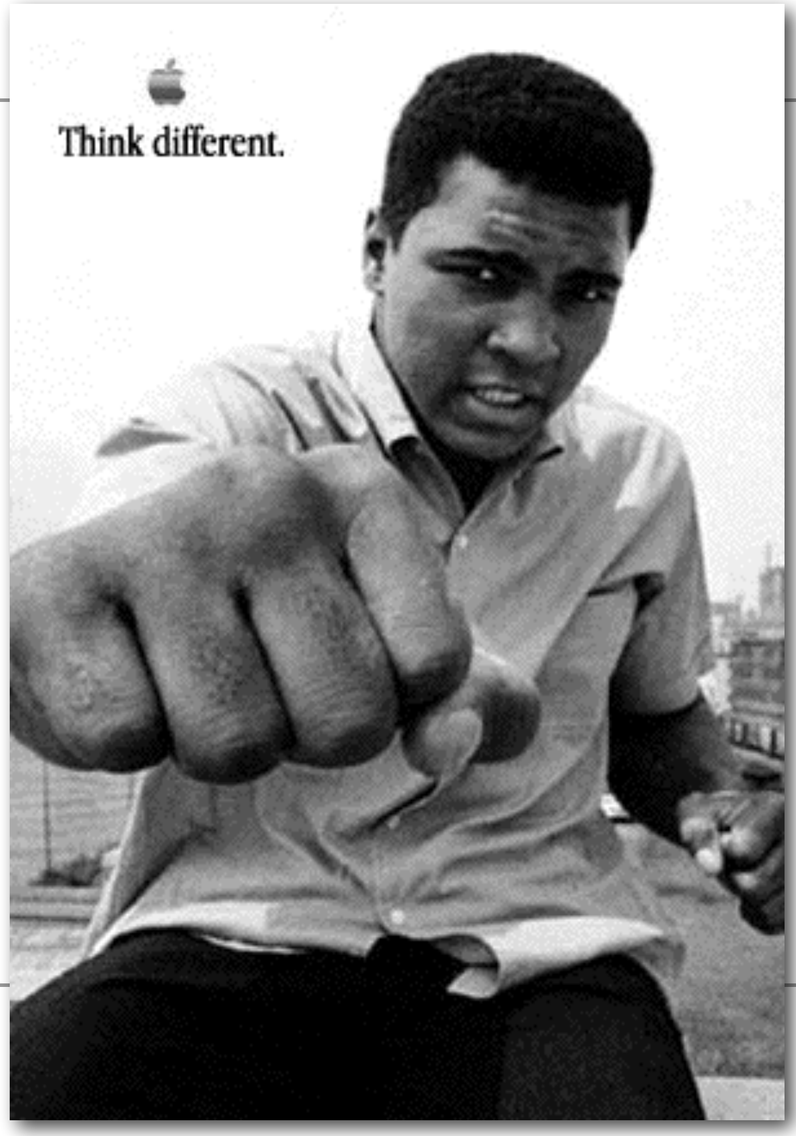
LB145-Fall *2023*



1. **Pick up** Name Folder

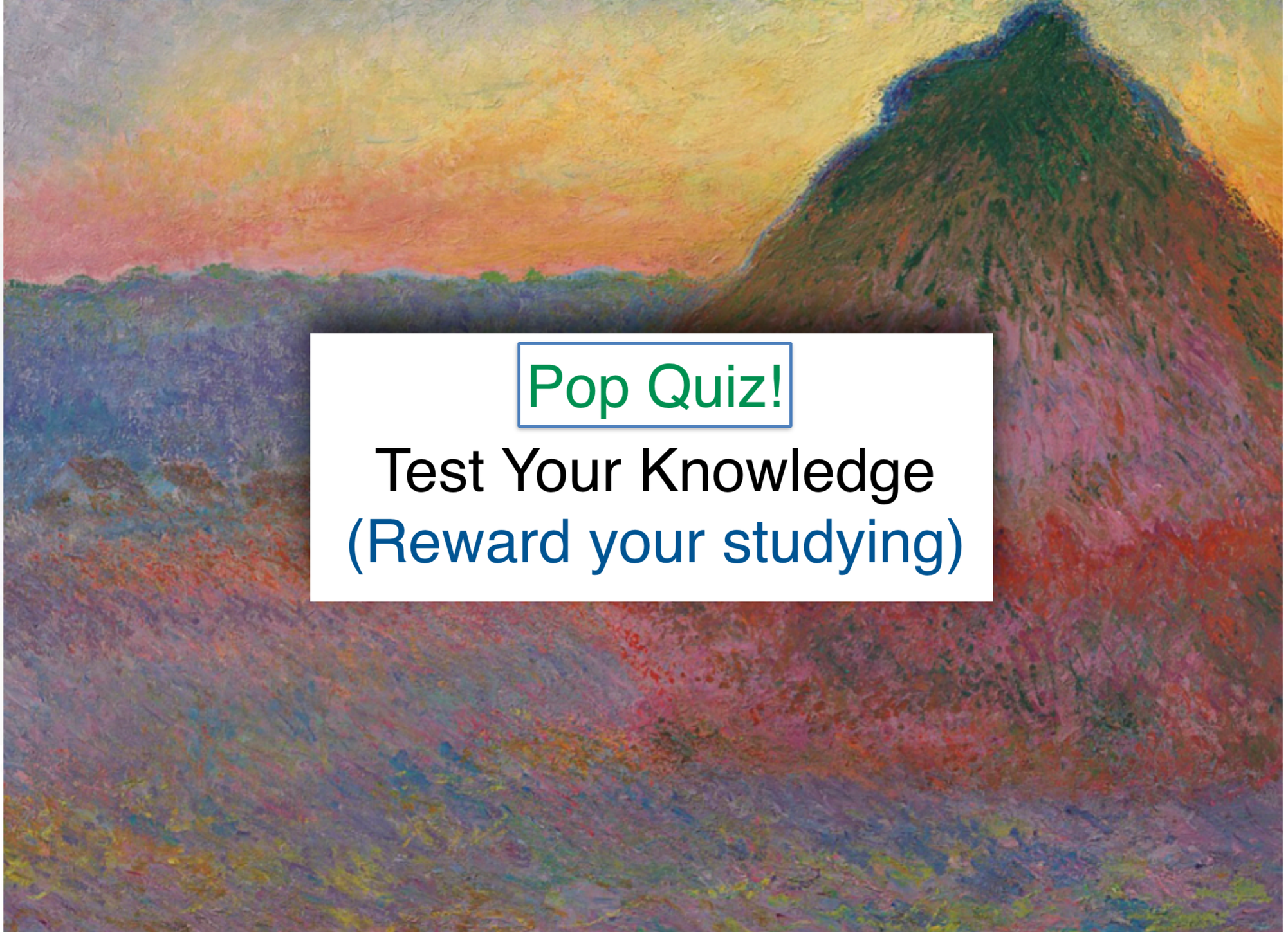
- Pick up name folder and set it up at seat.

2. **Sit** with your group.

- laptops on outer perimeter (avoid distracting)

3. **Clicker** Attendance

- Launch your Top Hat, and get ready to click.



Pop Quiz!

Test Your Knowledge

(Reward your studying)

Monet's 1891 canva
"Meule" or
"Grainstack" fetche
$81.4 million with
fees.

CHRISTIE'S IMAGES LT

Survey: Got bands? (2.0) 1:00

What has your group completed in your research project so far?

A	Lab 1 bands
B	Lab 1 bands & isolated human DNA
C	Lab 1 bands & isolated human DNA & some control published primer bands
D	Lab 1 bands, human DNA, control bands & some designed primer bands
E	We already submitted our final manuscript (peace!)
F	We com[redacted] on additional tests

Which of the following is NOT true of a codon?

A. It consists of three nucleotides.
B. It may code for the same amino acid as another codon.
C. It never codes for more than one amino acid.
D. It extends from one end of a tRNA molecule.
E. It is the basic unit of the genetic code.

Which of the mutations would be most likely to have a harmful effect on an organism?

A. a base-pair substitution
B. a deletion of three nucleotides near the middle of a gene
C. a single nucleotide deletion in middle of intron
D. a single nucleotide deletion near the end of the coding sequence
E. a single nucleotide insertion downstream of, and close to, the start of the coding sequence

Chemiosmosis: Uncouplers

Some drugs known as uncouplers facilitate diffusion of protons across the mitochondrial inner membrane. When such a drug is added, what will happen to ATP synthesis and oxygen consumption?

a) Both ATP synthesis and oxygen consumption will decrease.

b) ATP synthesis will decrease; oxygen consumption will increase.

c) ATP synthesis will increase; oxygen consumption will decrease.

d) Both ATP synthesis and oxygen consumption will increase.

e) ATP synthesis will decrease; oxygen consumption will stay the same.

Electron Transport Chain and Respiration

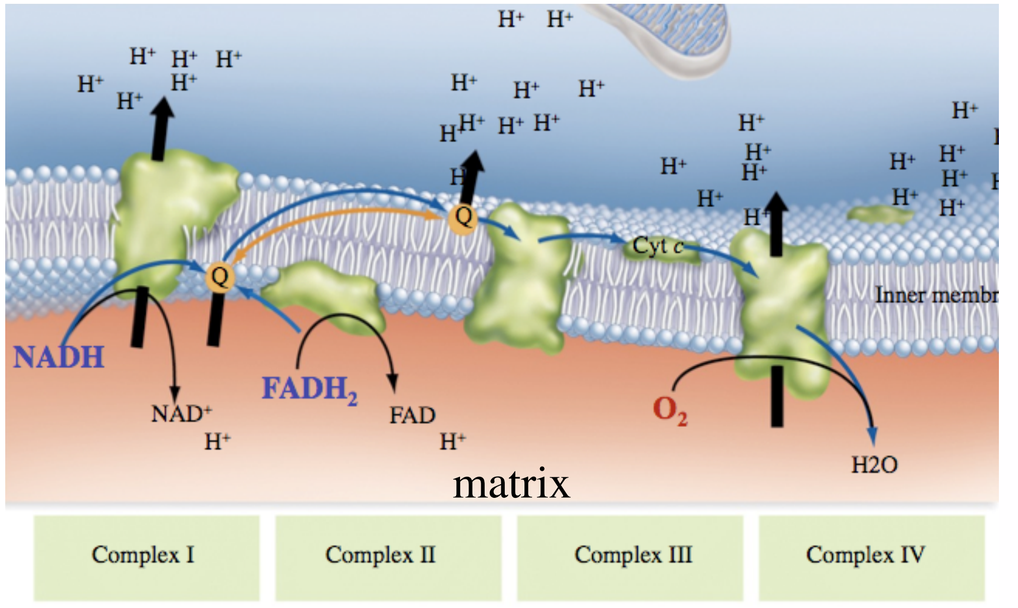
Rotenone inhibits Complex I (NADH-Q Reductase). When Complex I is completely inhibited, cells will

a) neither consume oxygen nor make ATP.

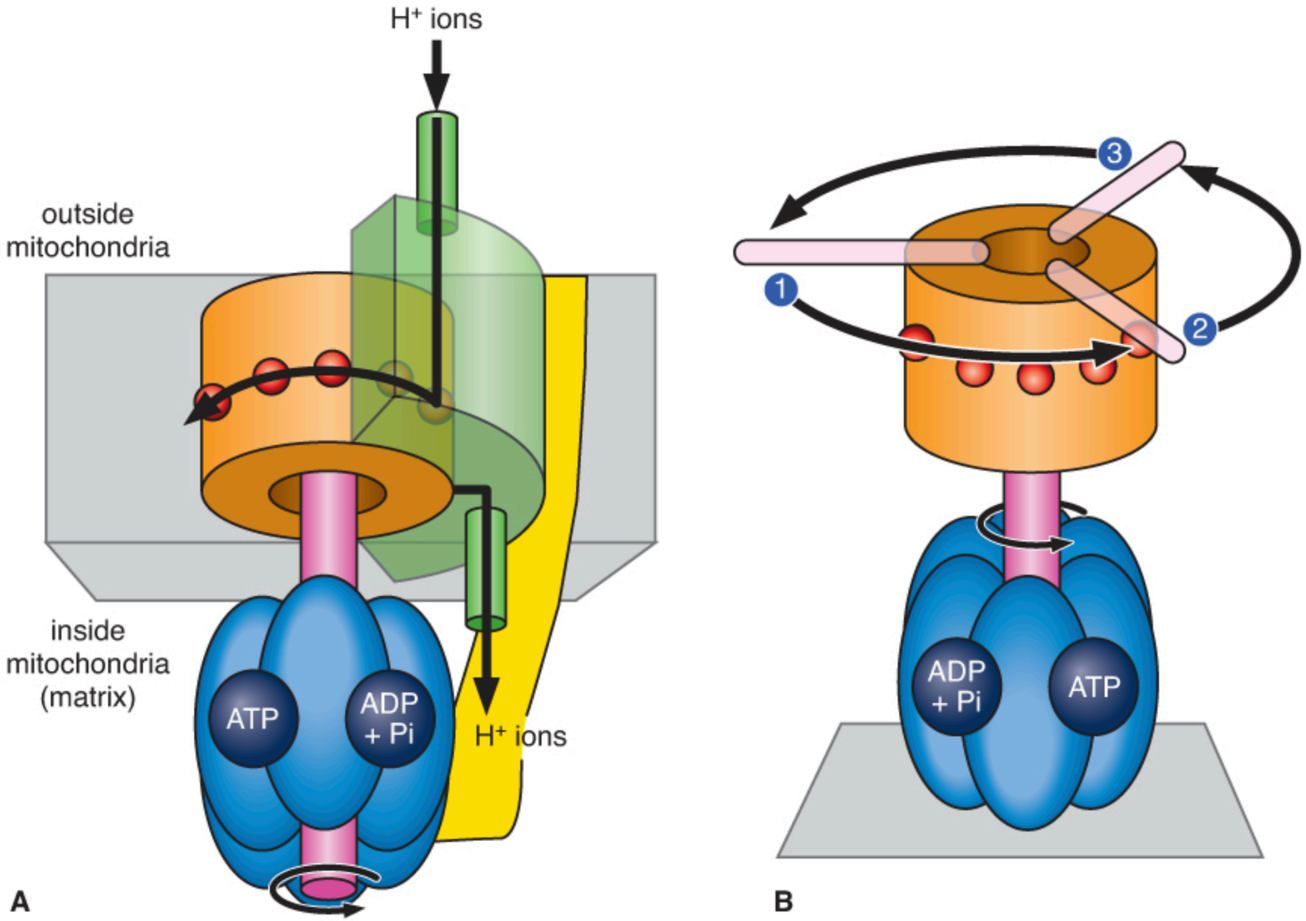
b) not consume oxygen and will make ATP through glycolysis and fermentation.

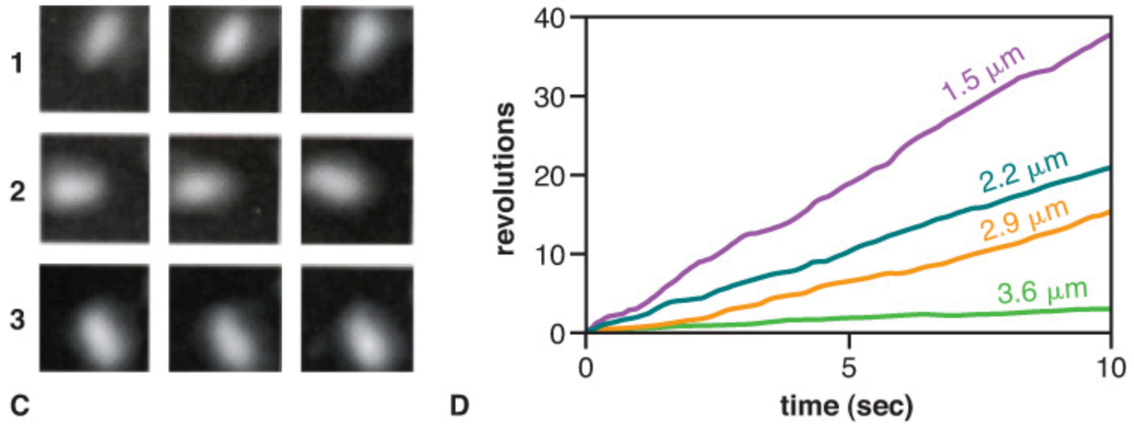
c) not consume oxygen and will make ATP only through substrate-level phosphorylation.

d) consume less oxygen but still make some ATP through both glycolysis and respiration.



Trifecta


H+ ions
outside mitochondria
inside mitochondria (matrix)
ATP
ADP + Pi
H+ ions
A
1
2
3
ADP + Pi
ATP
B


1
2
3
C
40
30
20
10
0
revolutions
1.5 μm
2.2 μm
2.9 μm
3.6 μm
0
5
10
time (sec)
D

Trifecta

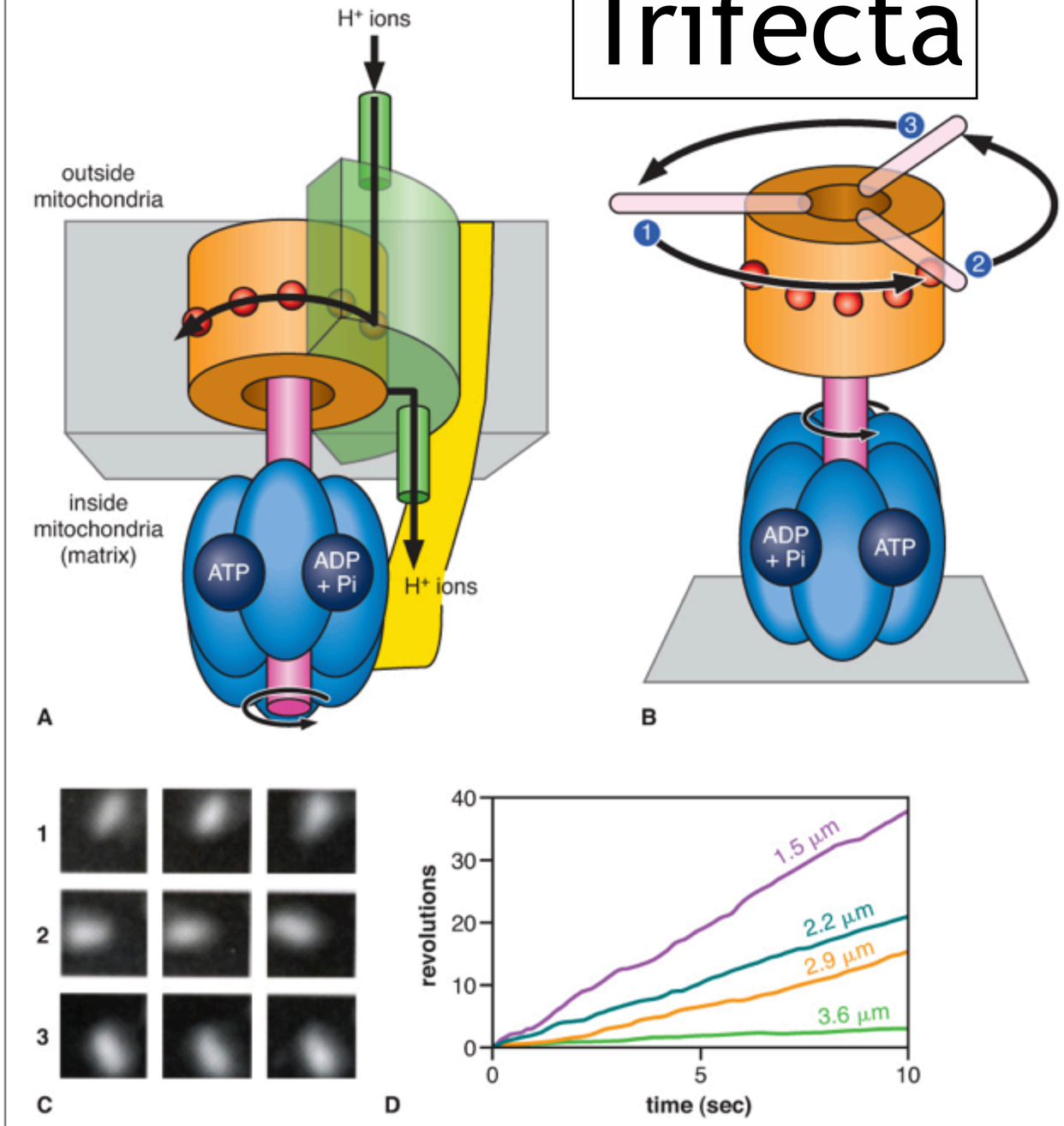
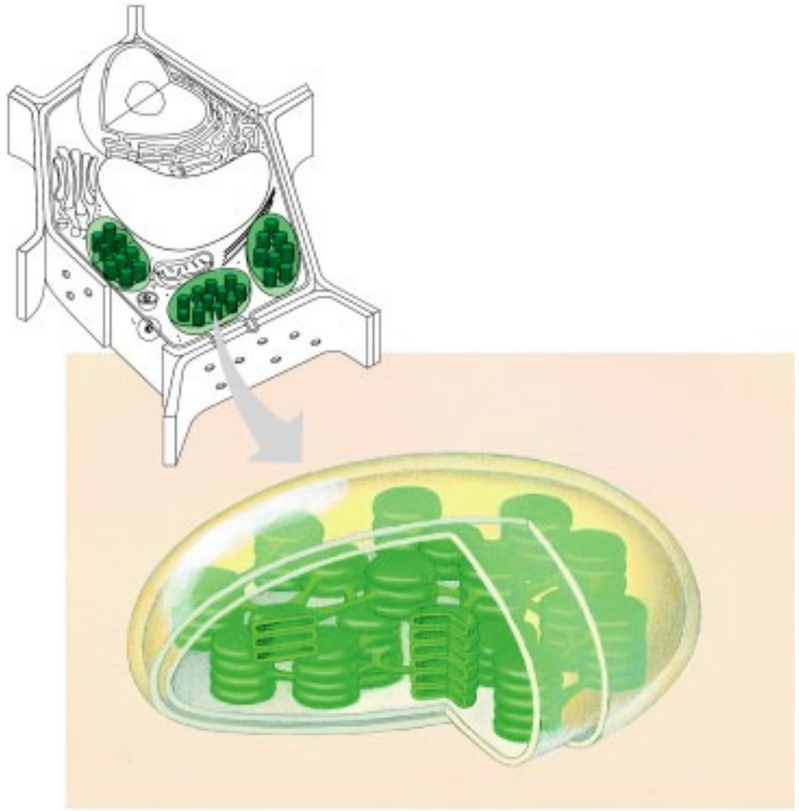
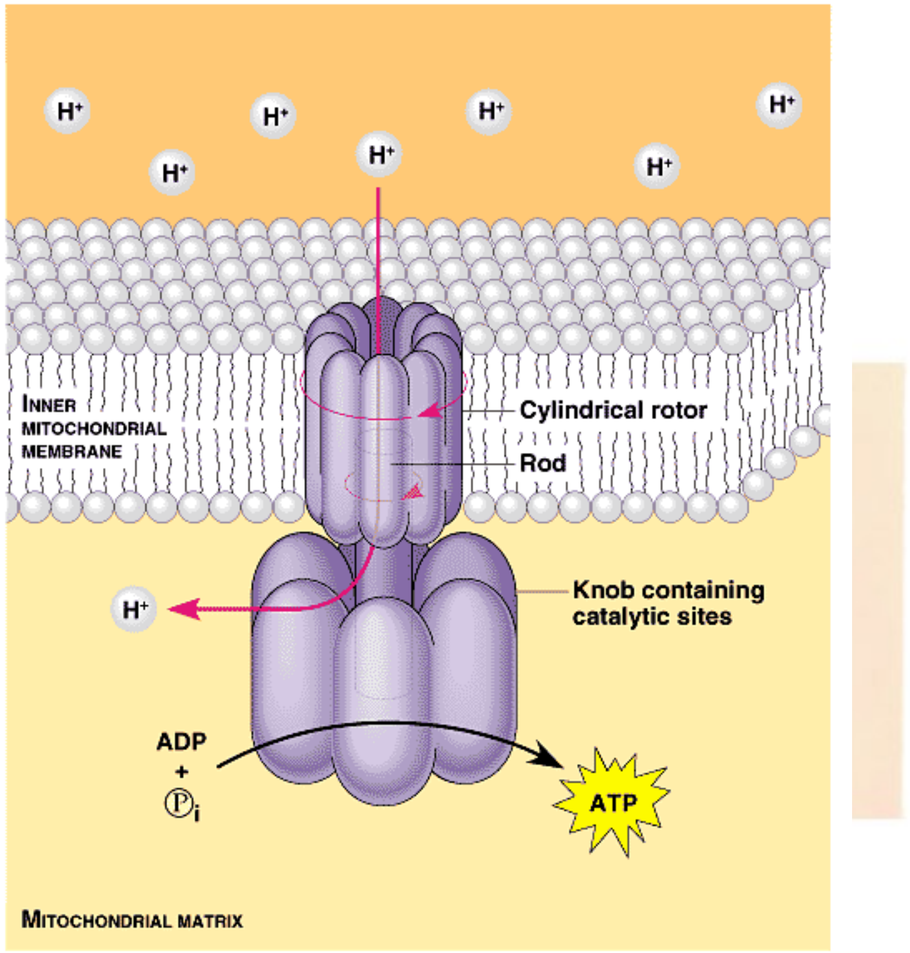


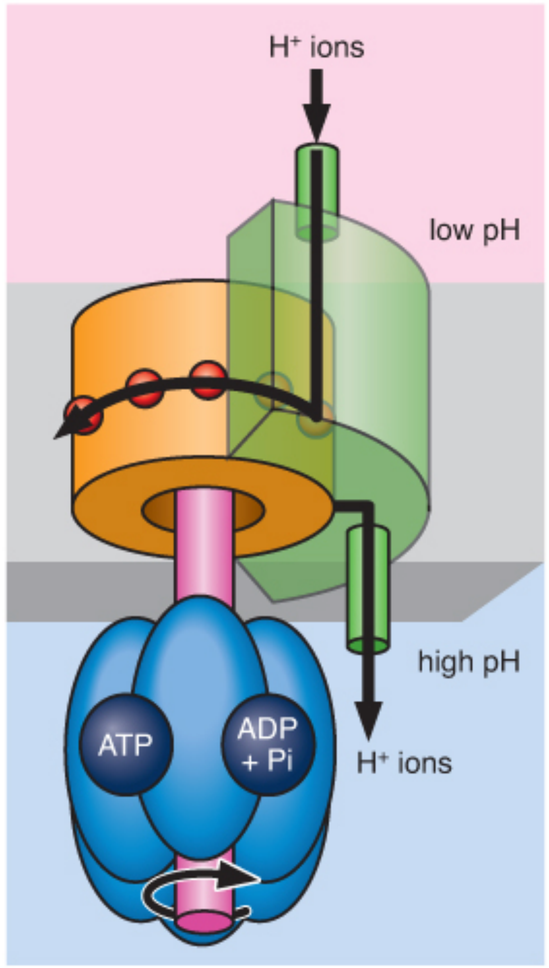
Figure 10.22 ATP synthase spins like a turbine to produce ATP. **A,** Molecular structure of ATP synthase is very similar to a human-made turbine. **B,** Immobilized ATP synthase spins its base backward when consuming ATP as visualized by attached actin rod. **C,** Photos from spinning actin from movie. **D,** Spinning rate of ATP synthase is affected by length of actin rod. You can watch the short actin rod and the long actin rod movies. Panel A from common knowledge and PDB file. Panels B and D modified from Sambongi et al, 1999; figures 1 and 2a. Sambongi, Yoshihiro, Yuko Iko, *et al.* 1999. Mechanical rotation of the c subunit oligomer in ATP synthase (F0F1): Direct observation. Vol. 286: 1722 – 1724. Reprinted with permission from AAAS. Panel C taken from a subset of Yasuda *et al.*, 1998; figure 3e. Reprinted from Yasuda, Ryohei, Hiroyuki Noji, *et al.* 1998. F1-ATPase is a highly efficient molecular moter that rotates with discrete 120º steps. Cell. Vol. 93: 1117 – 1124. , Copyright 1998, with permission from Elsevier.

Paul Boyer: I think it actually twists!

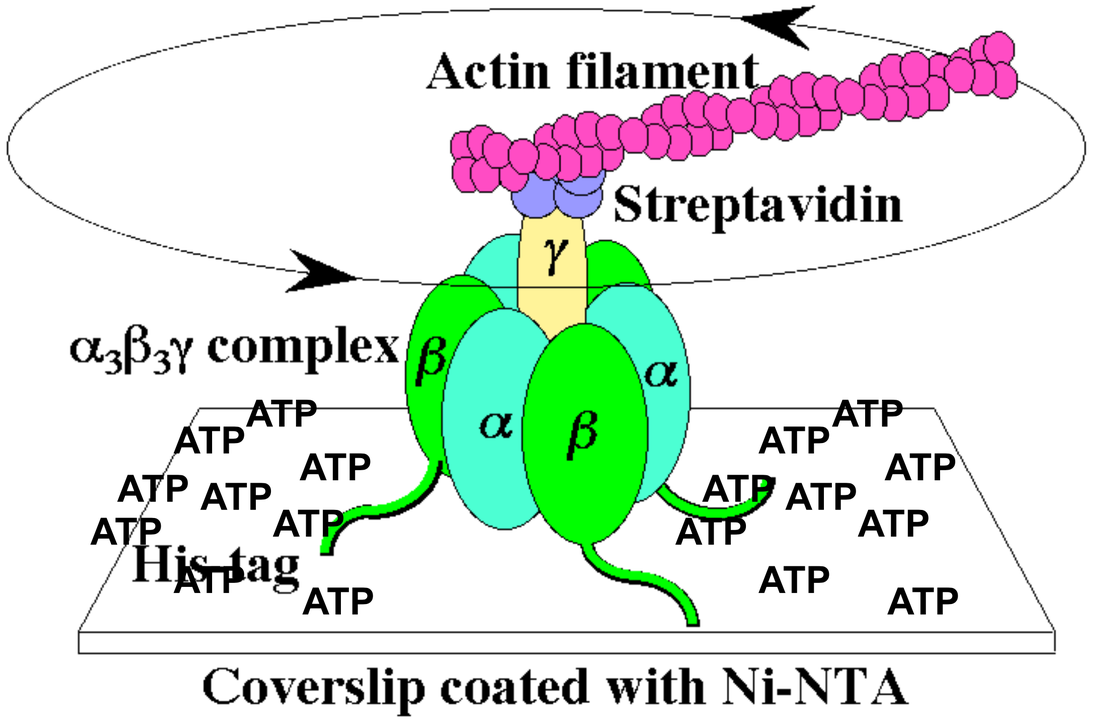




Paul Boyer:
I think it is *Rotational Catalysis*



Masasuke Yoshida “check this out.”



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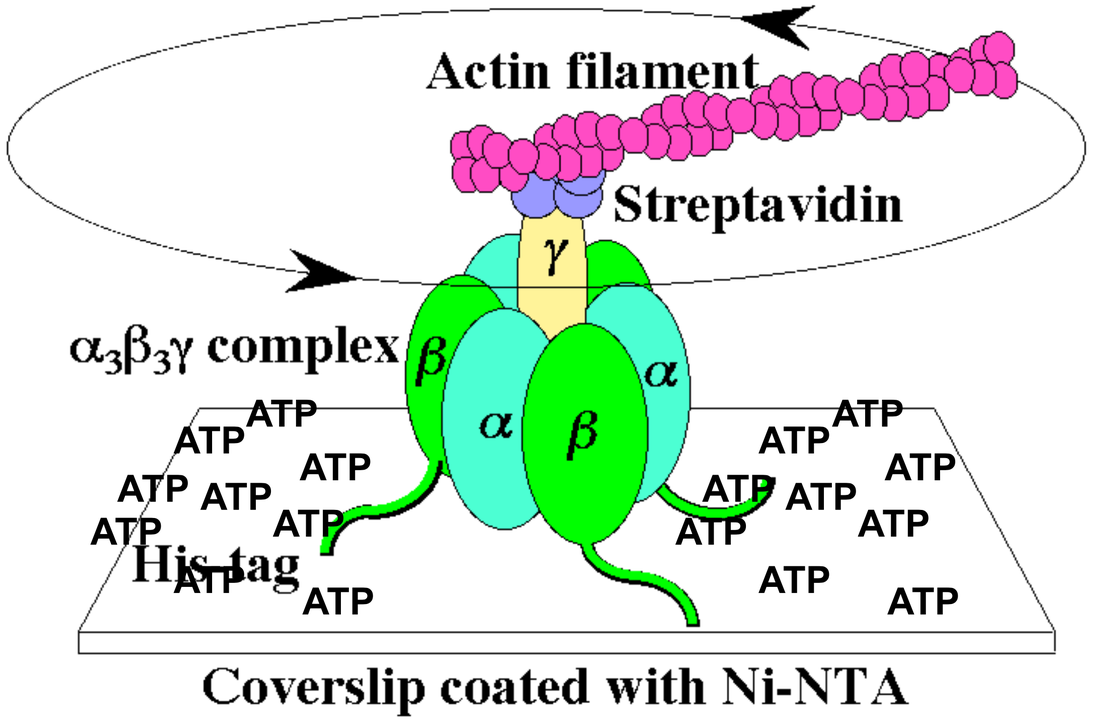

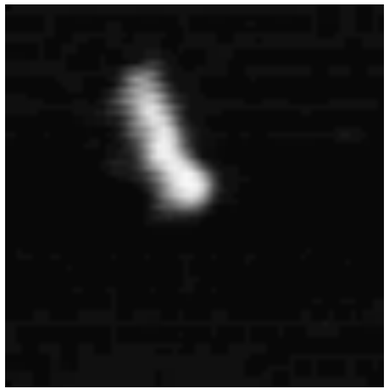

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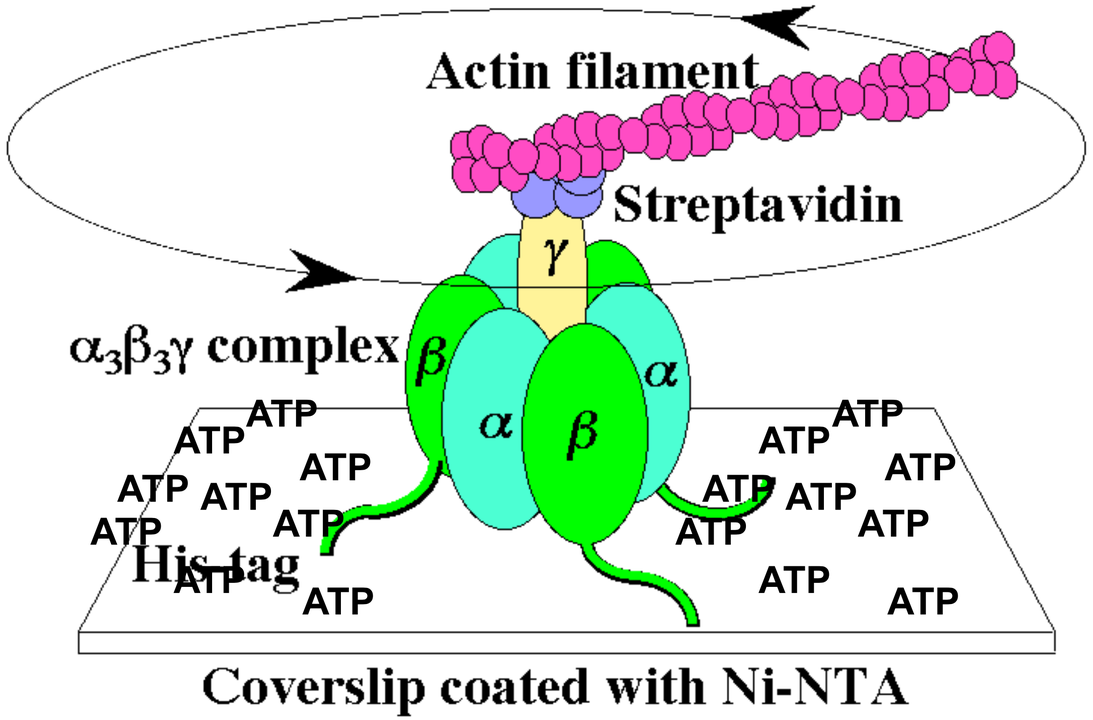
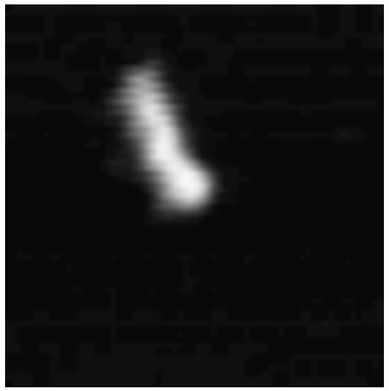
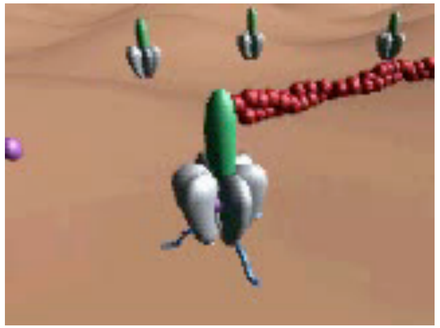






Why do we eat?

Why do we breathe?

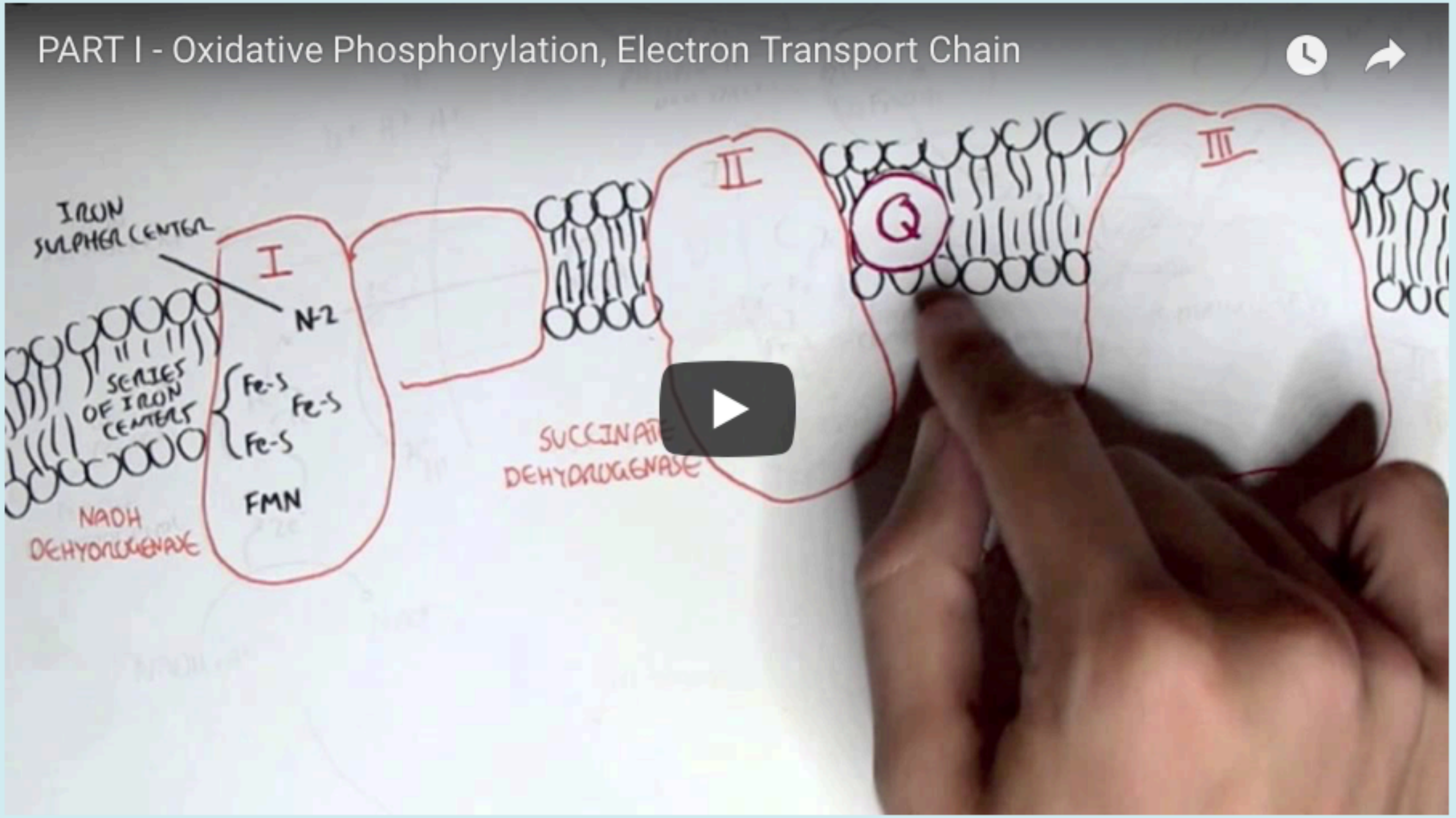
Learning Objectives

Oxidative Phosphorylation (ETC)

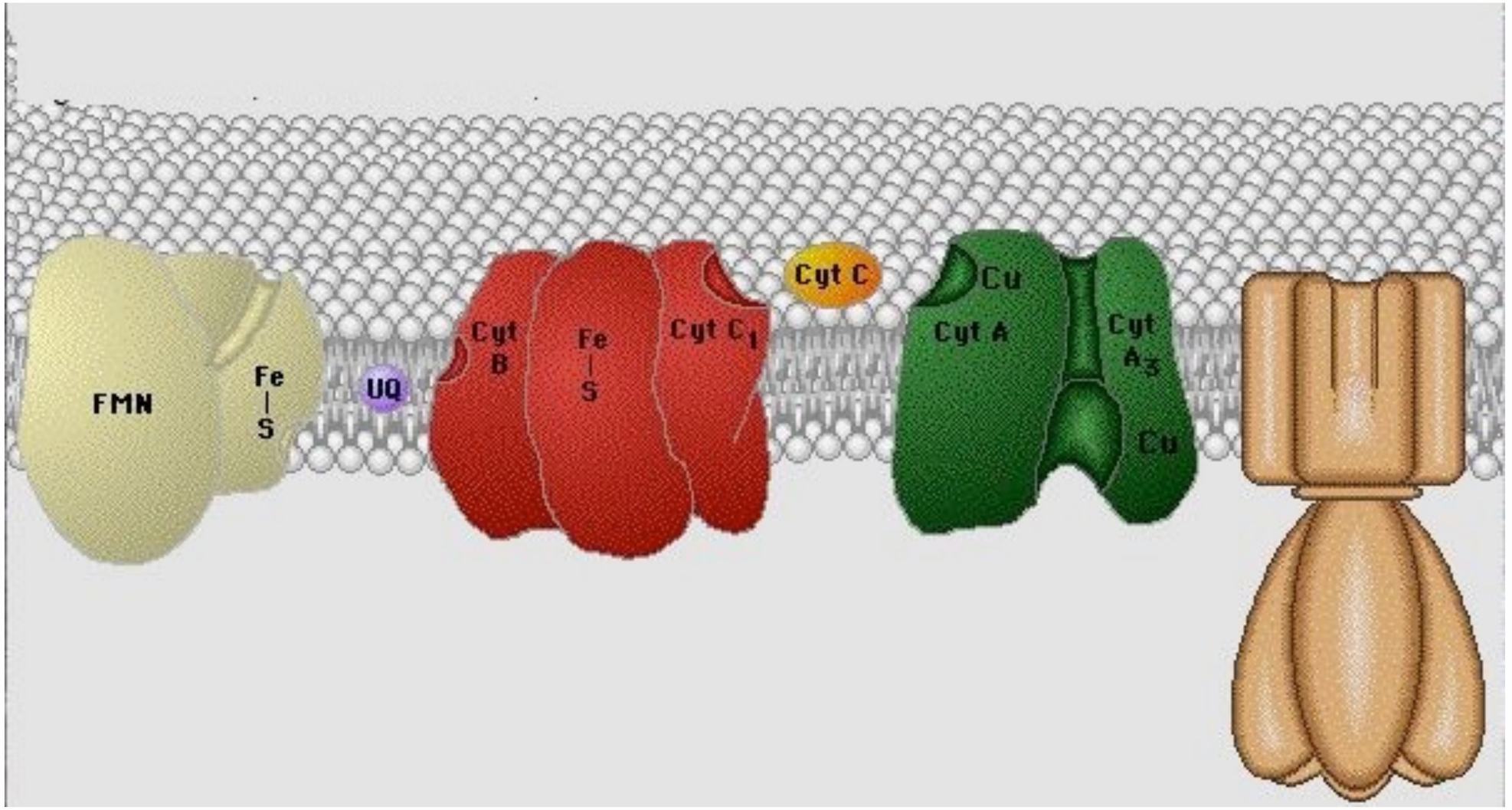
- Discuss the importance of electrons in the transfer of energy
- Describe how electrons move through the electron transport chain and what happens to their energy levels
- Explain how a proton (H+) gradient is established and maintained by the electron transport chain

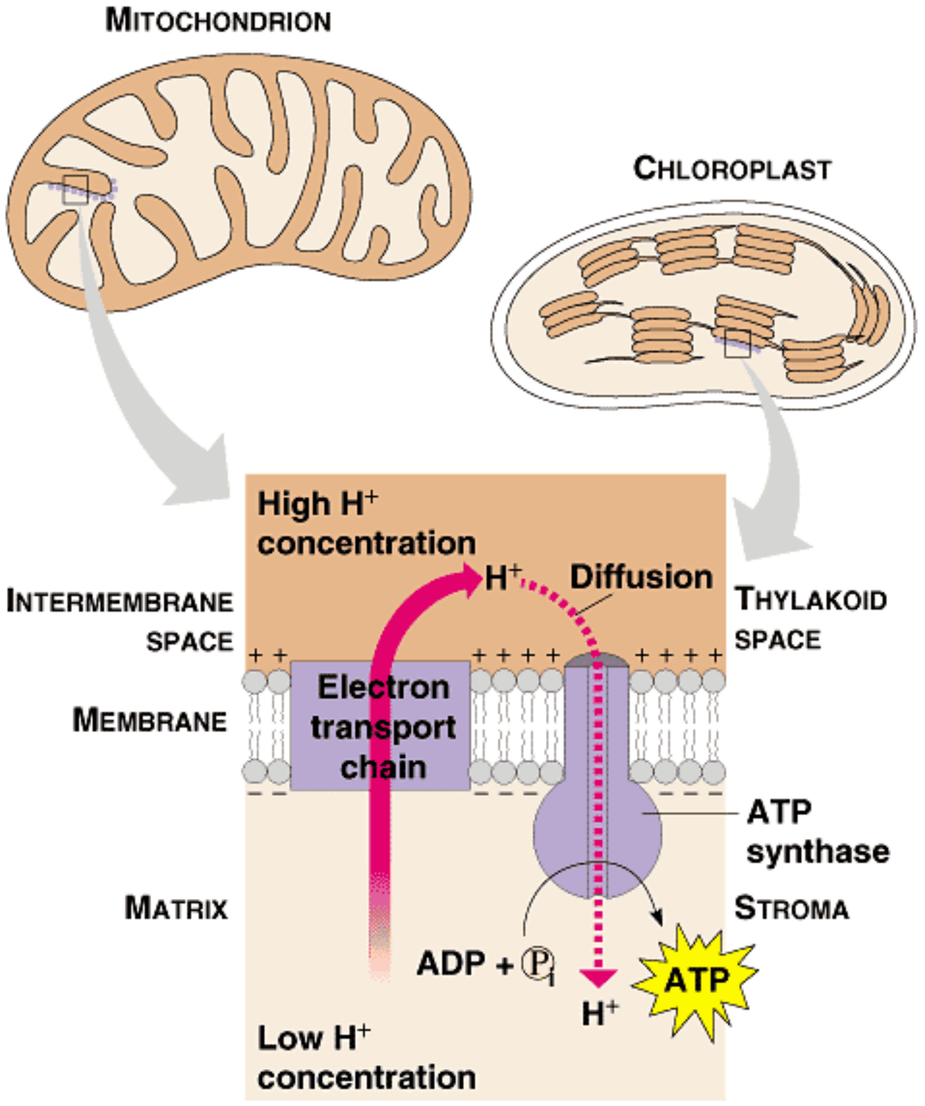
Link to Learning: https://youtu.be/jU2lnPwTXP0

Video: Oxidative Phosphorylation, Electron Transport Chain.

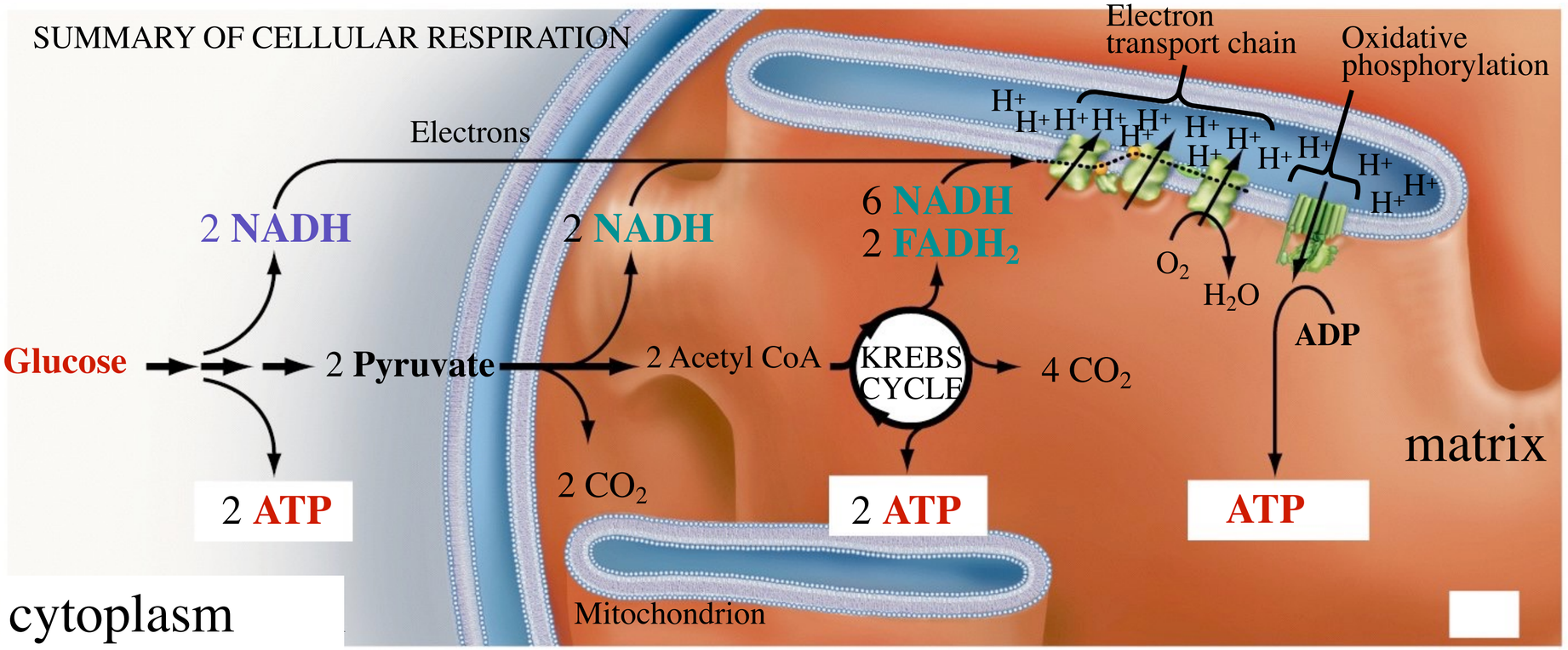


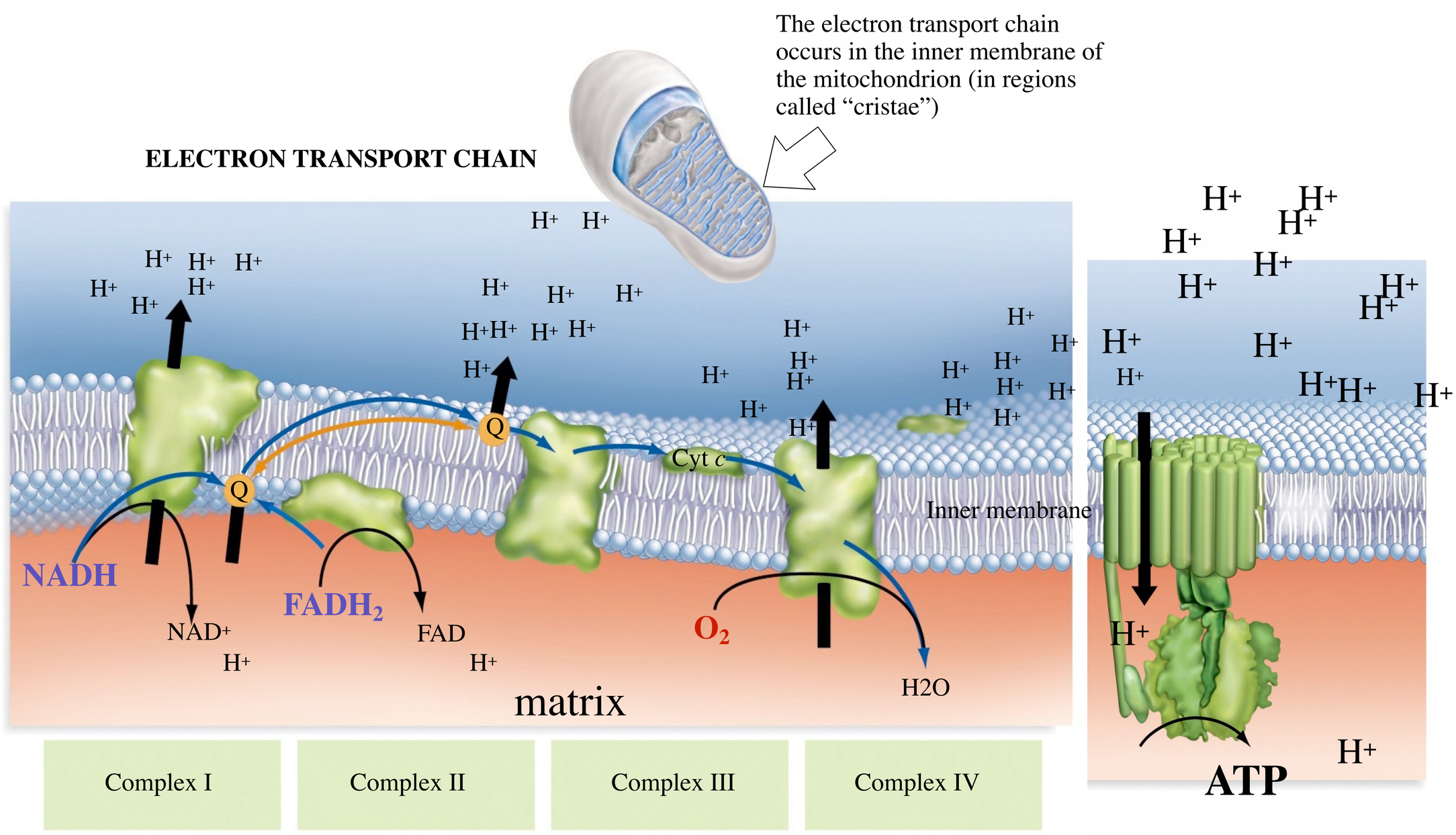
What does this remind you of?



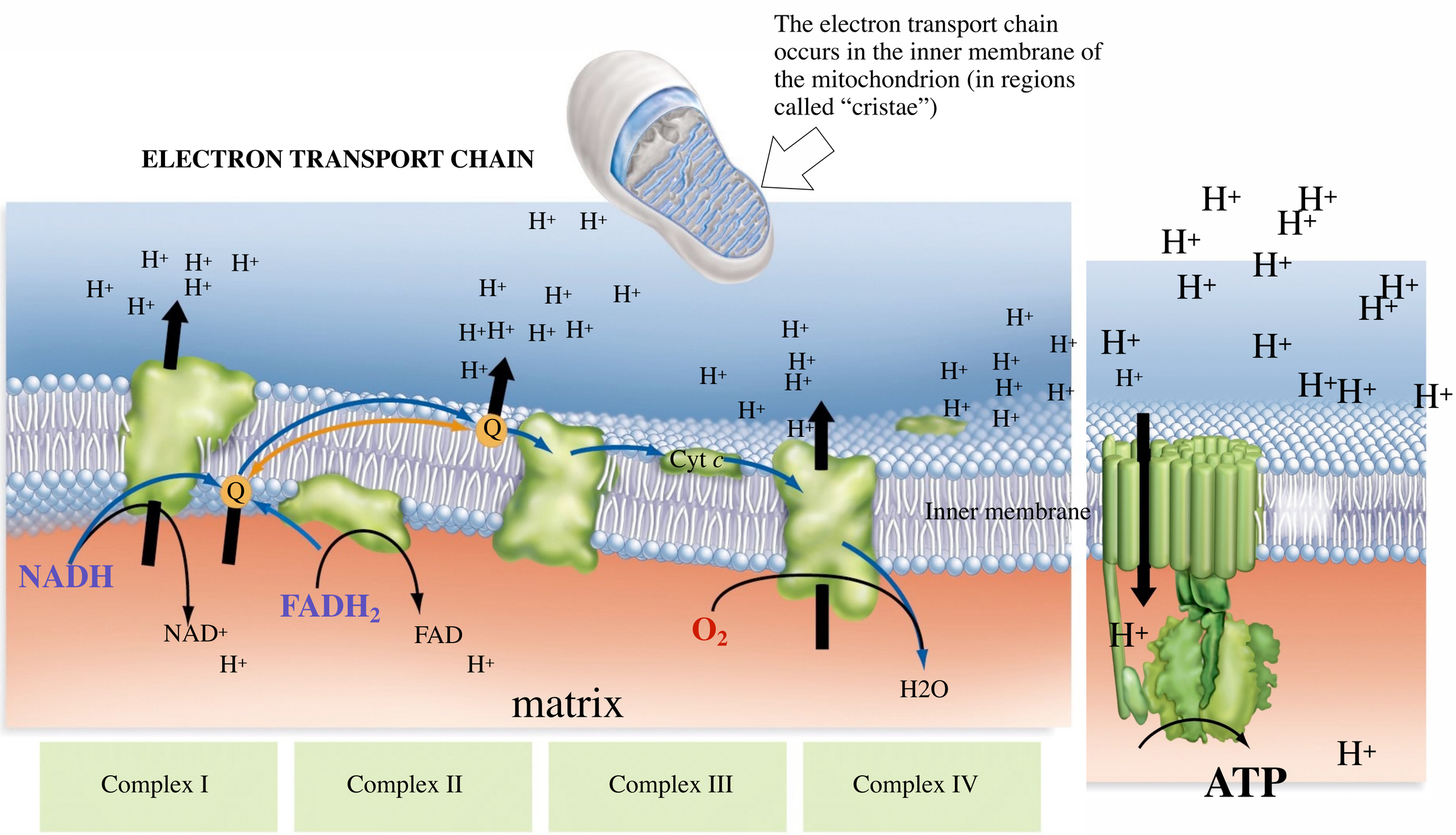


1. What is backwards?





1. What is backwards? 2. How much ATP? 3. Poke hole?

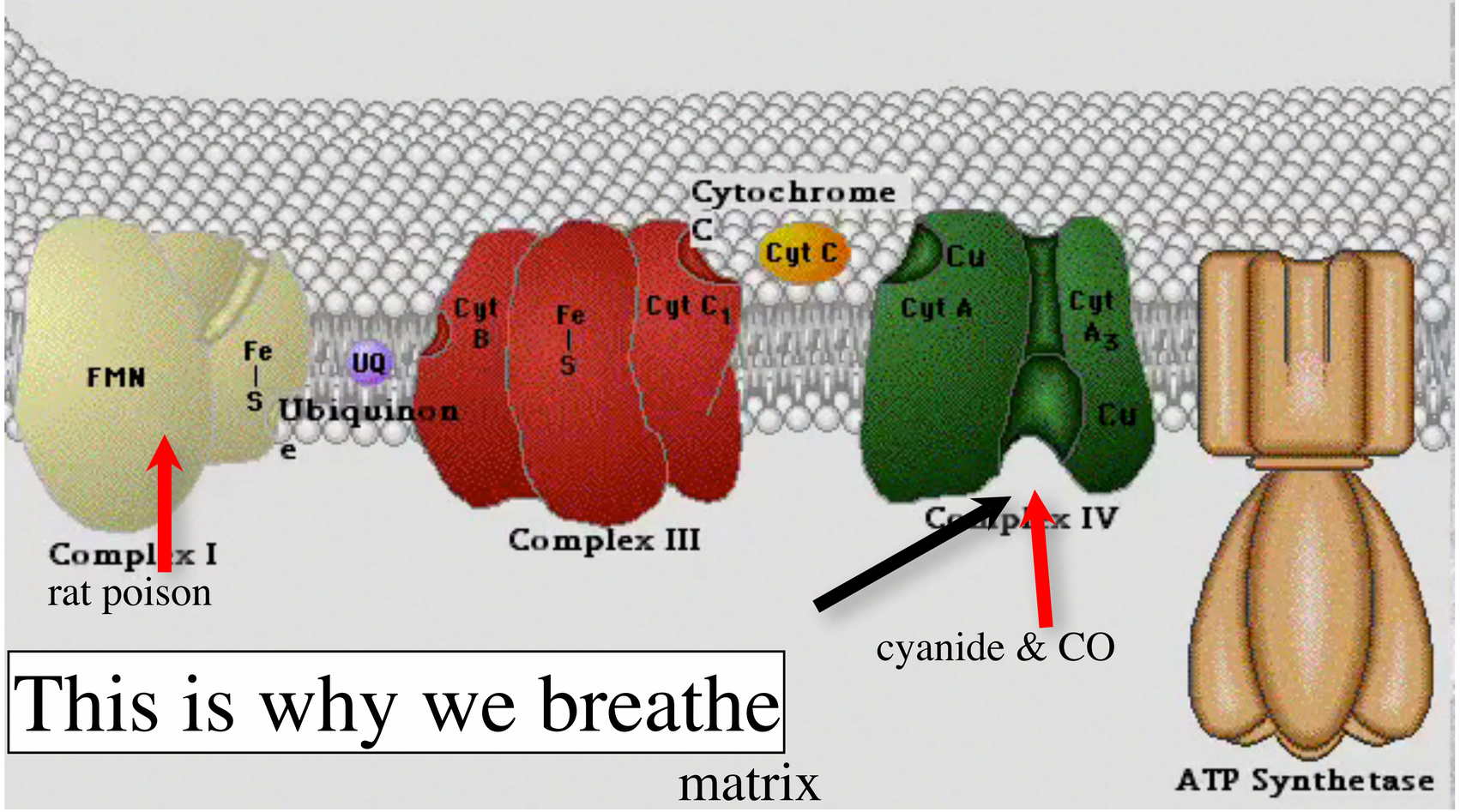


NADH-Q Reductase, FADH-Q Reductase, Cytochrome Reductase, Cytochrome Oxidase

(NADH dehydrogenase, FADH dehydrogenase, Cytochrome complex, Cytochrome Oxidase)

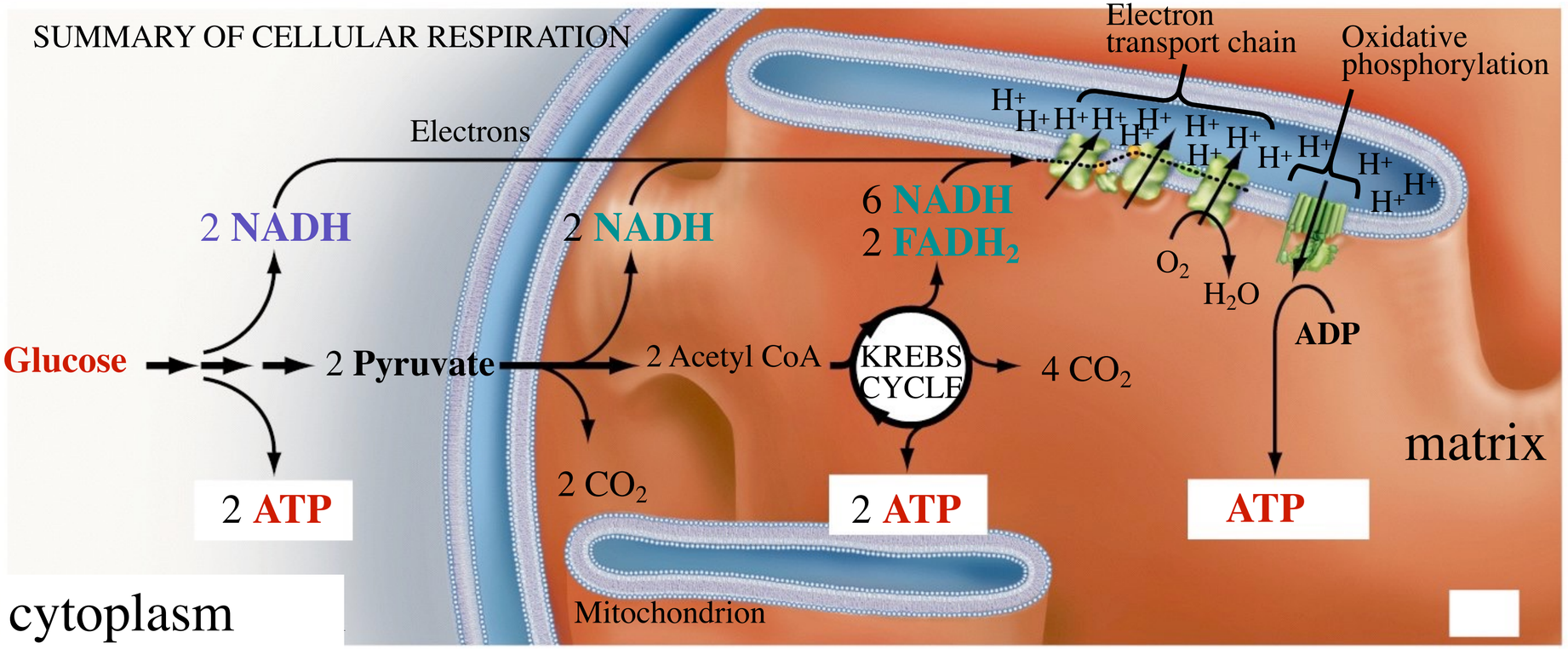
This is why we eat

The enzymes and proteins involved in oxidative
membrane proteins, which act as electron transp
these are organized into just 4 or 5 large complexes embedded in the inner membrane of the mitochondrion.



This is why we breathe

matrix


SUMMARY OF CELLULAR RESPIRATION
Electron transport chain
Oxidative phosphorylation
Electrons
2 NADH
2 NADH
6 NADH
2 FADH2
Glucose
2 Pyruvate
2 Acetyl CoA
KREBS CYCLE
4 CO2
O2
H2O
ADP
matrix
2 CO2
2 ATP
2 ATP
ATP
cytoplasm
Mitochondrion

Ahh yes good times