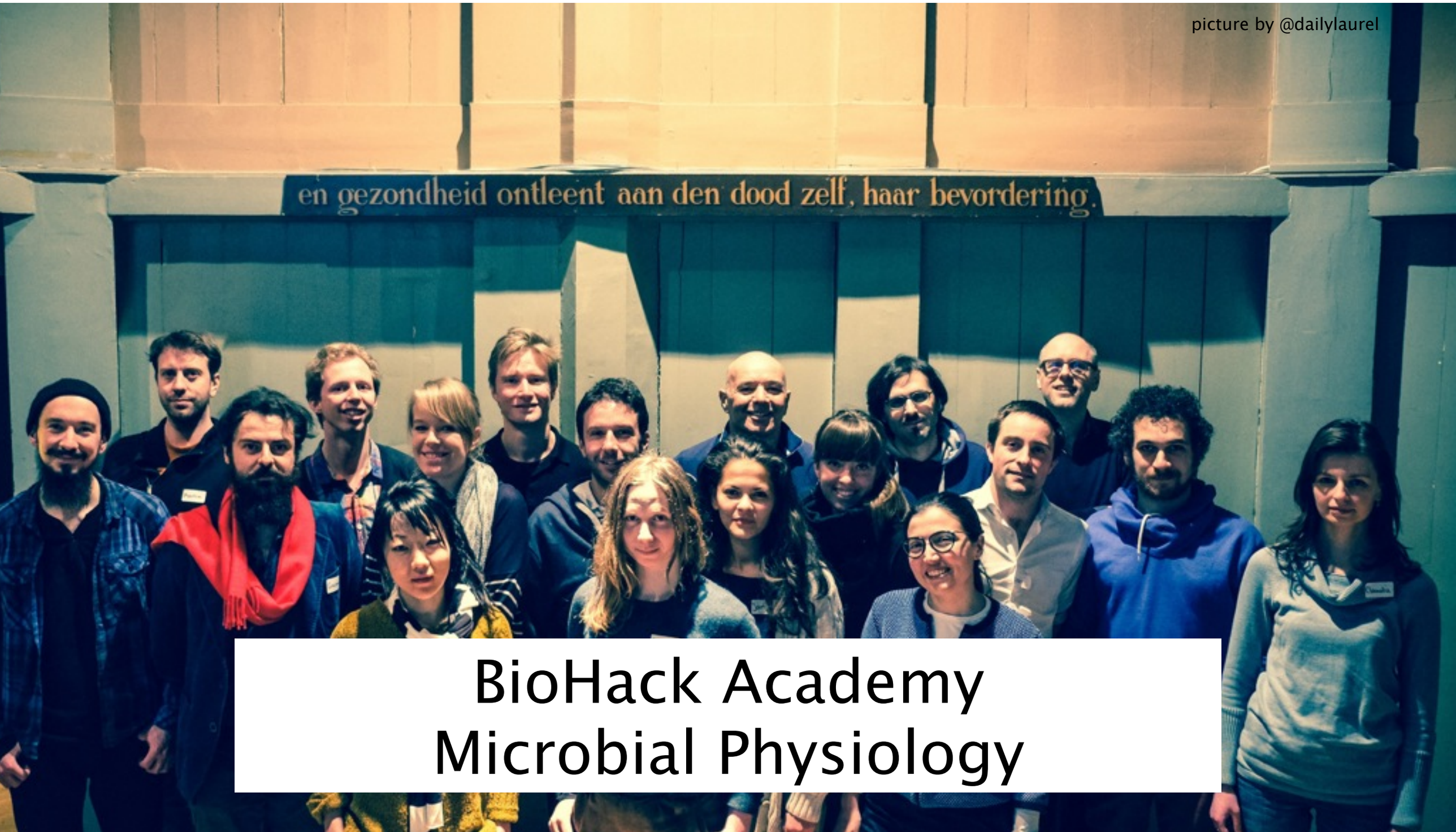

picture by @dailylaurel

BioHack Academy
Microbial Physiology

BioFactory
canvas

open wetlab
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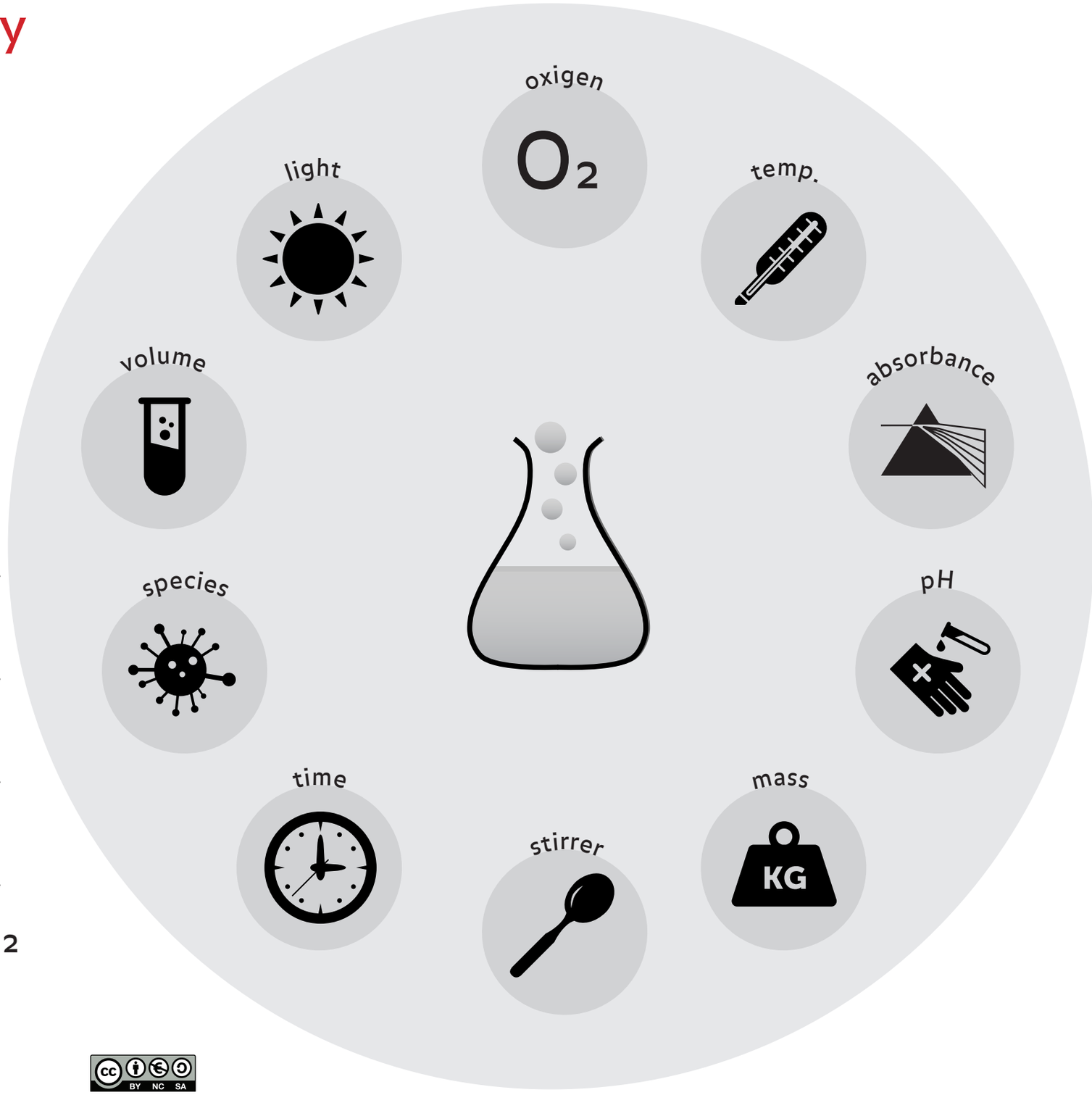

input

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observations

day #	
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day #	
day #	

material

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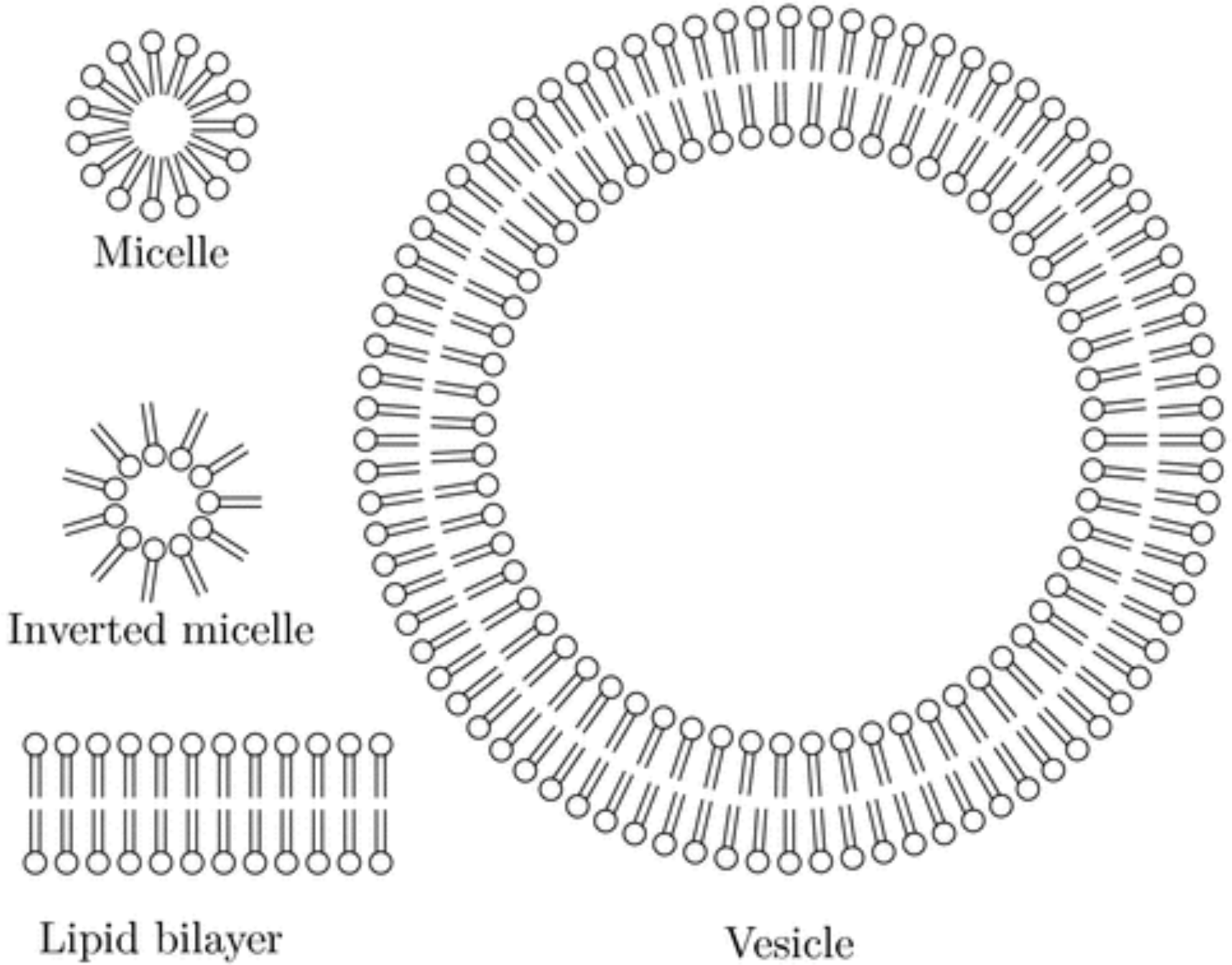
The Cell

Lipid bilayer cell



Life is made out of cells

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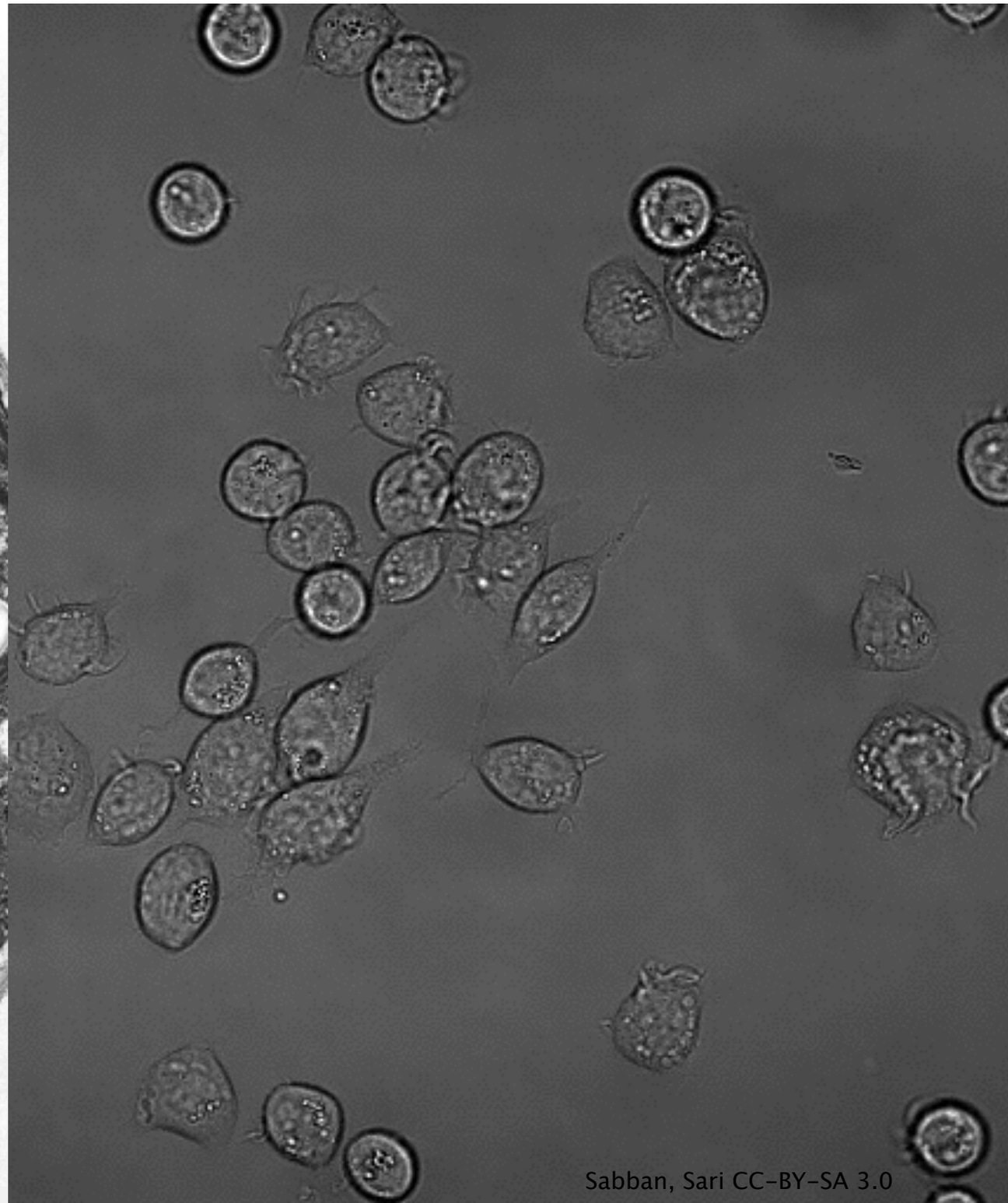
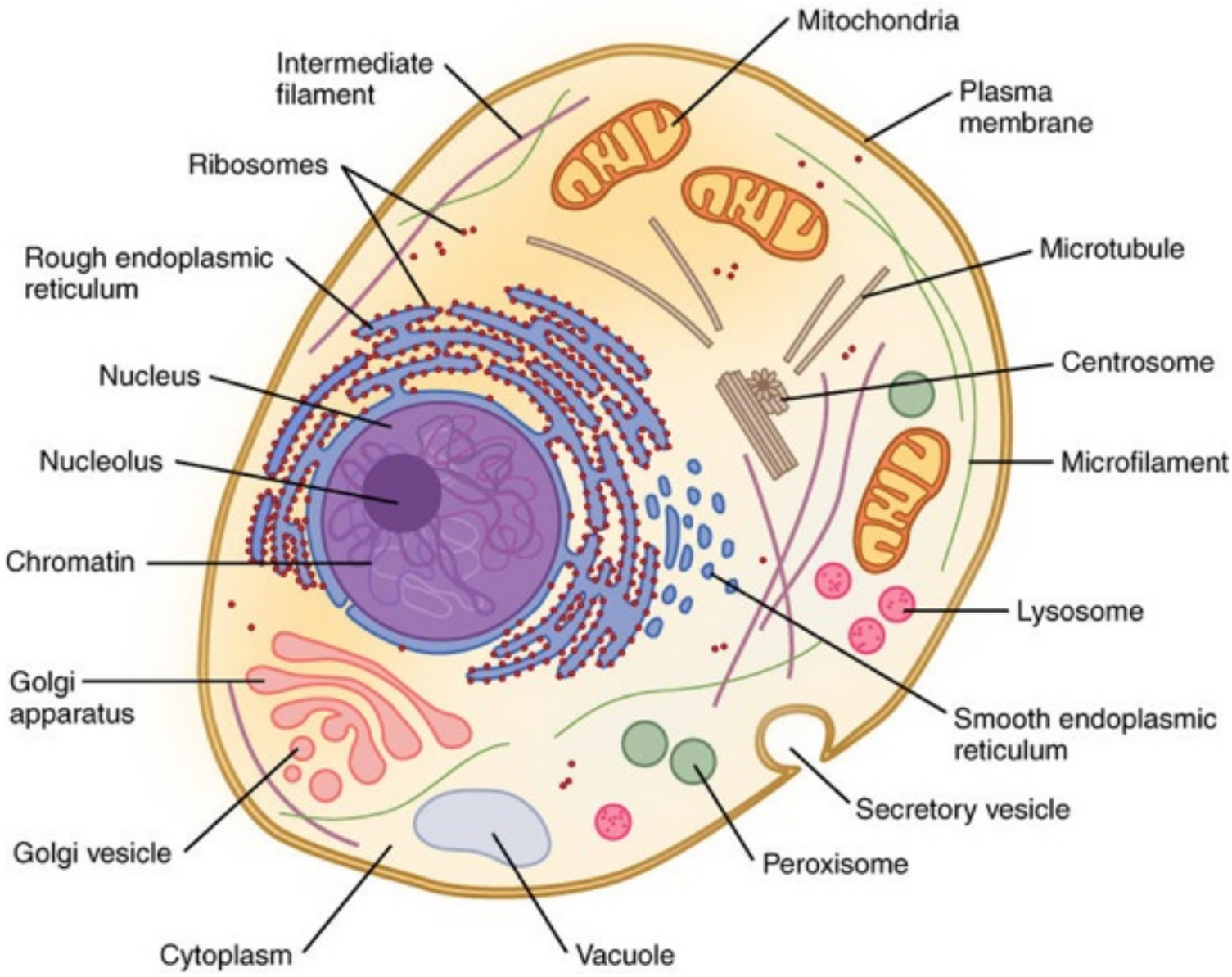


Sabban, Sari CC-BY-SA 3.0

What's a cell made of:

- Lipids
- Proteins
- DNA
- RNA
- Metabolites
- Ions



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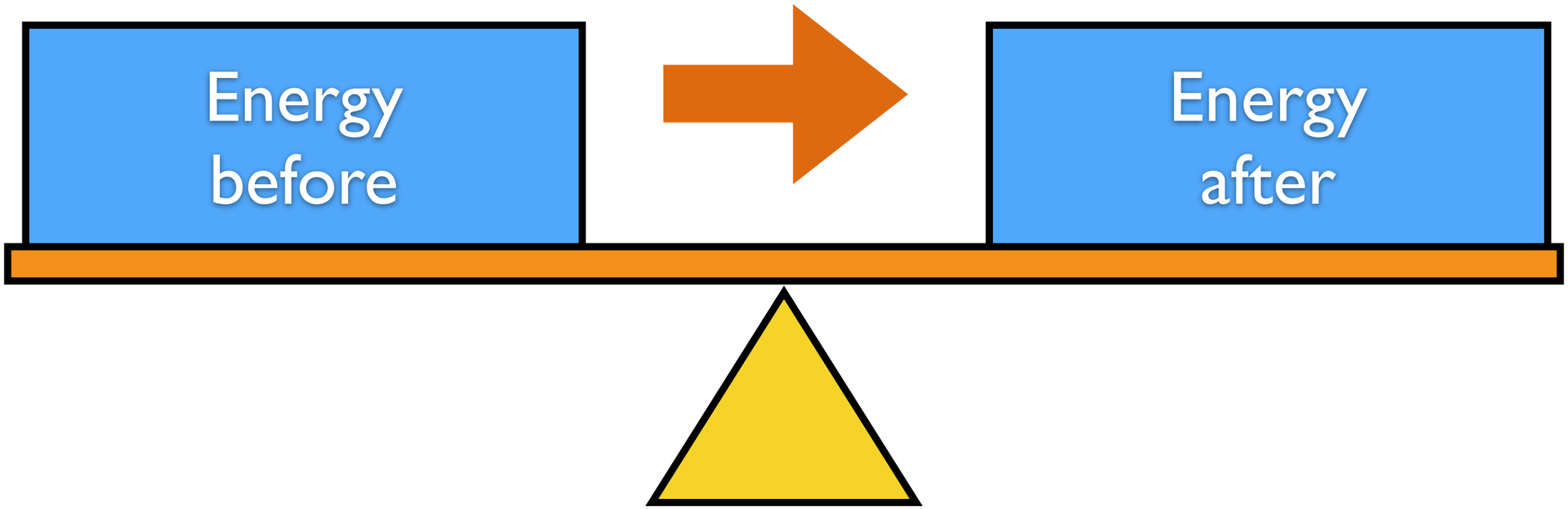
Energy of life

Bio energy

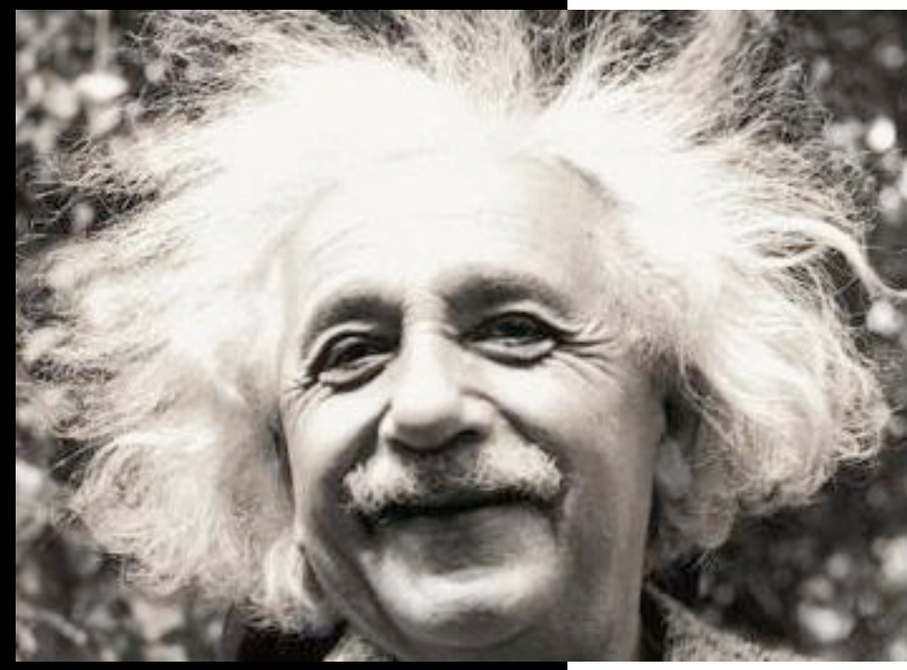
Brocken Inaglory CC-BY-SA 3.0

First law of thermodynamics

Energy
transformation



E = mc^2

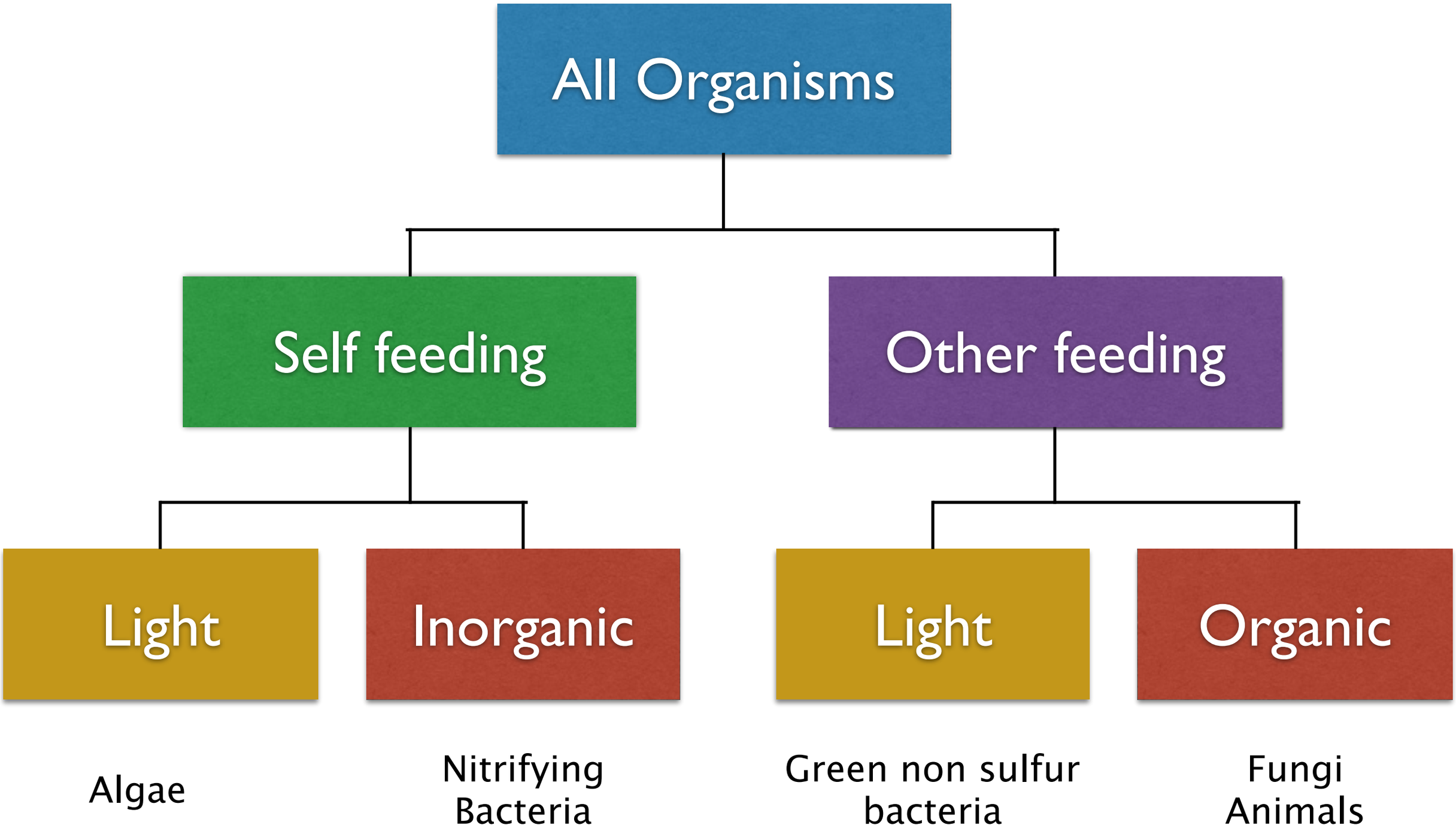


Second law of thermodynamics

Nothing will happen spontaneously unless it increases the **entropy** of the universe

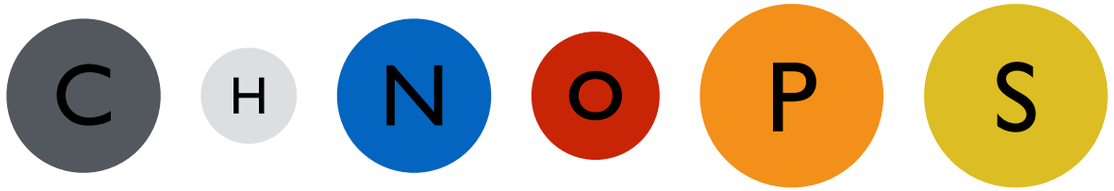
Entropy is a measure of disorder

Diversity in Metabolism

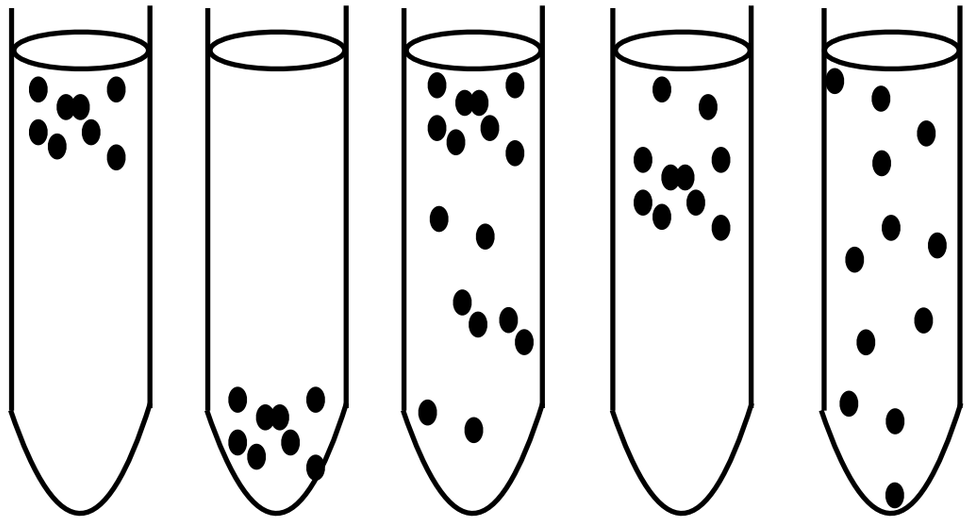


Diversity in growth conditions

Nutrients



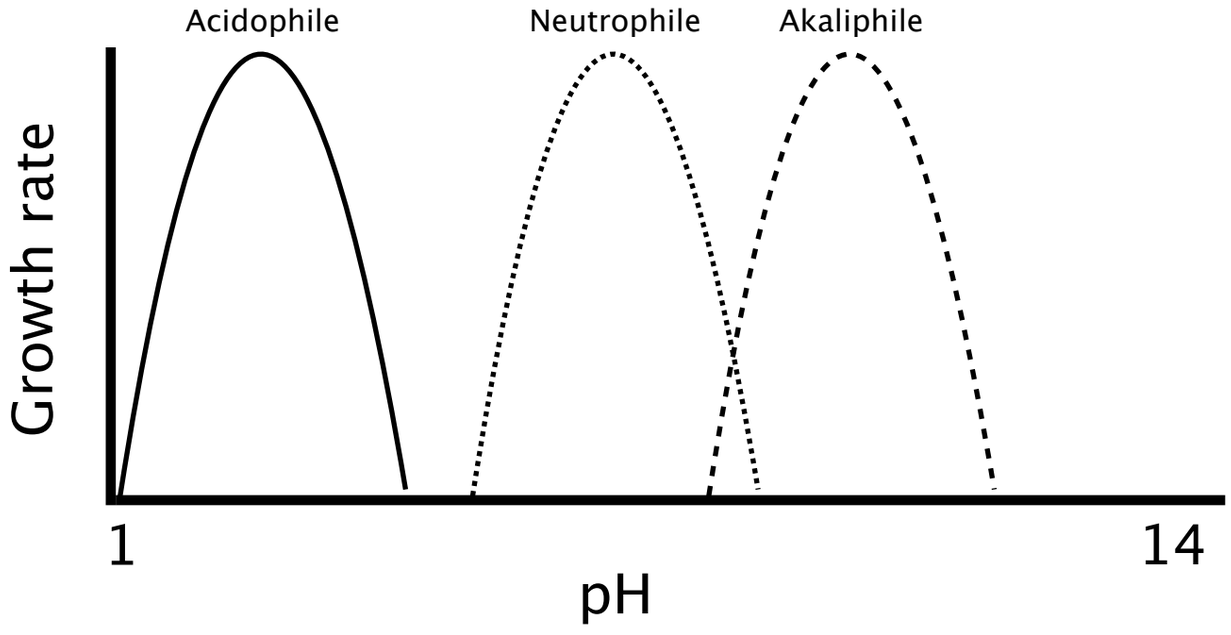
Atmosphere



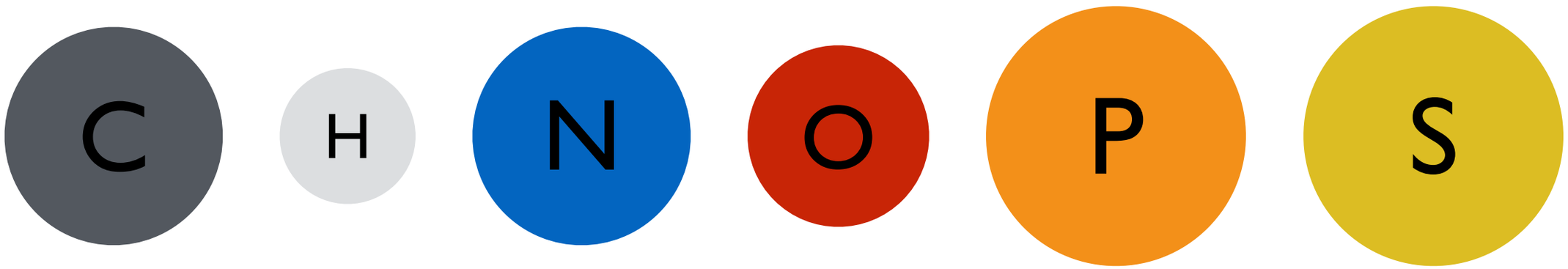
Temperature

Pixabay - CC0

pH



Elements of Life



Carbon

Hydrogen

Nitrogen

Oxygen

Phosphorus

Sulfur

Non selective

- Plate count agar
- Nutrient agar

Slightly selective

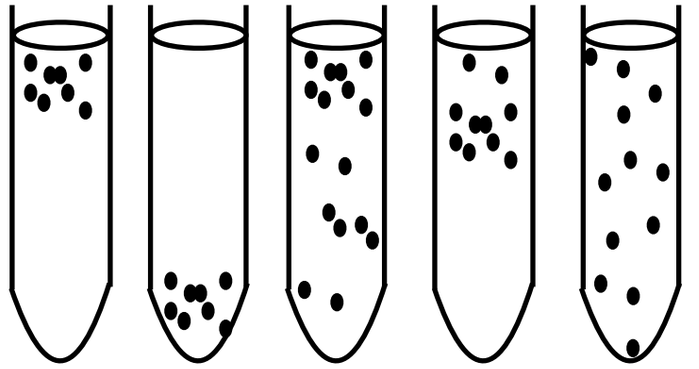
- Malt agar
- MRS agar

- Kombucha medium

Selective

- Spirulina medium

Diversity in Atmosphere

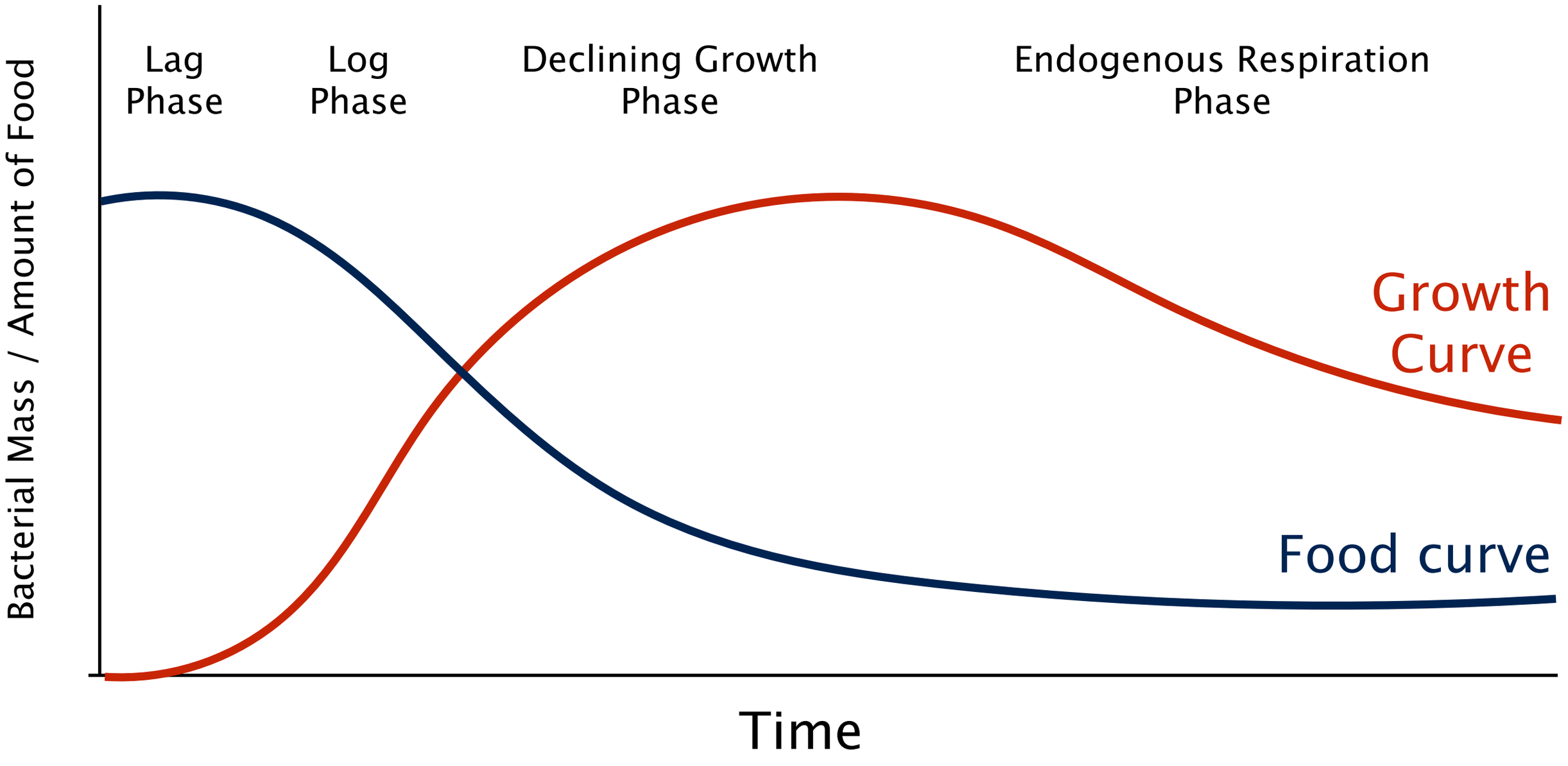


Term	Property	Example
Strict aerobe	Requires oxygen	Pseudomonas aeruginosa
Stric anaerobe	Does not tolerate oxygen	Bacteroides fragilis
Facultative anaerobe	Aerobe, but can also grow anaerobically	Escherichia coli
Aerotolerant	Anaerobe, but can tolerate oxygen	Clostridium perfringens
Micro-aerophilic	Prefers reduced level of oxygen	Helicobacter spp.
Capnophilic	Prefers increase level of oxygen	Neisseria spp.

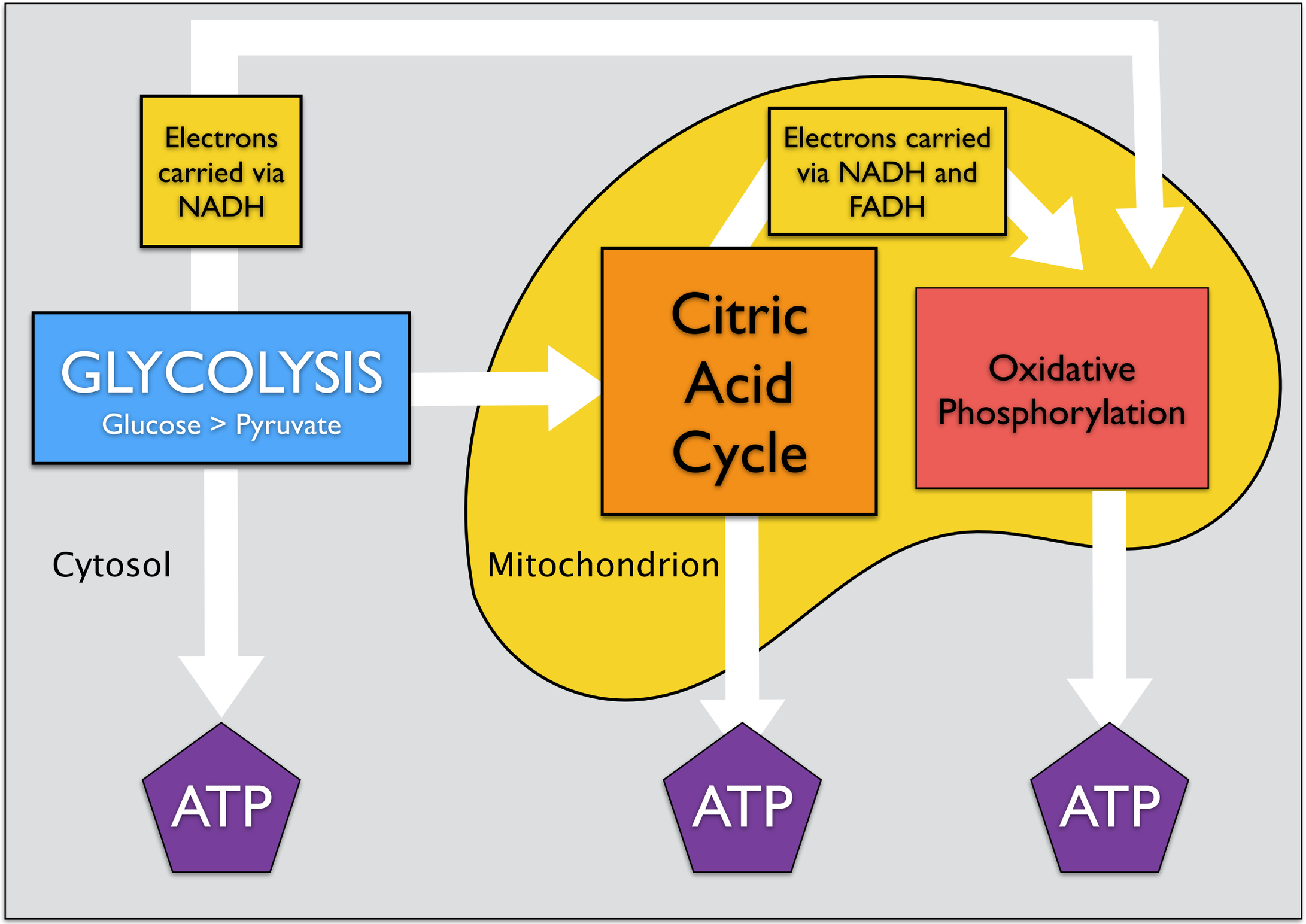
Diversity in Temperature

Term	Property	Example
Psychrophilic	Temp < 10 C	Flavobacterium spp
Thermophilic	Temp > 60 C	B. stearothermophilus
Mesophilic	20 - 40 C	Most pathogens

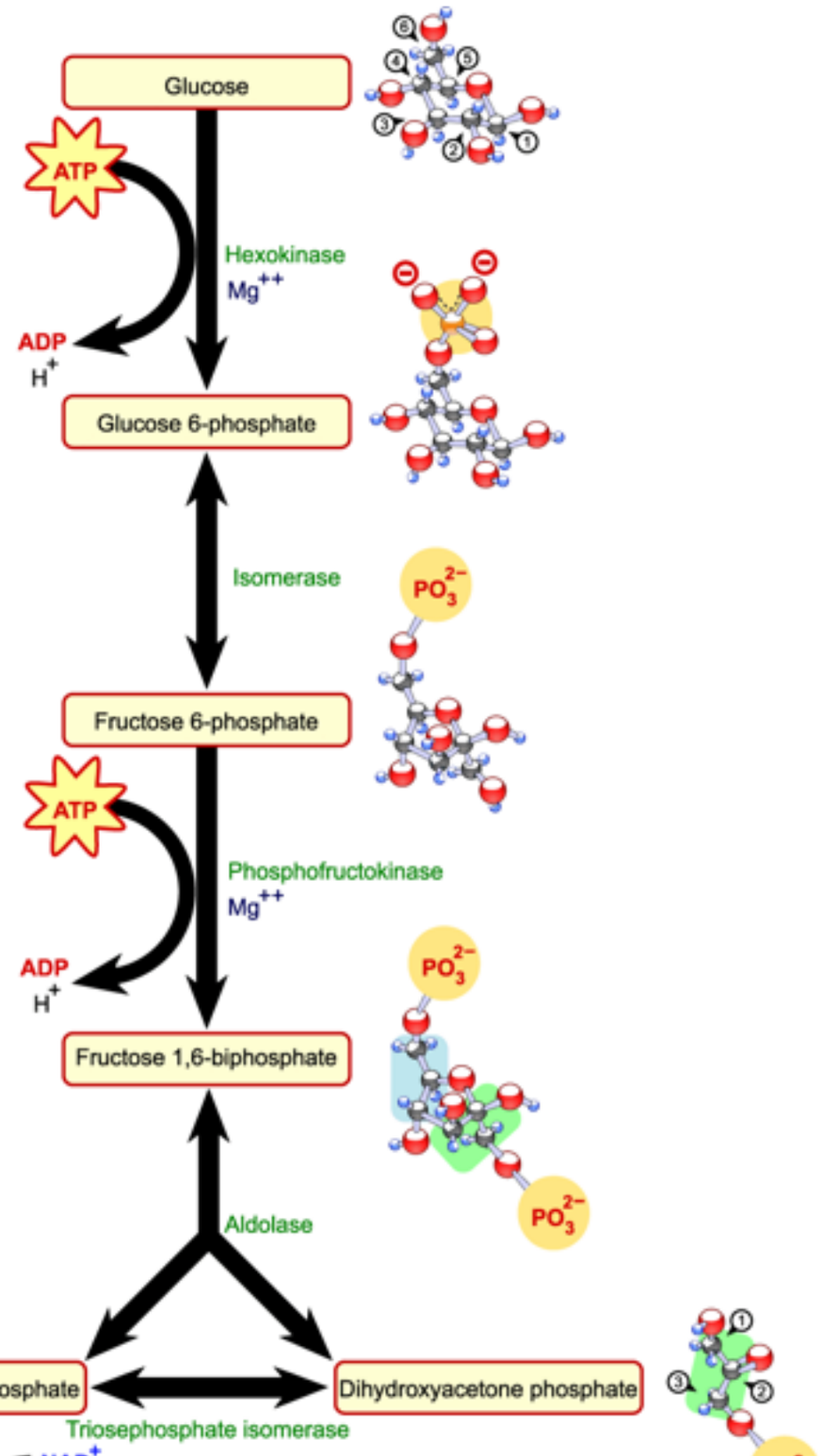
Bacterial growth curve



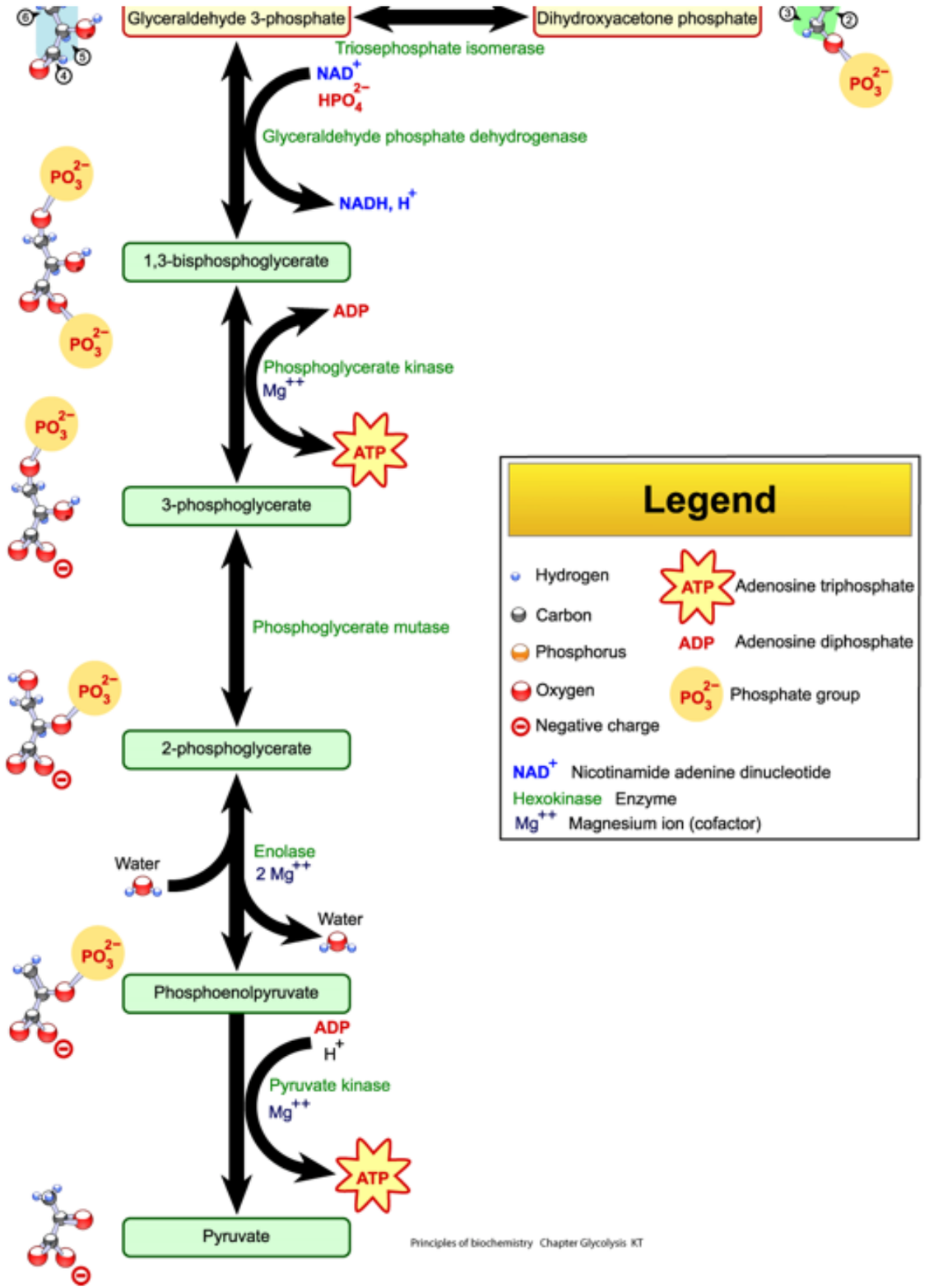
Respiration



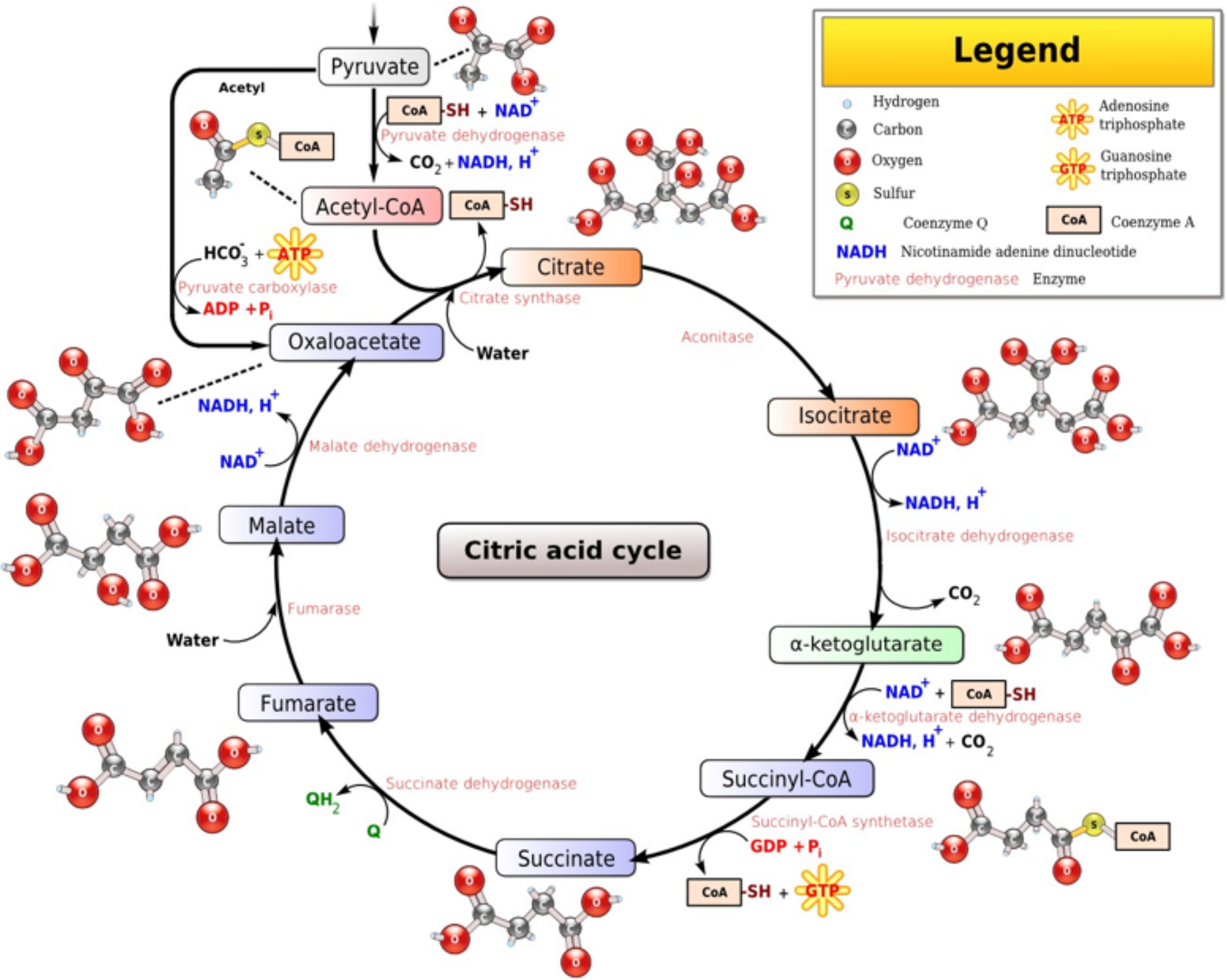
Glycolysis part 1



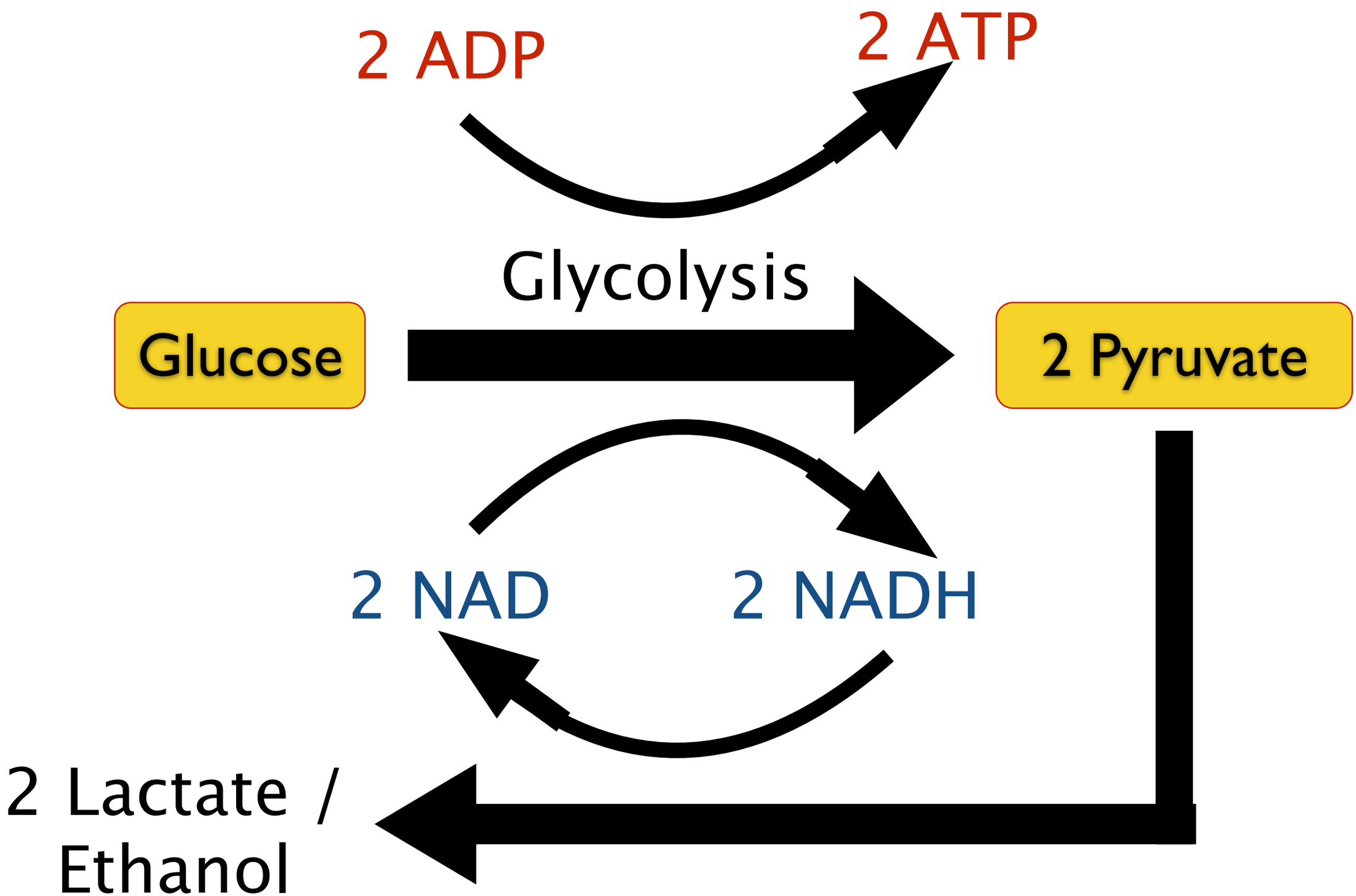
Glycolysis part 2



Citric Acid Cycle



Fermentation



Assimilation

- Amylase
- Glucomylase
- Protease
- Invertase
- Peptidase
- Lipase
- Lactase
- Cellulase

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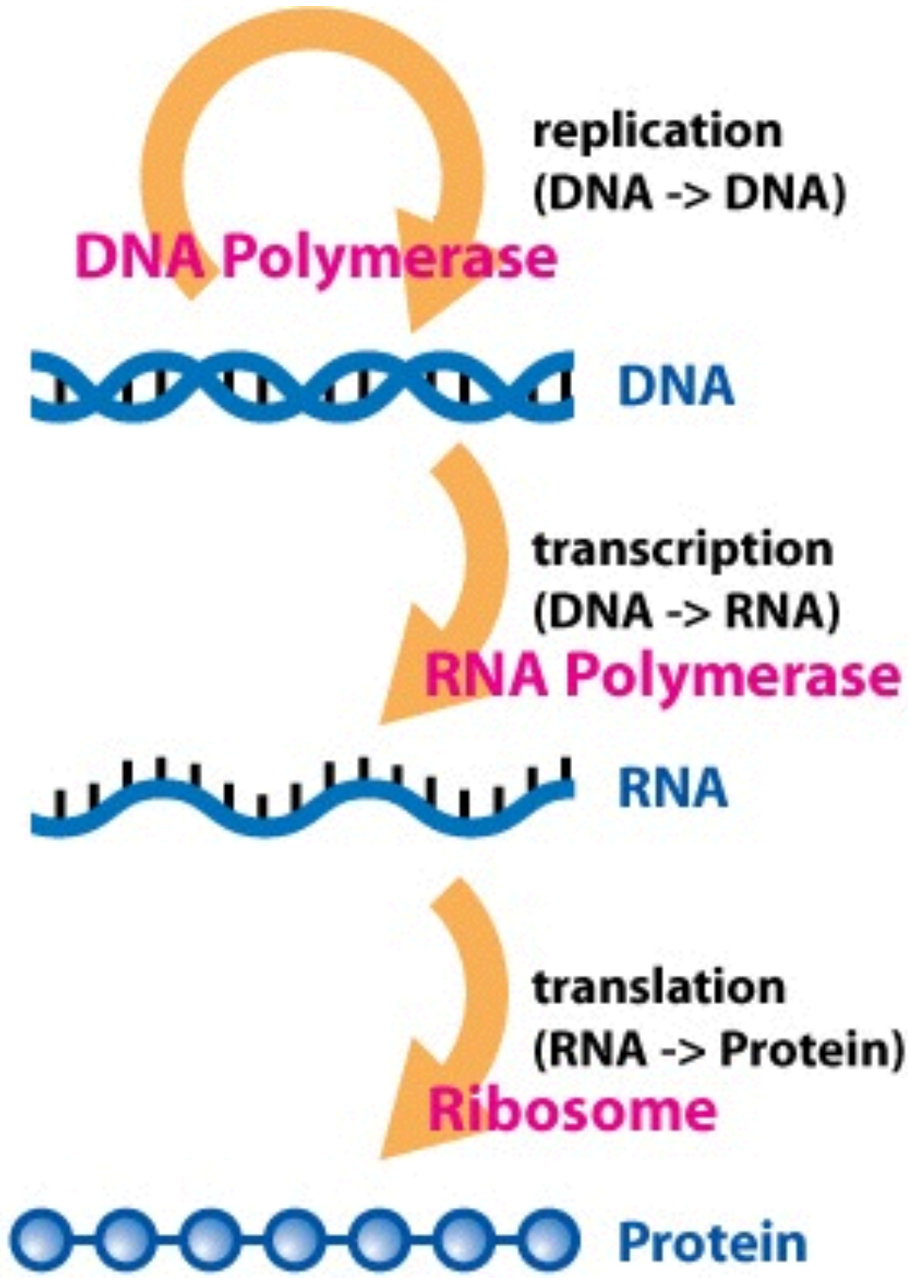
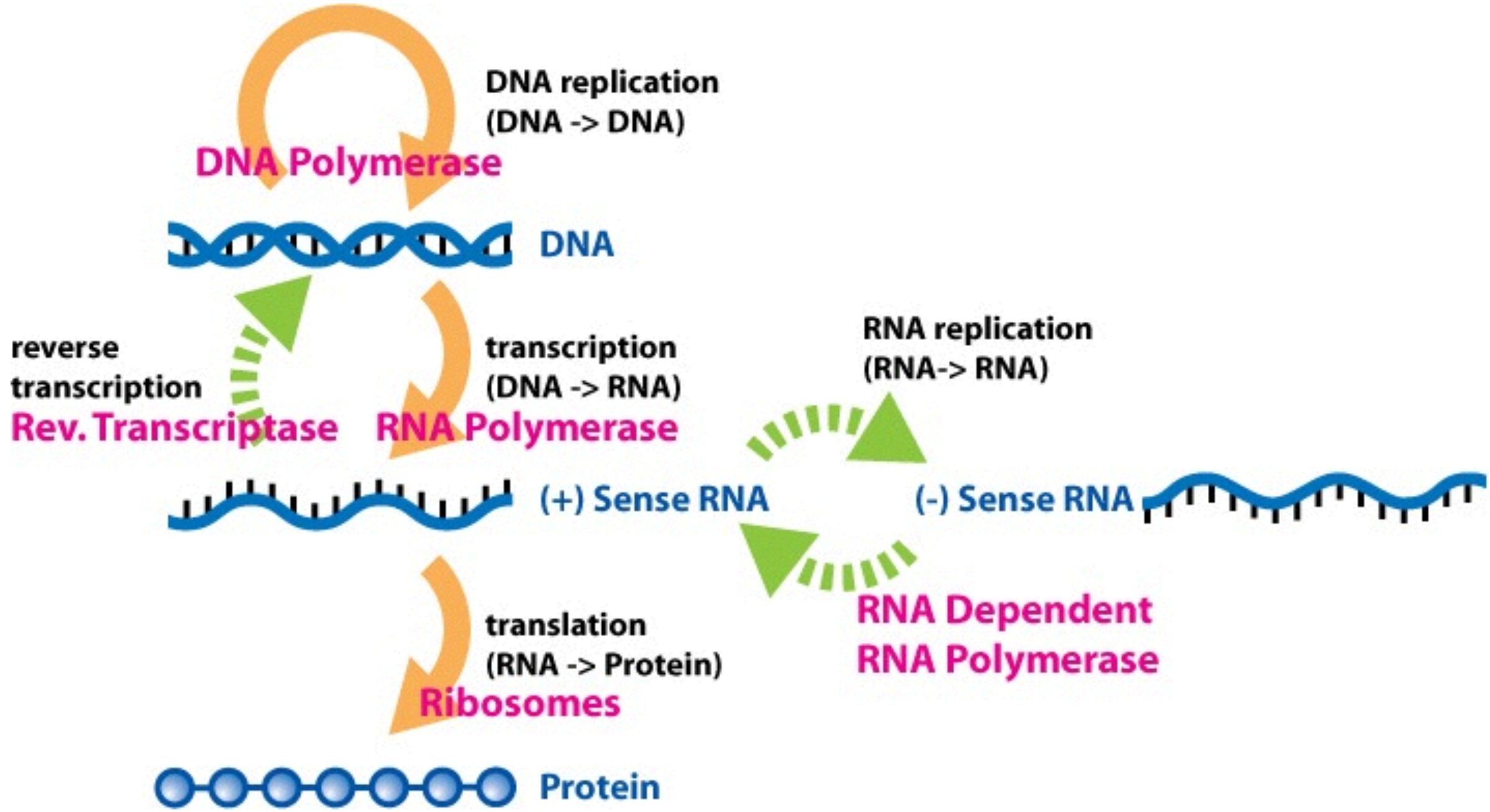
DNA & Chromosomes

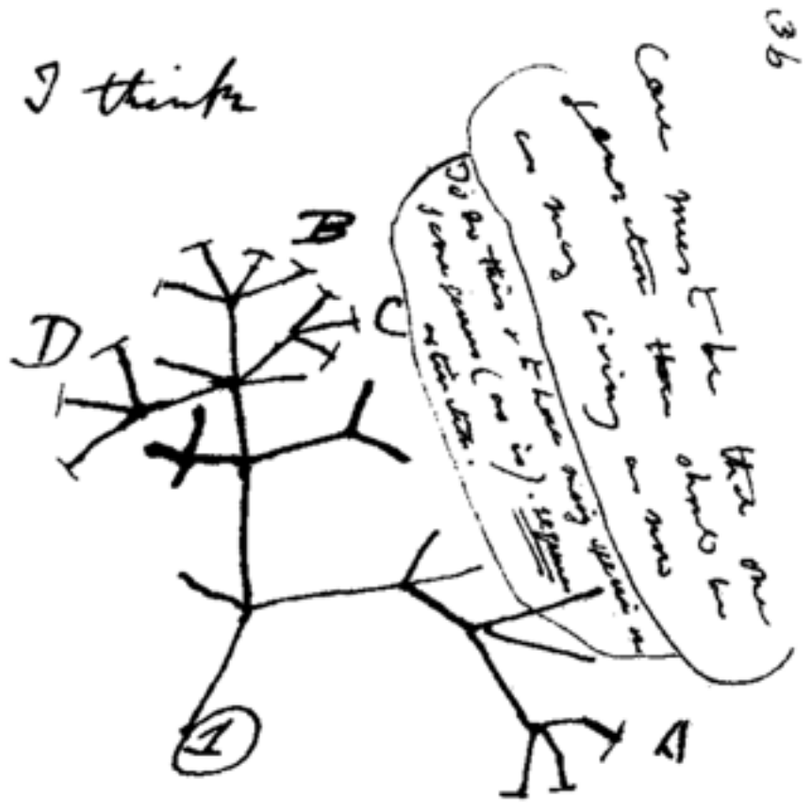
Central Dogma



Central Dogma



Origin of Species



Then between A & B. causing
2 of relation. C & B. the
first gradation, B & D
rather greater distinction
then genera would be
formed. — Bearing relation

Public Domain

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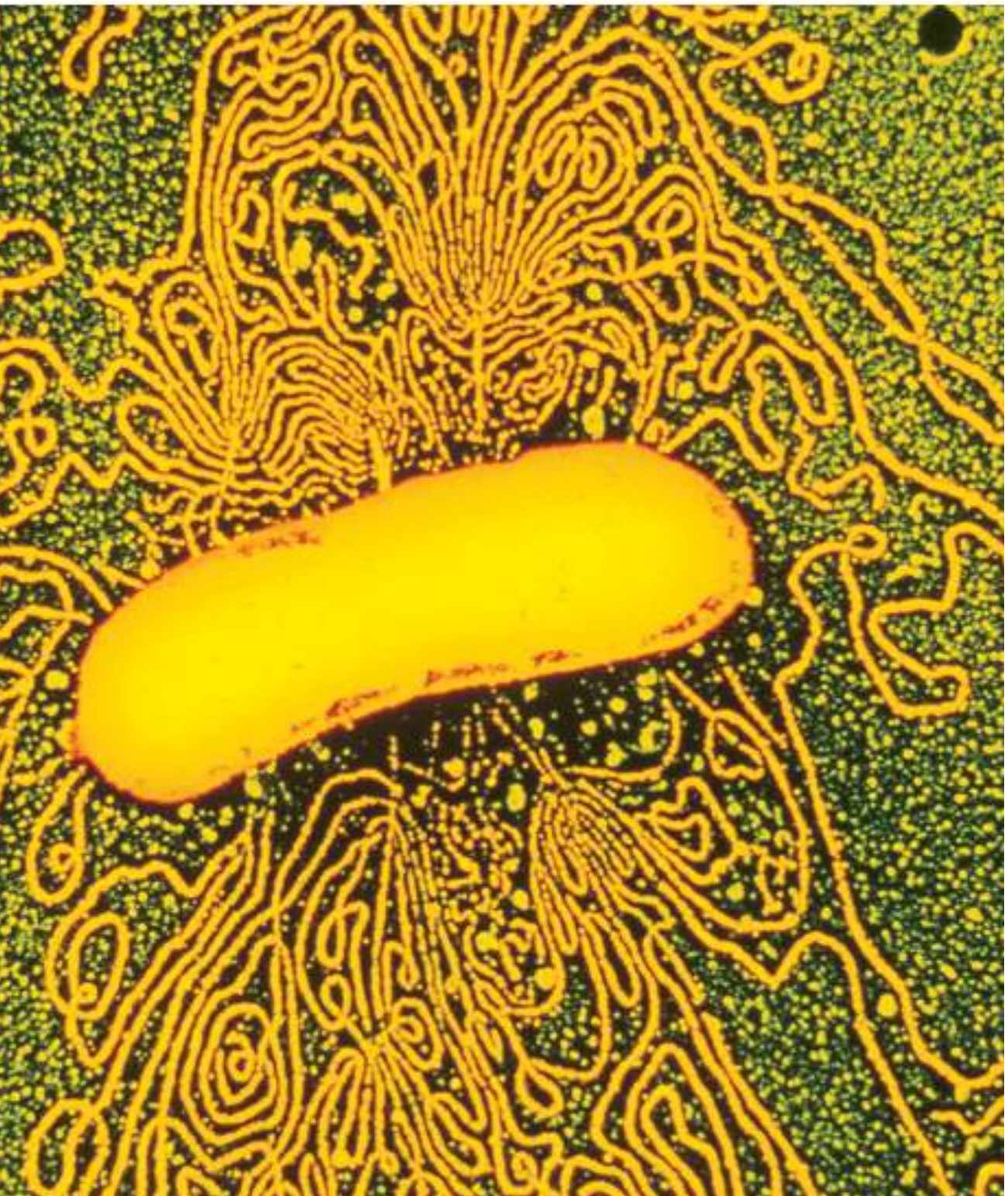
5,000 vs 25,000 genes



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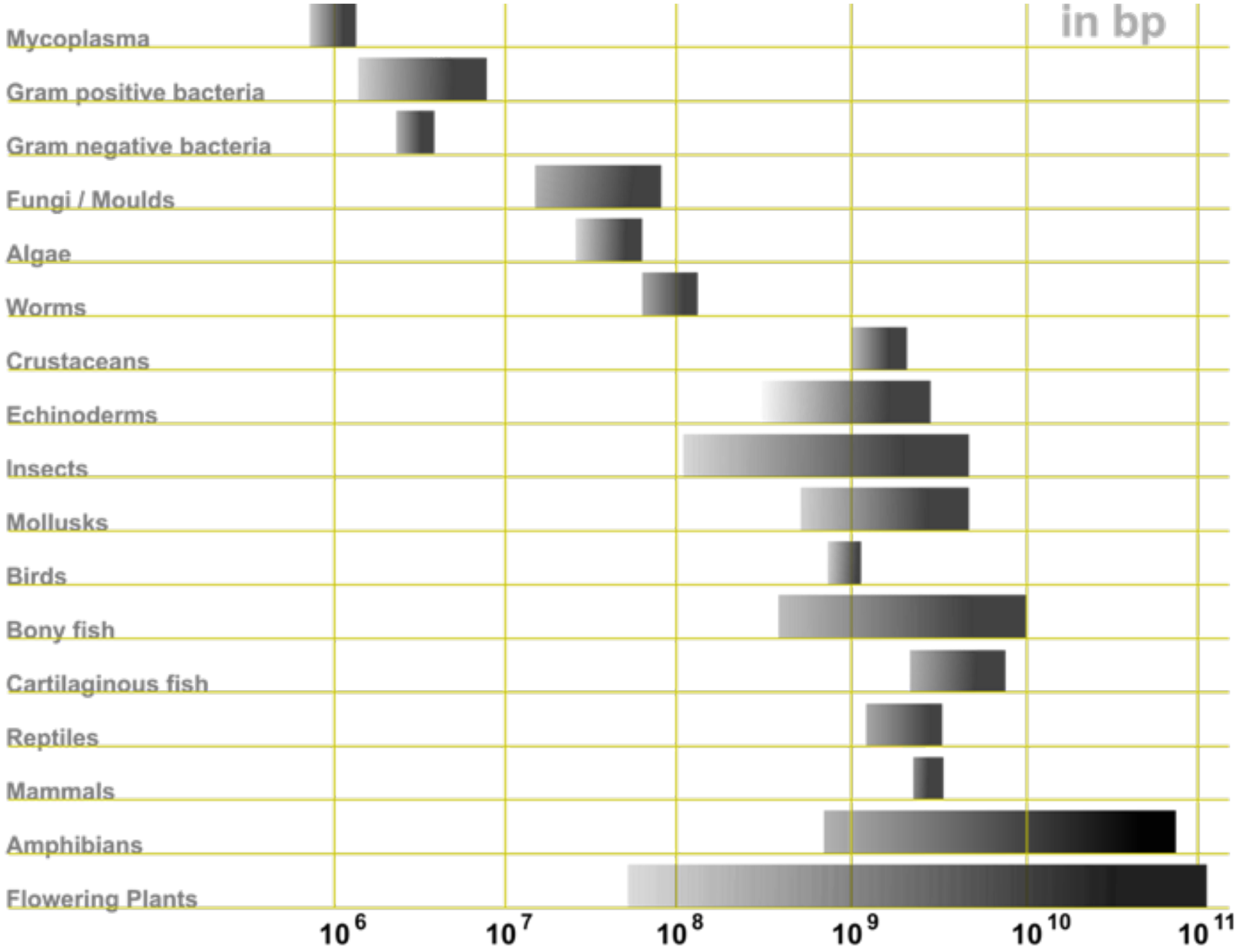
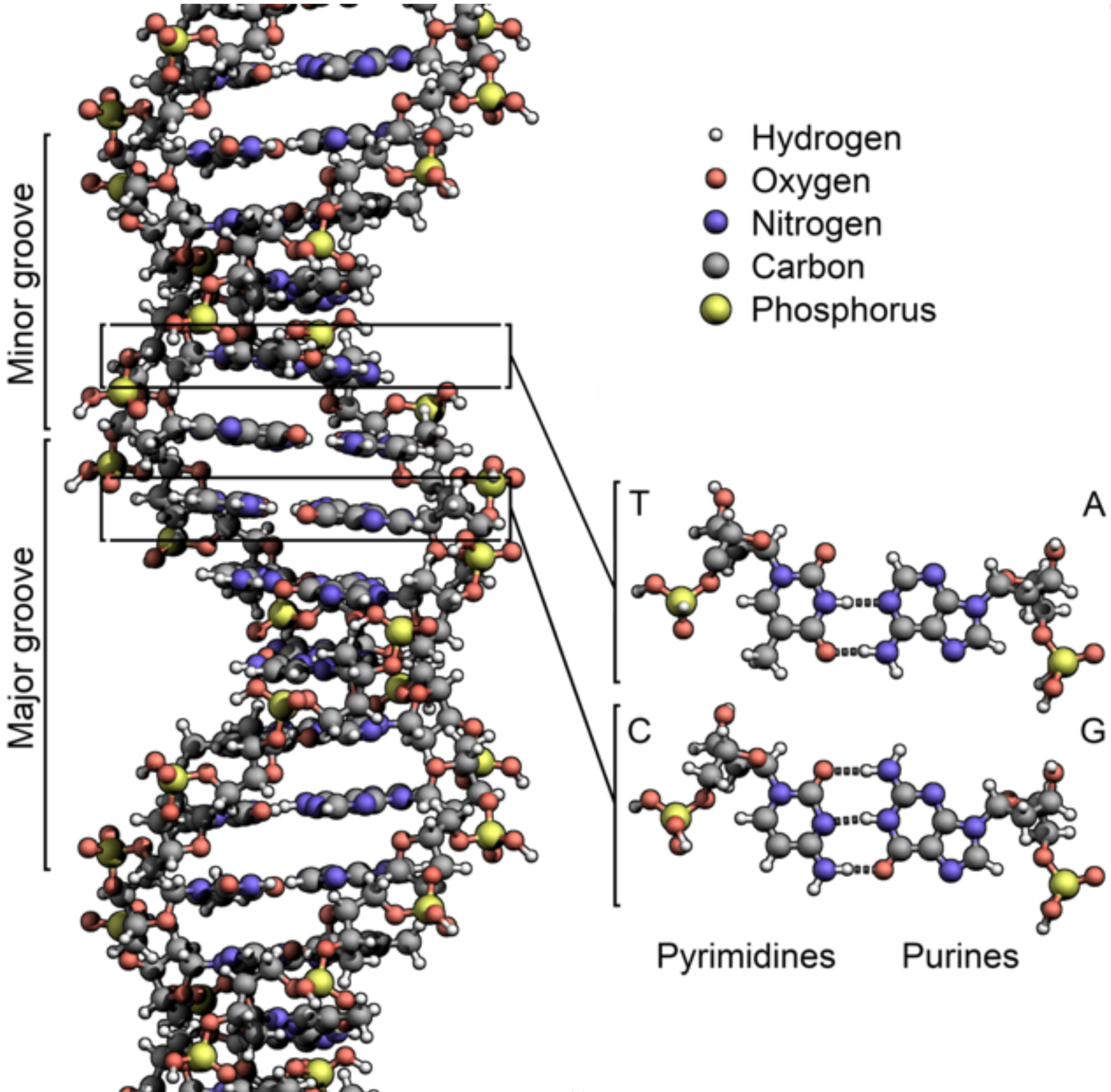
Genome size compared



DNA Molecule



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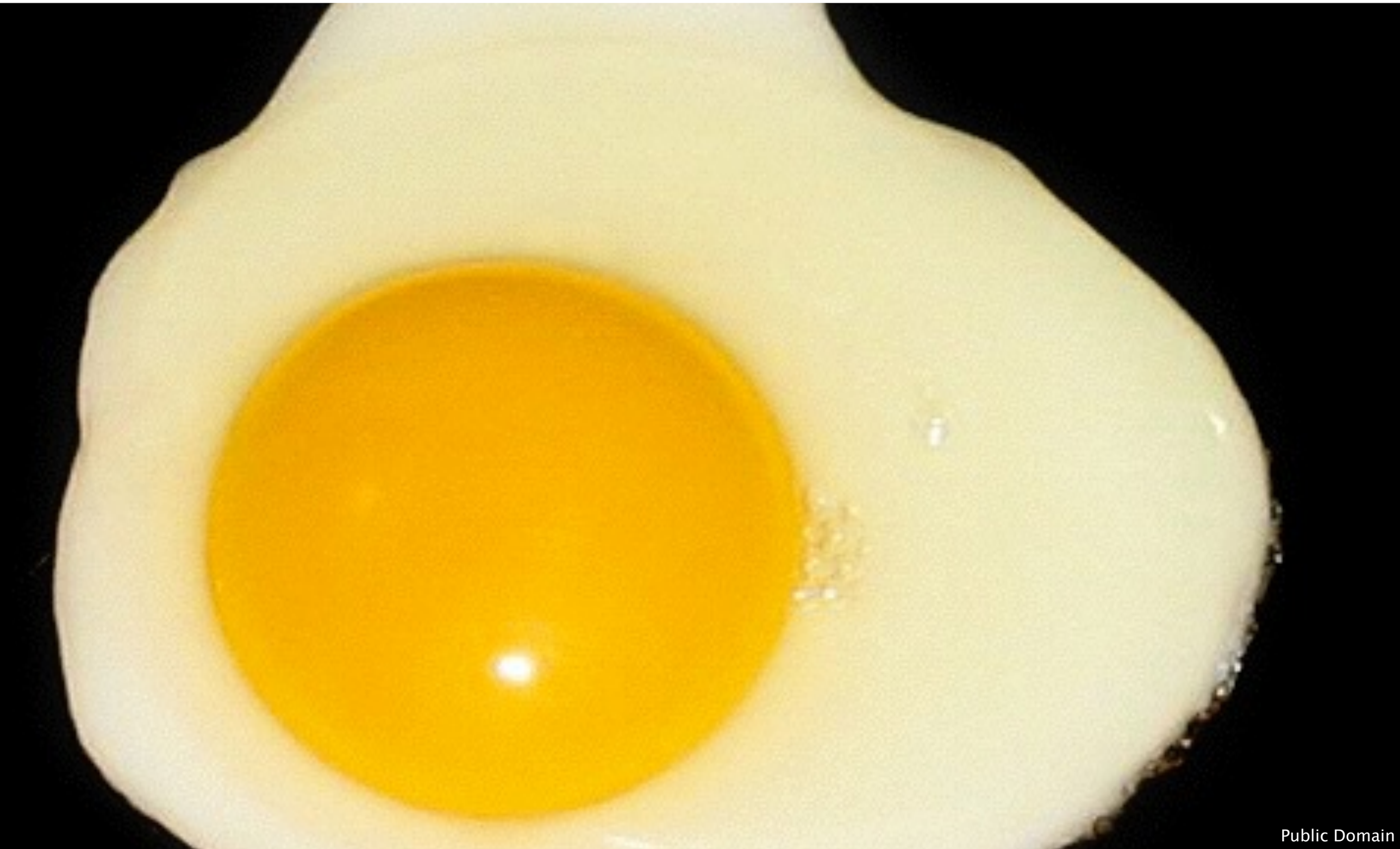
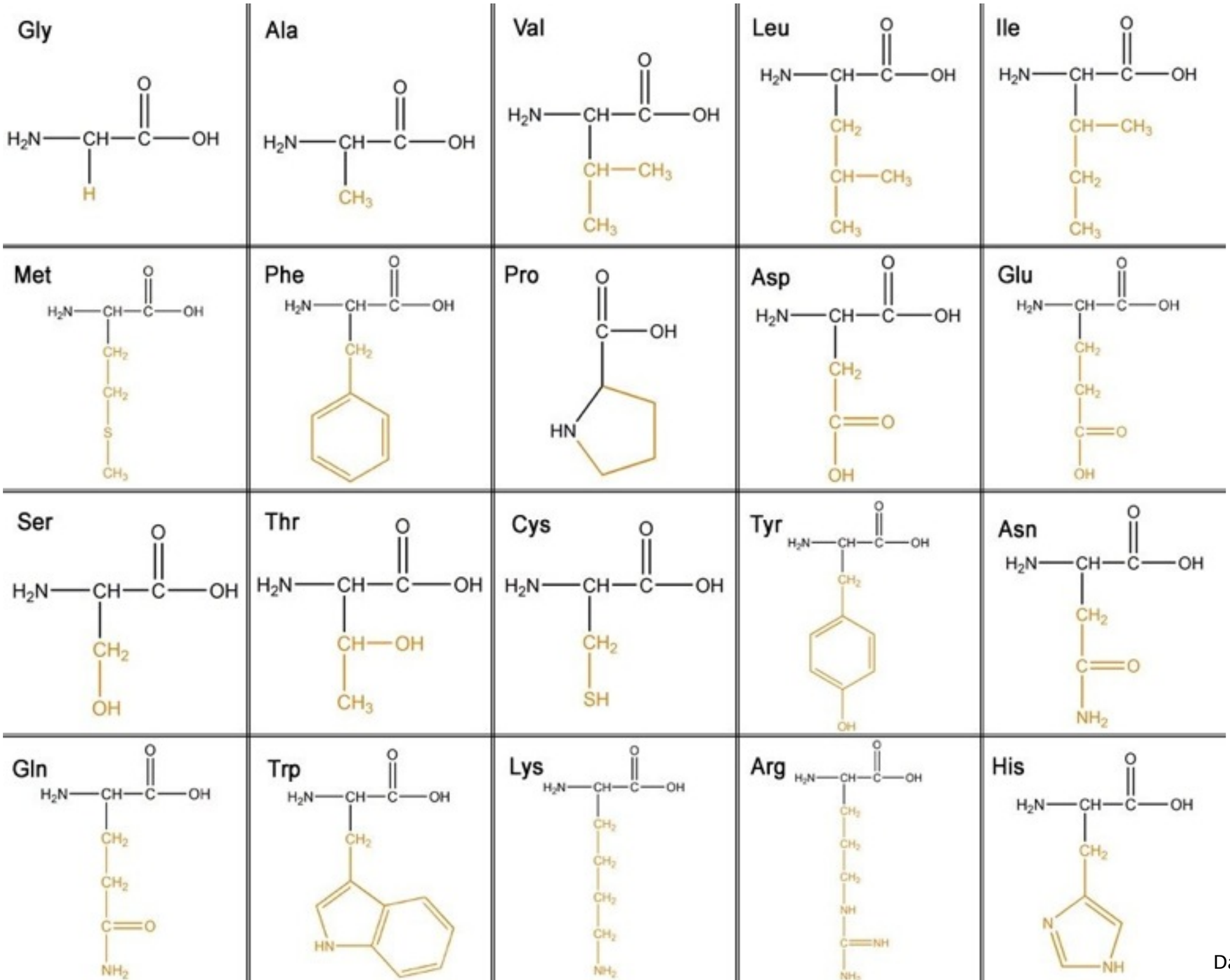
Proteins

Proteins

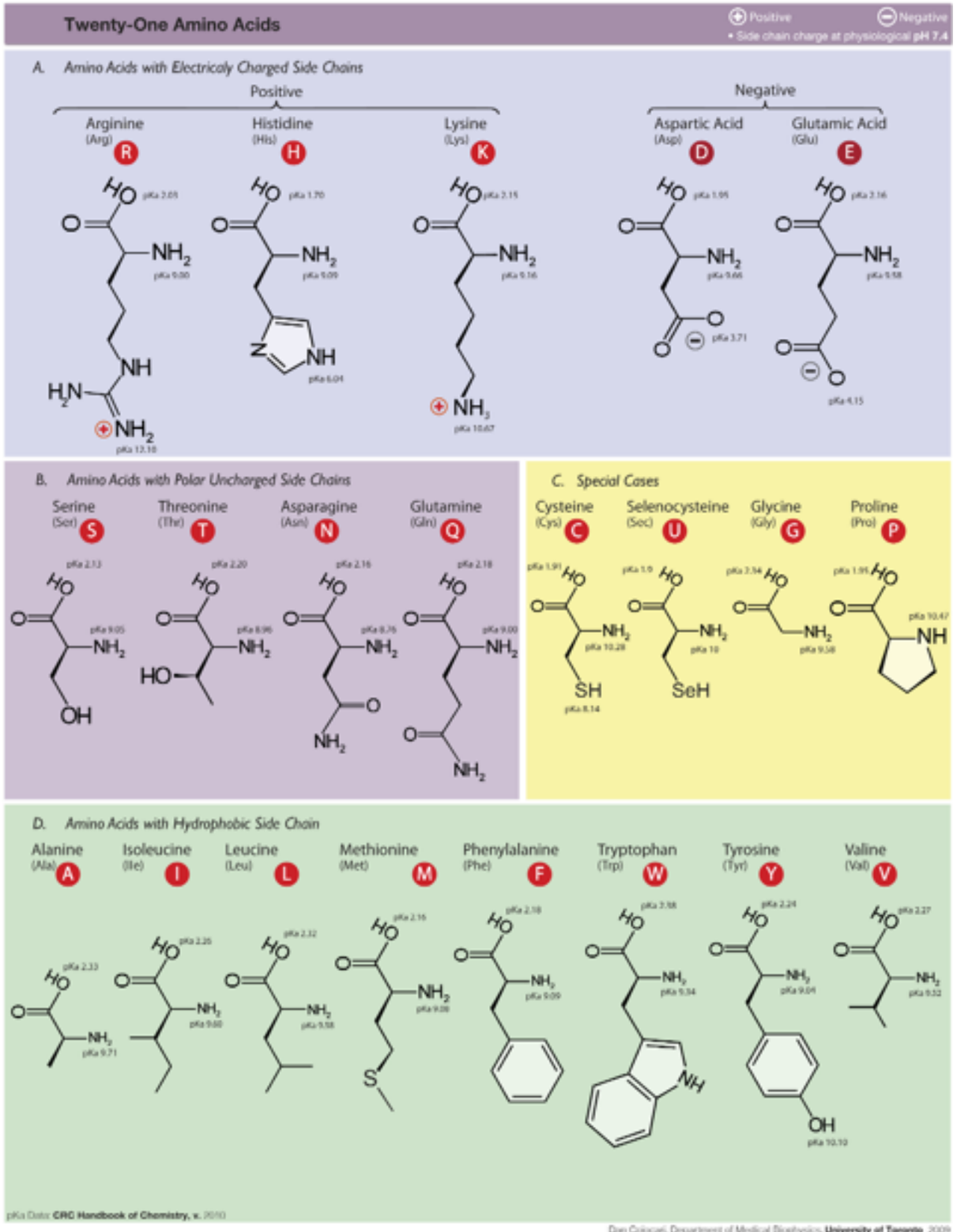
Egg white



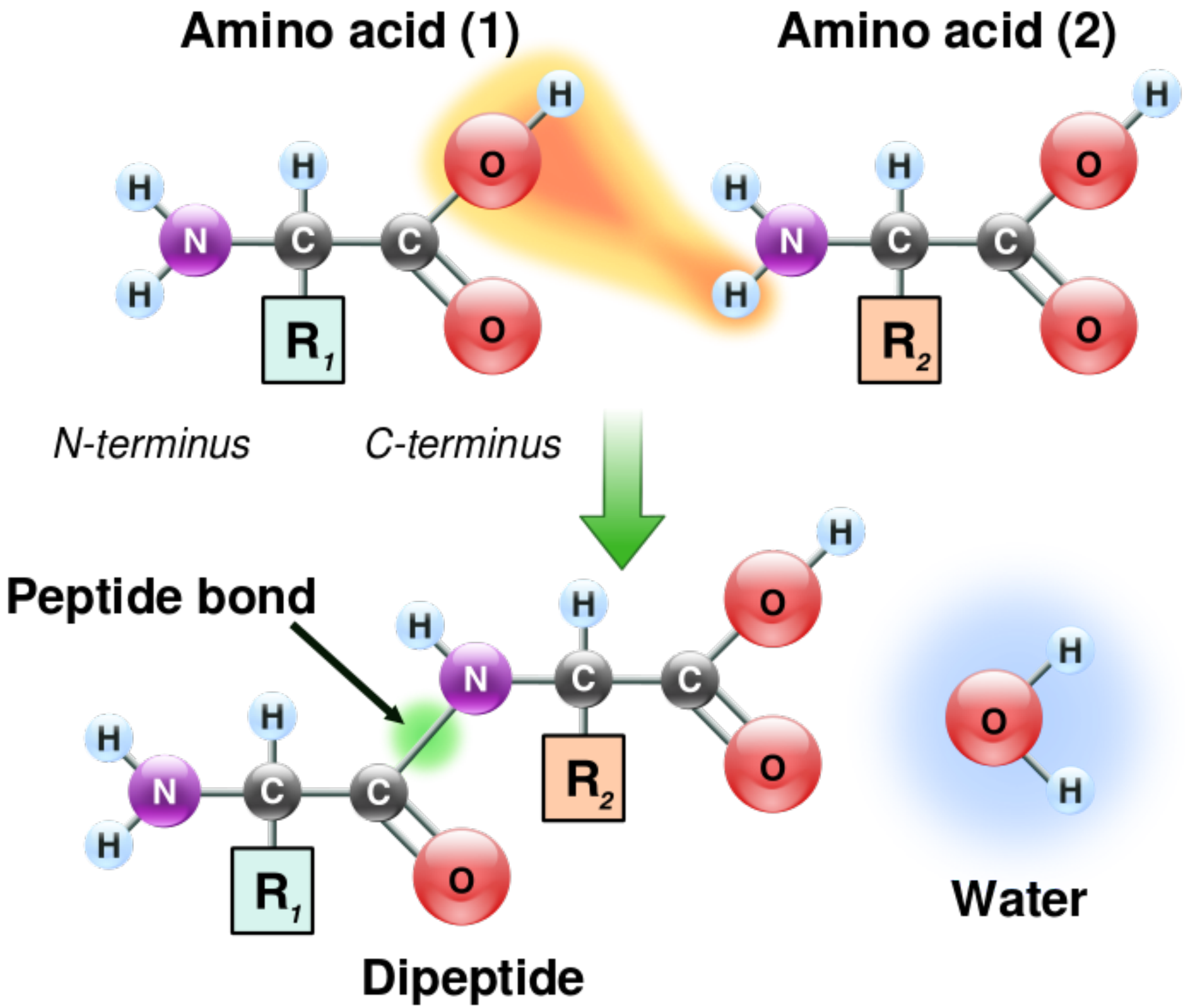
Amino acids, the building blocks



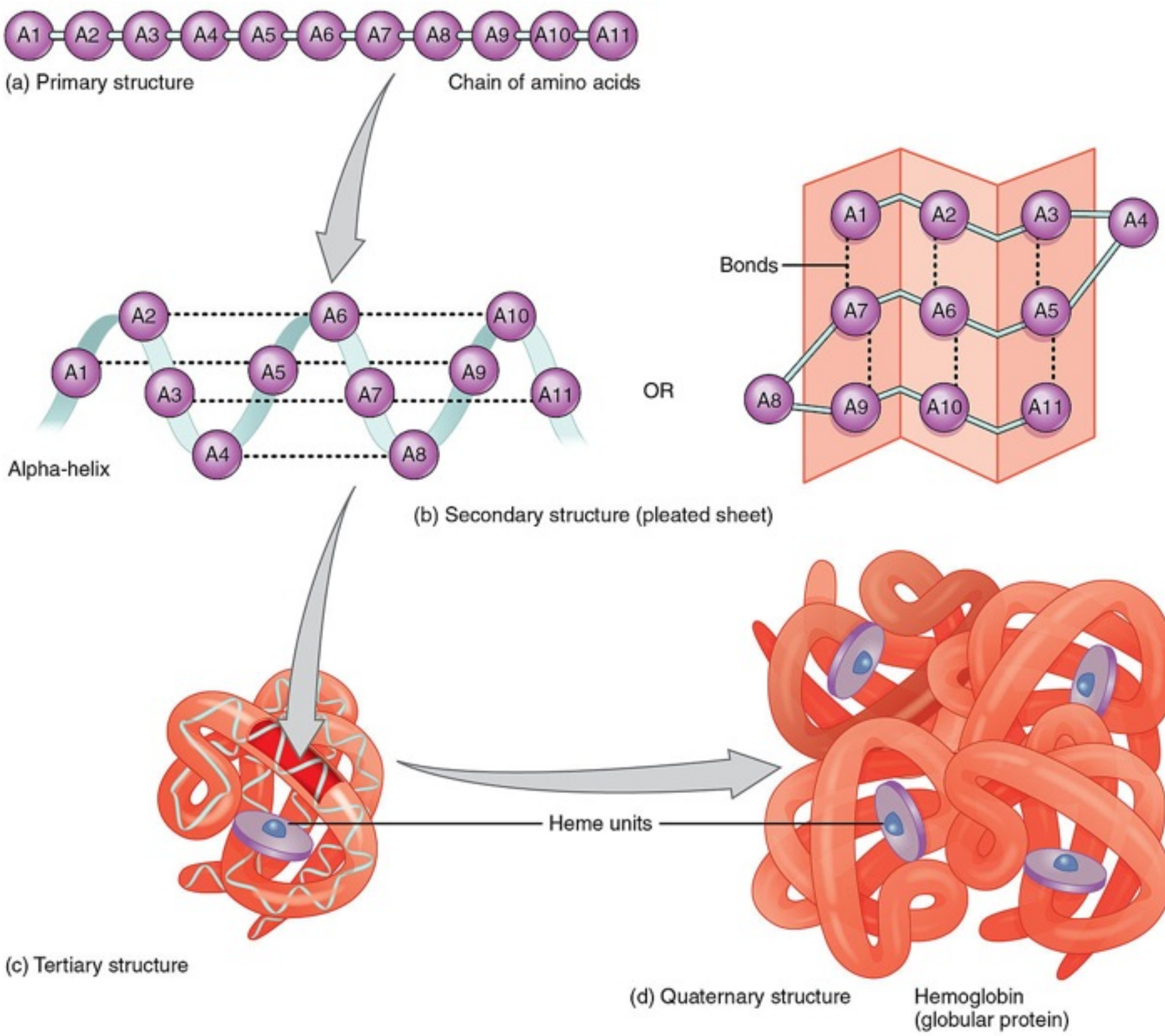
Amino acid groups



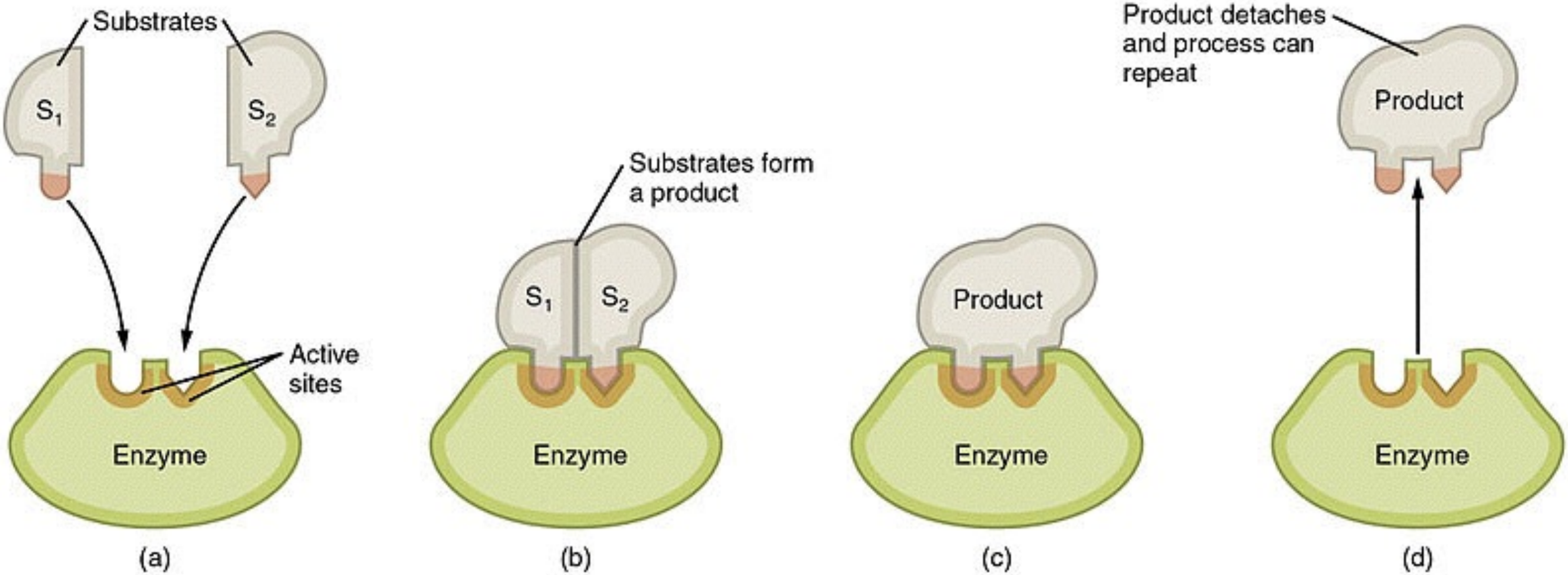
Peptide bond formation



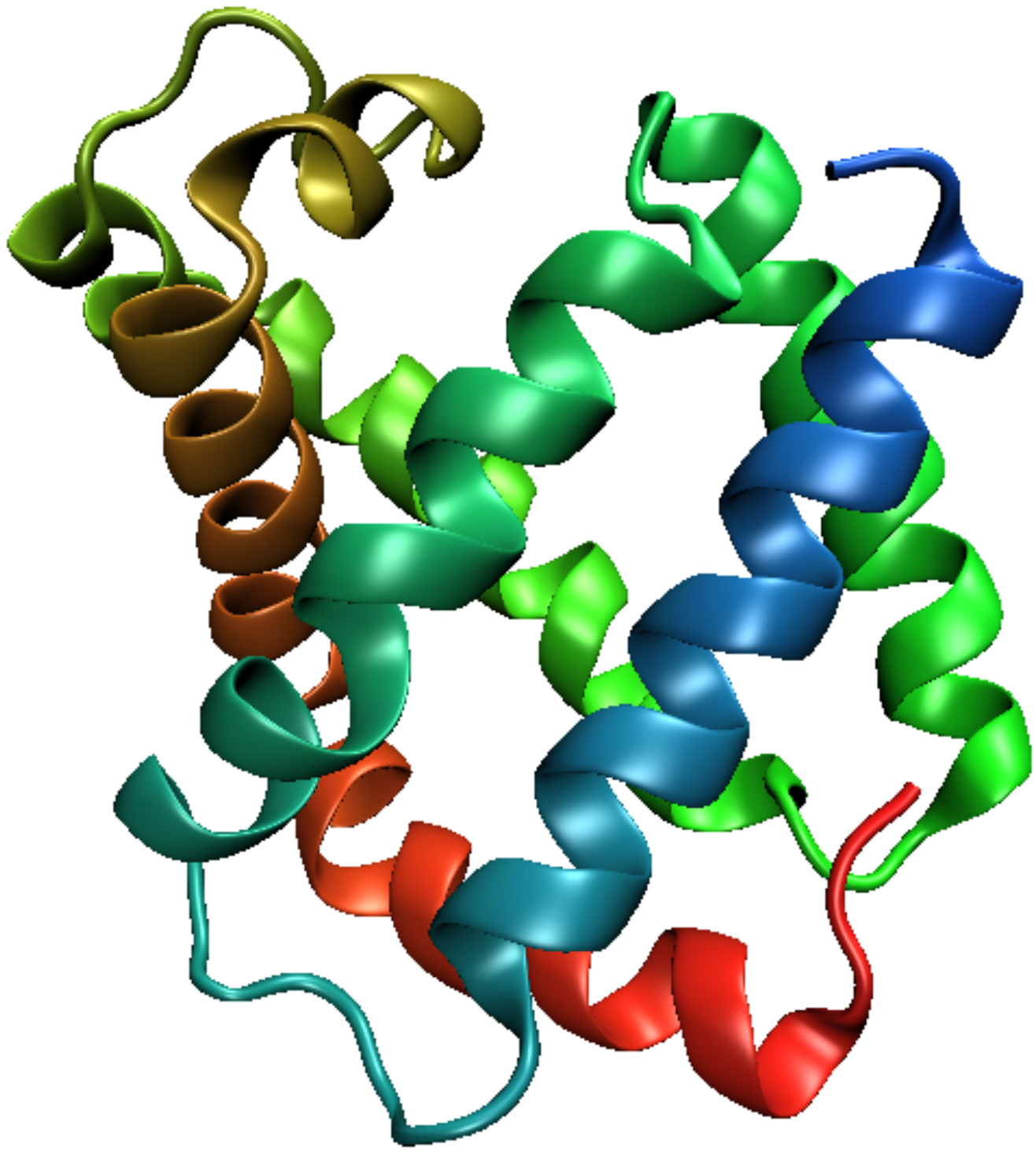
Protein folding



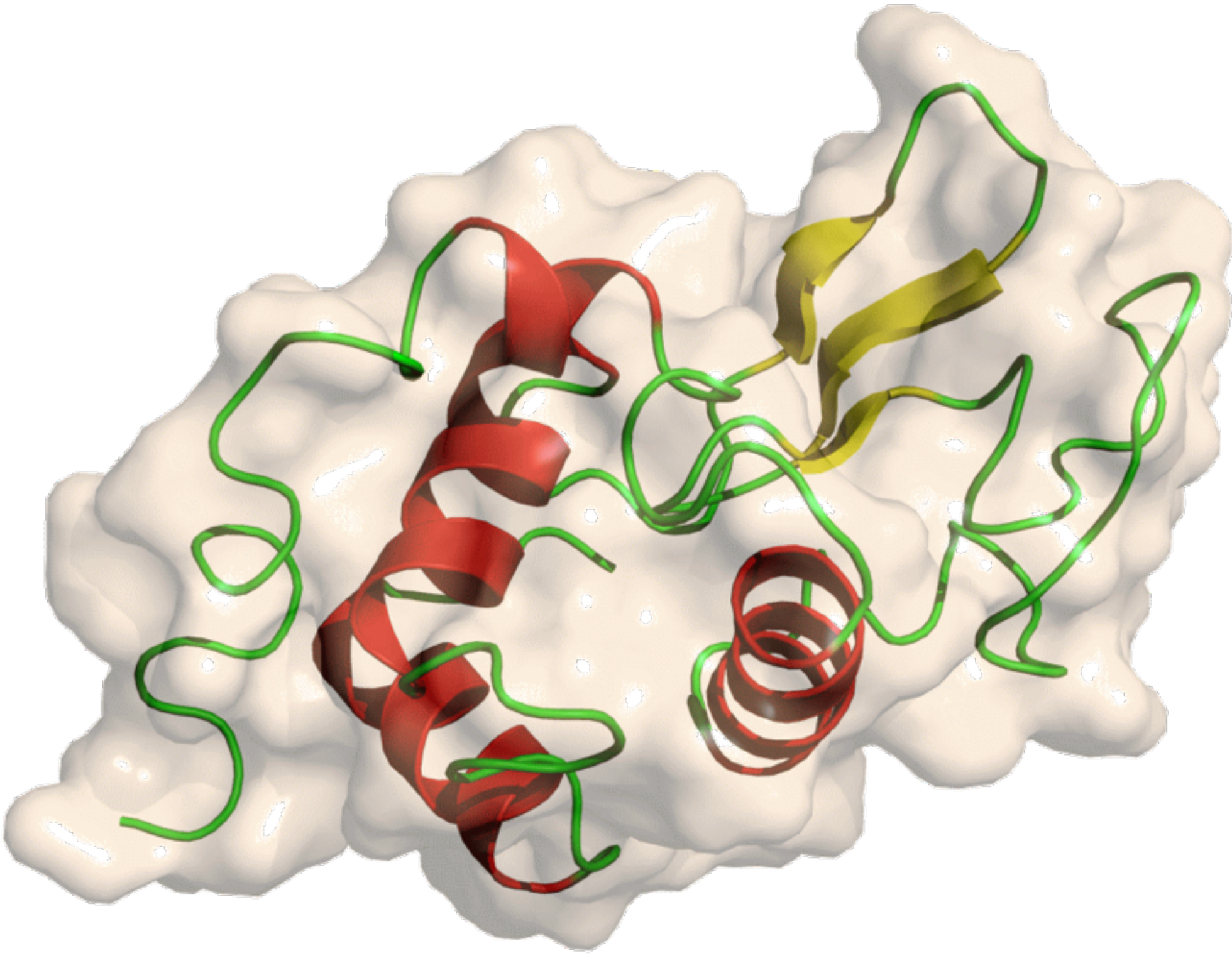
Enzymatic reactions



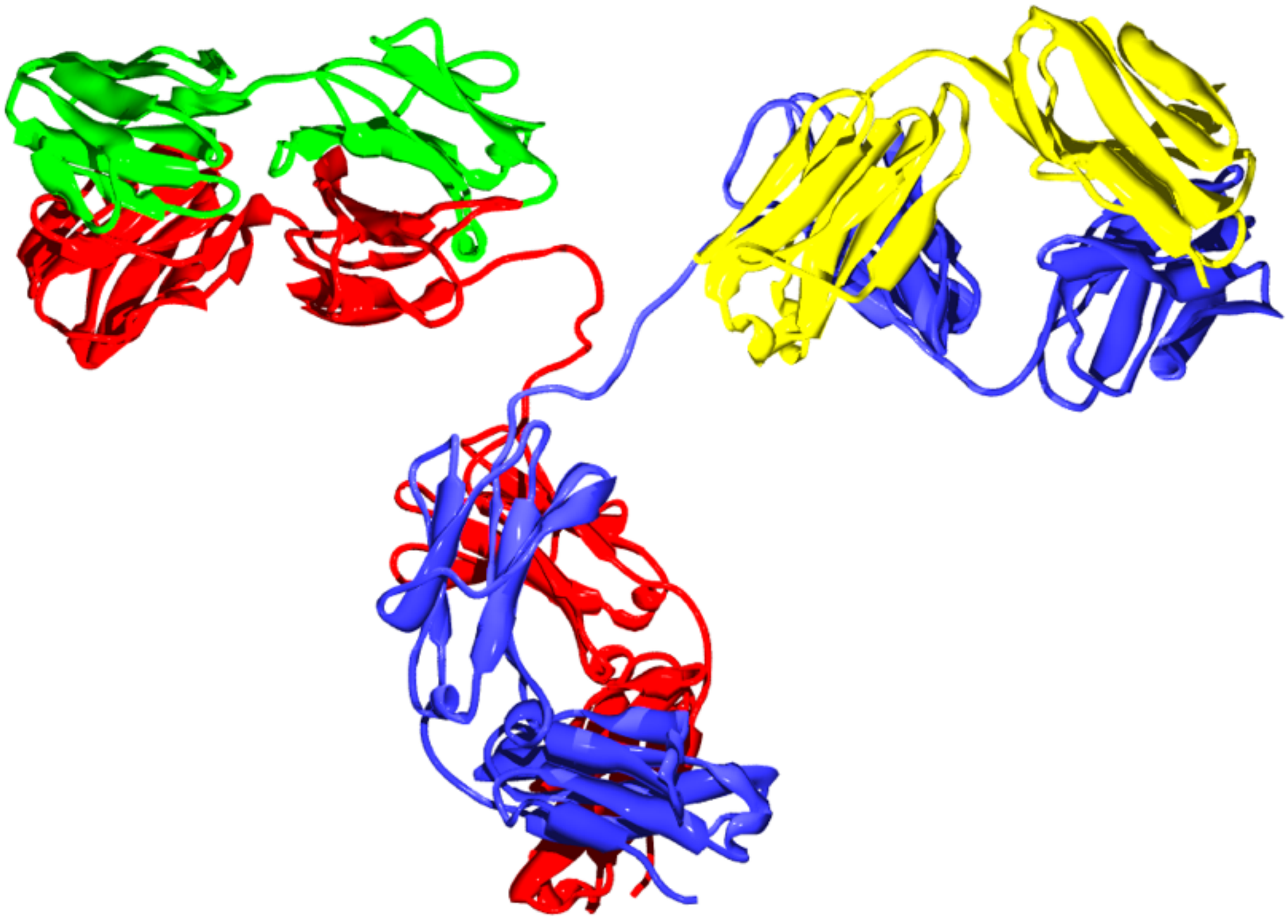
Myoglobin



Lysozyme

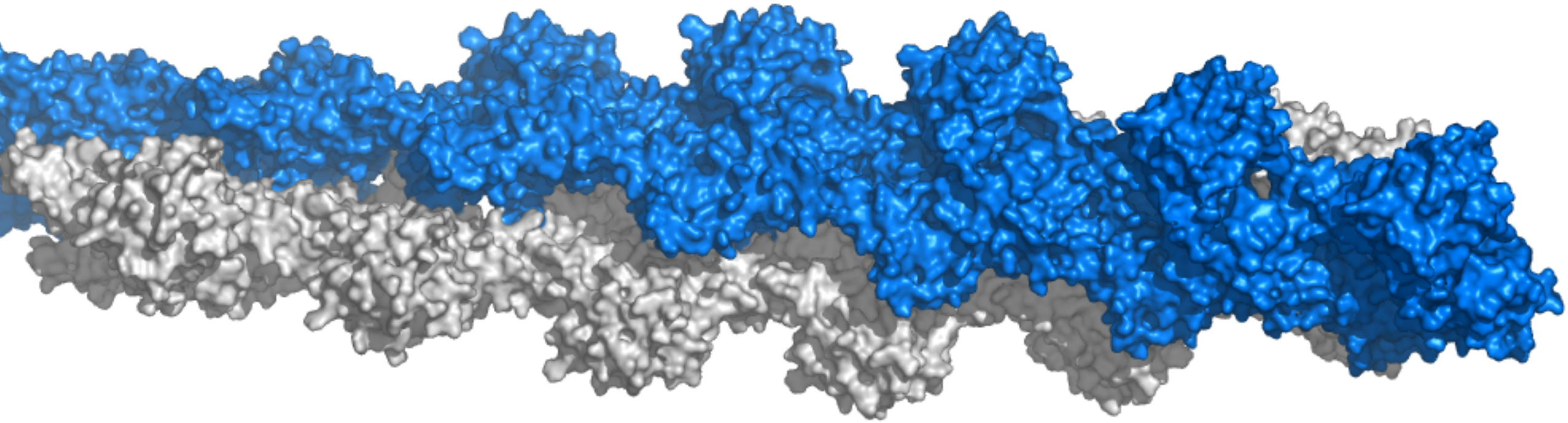


Antibody

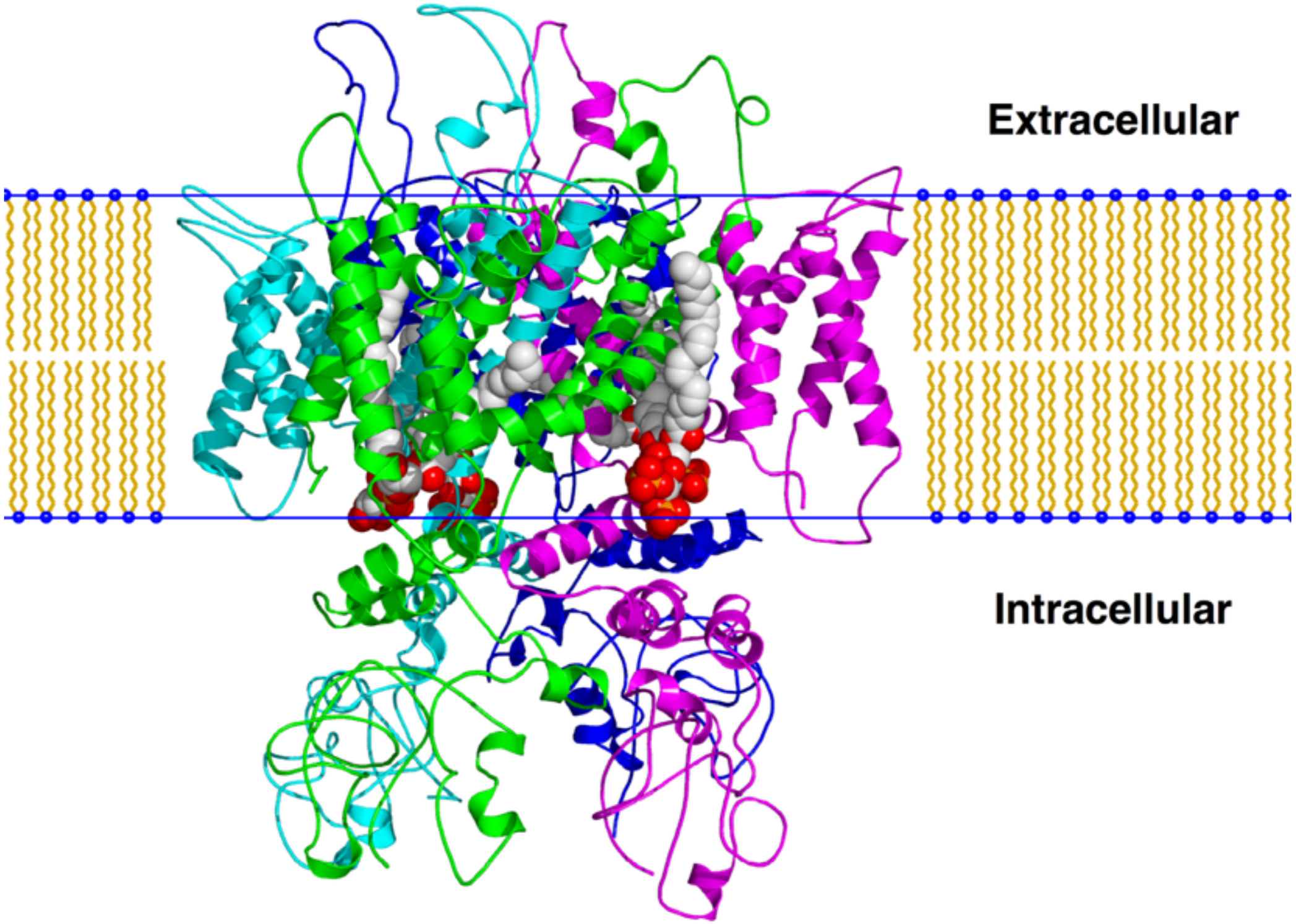


PDB 1IGT, PMID 9048542

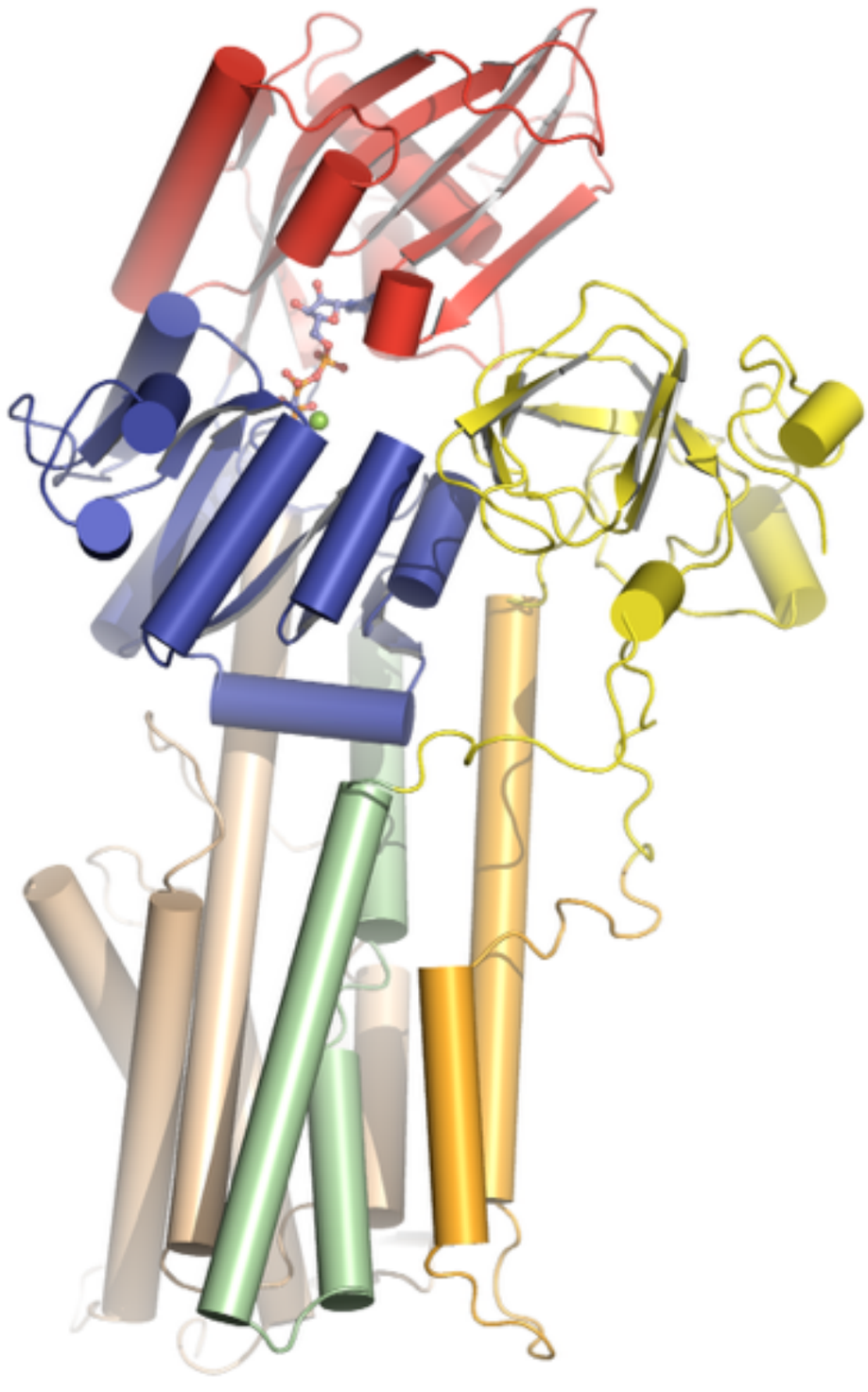
Structural proteins: Actin



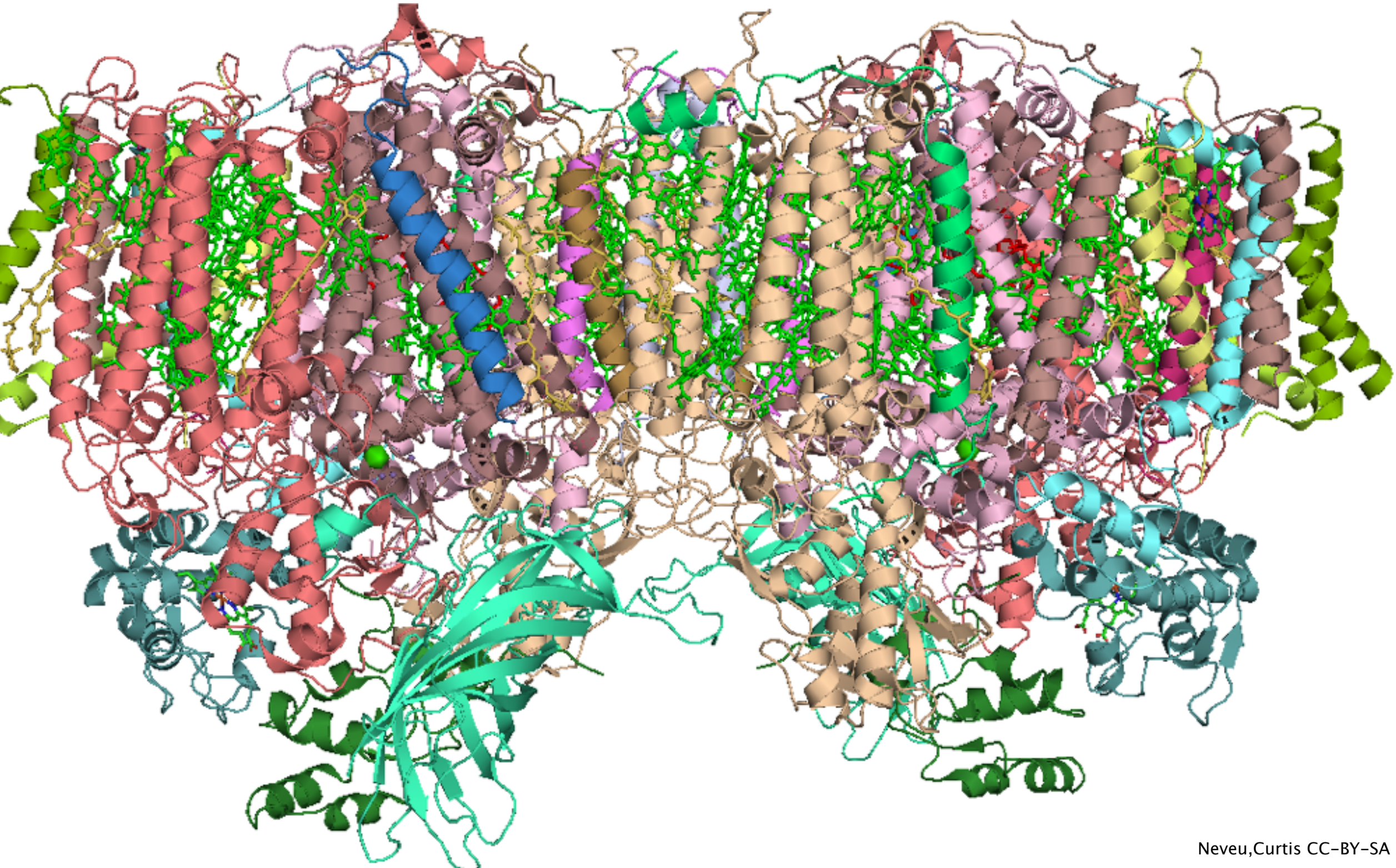
Receptor proteins



ATPase

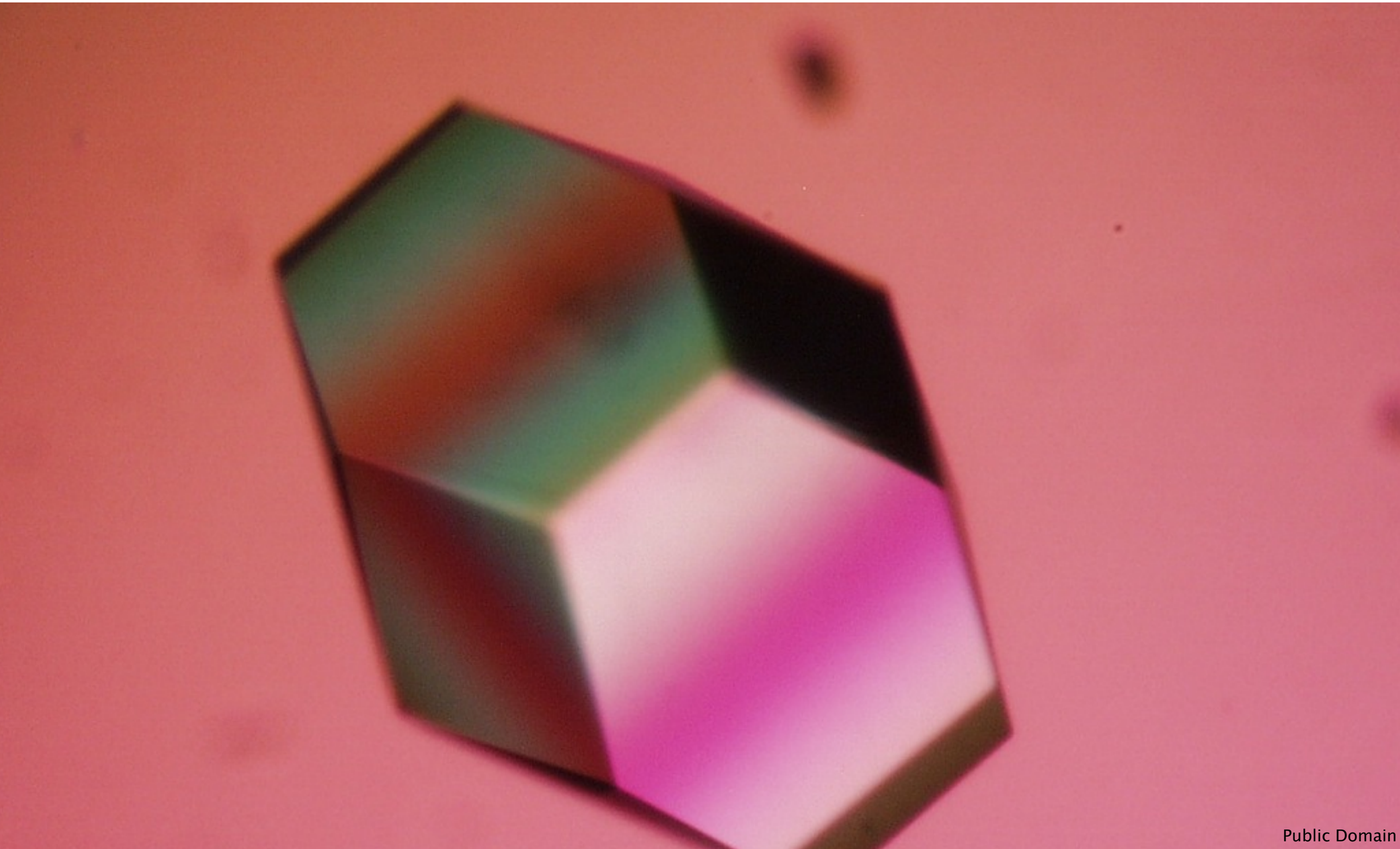


Photosystem II

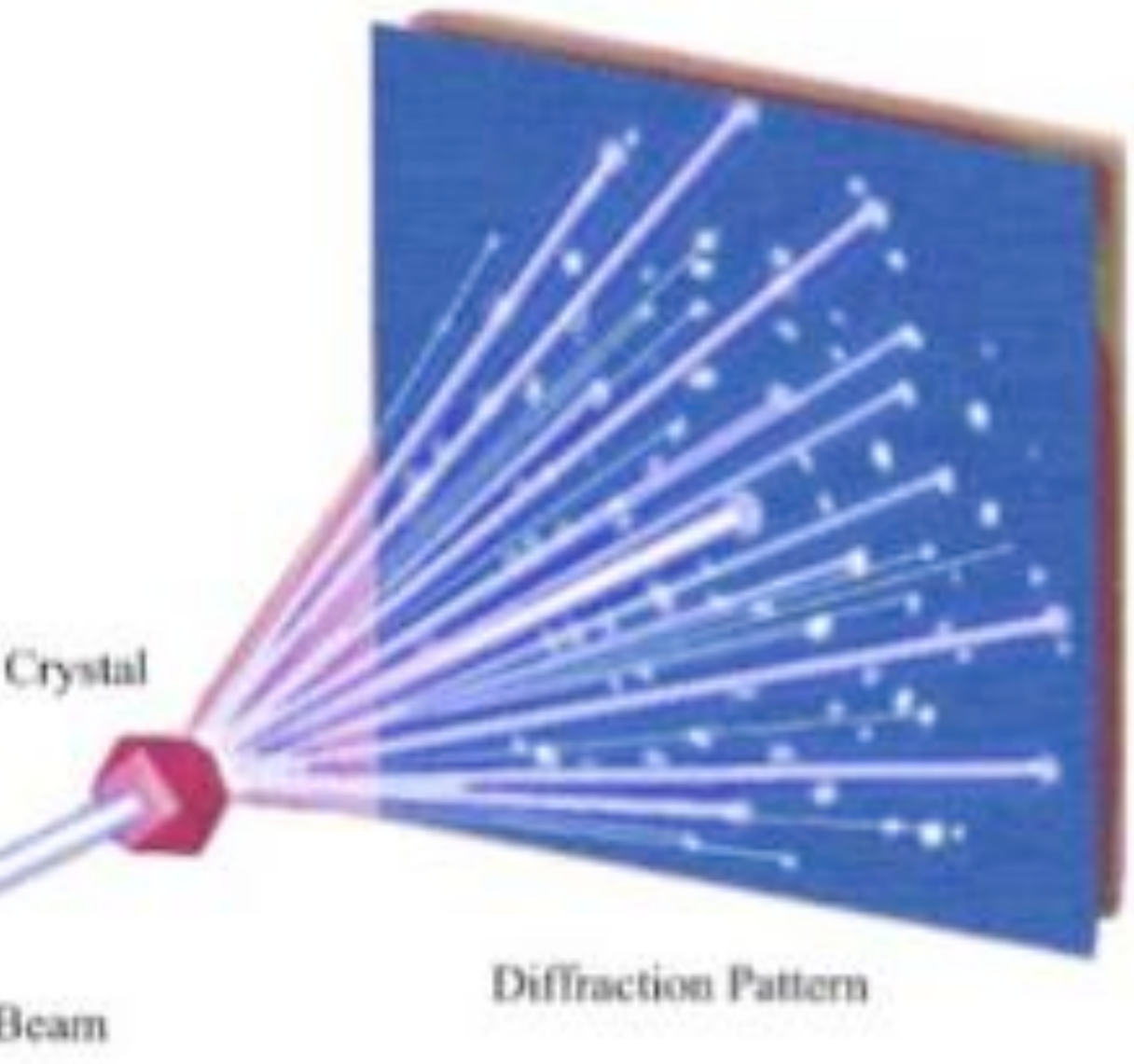


Synchrotron EMBL Grenoble

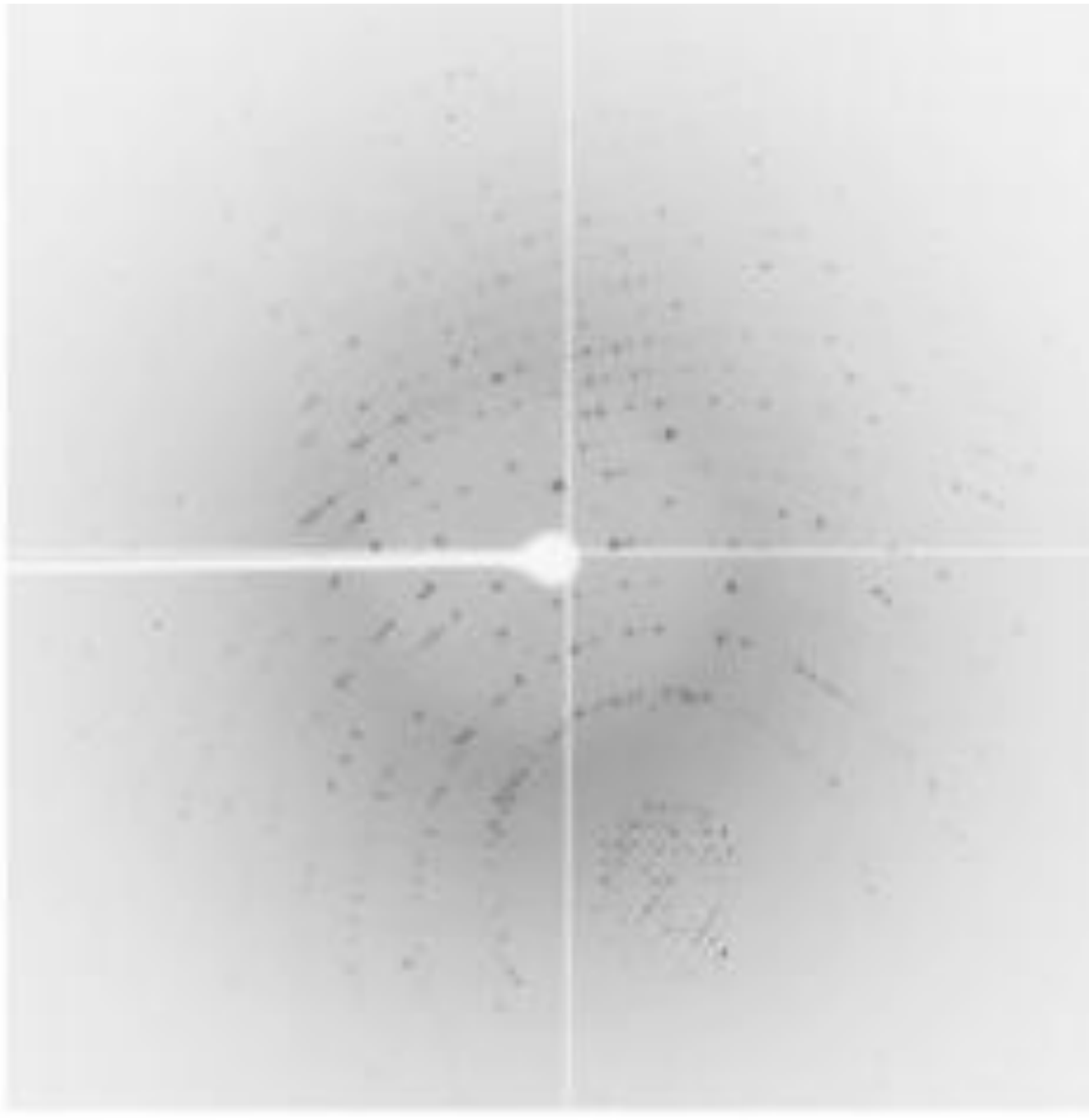
Lysozyme crystal



Protein crystal diffration



Diffraction Process



Diffraction Pattern from NSLS