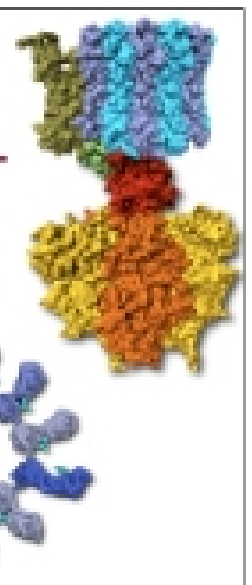
Lecture 22

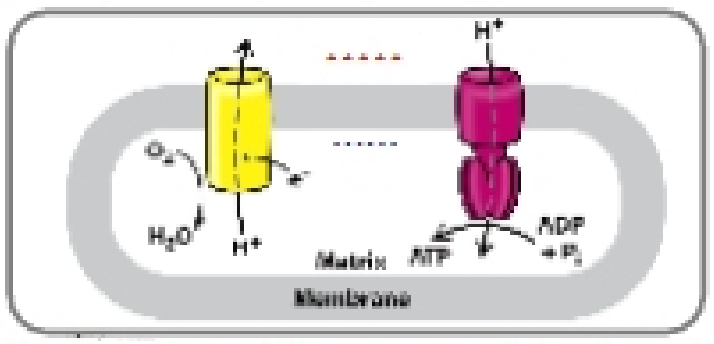
ATP Synthesis

Uncouplers of Oxidative Phosphorylation

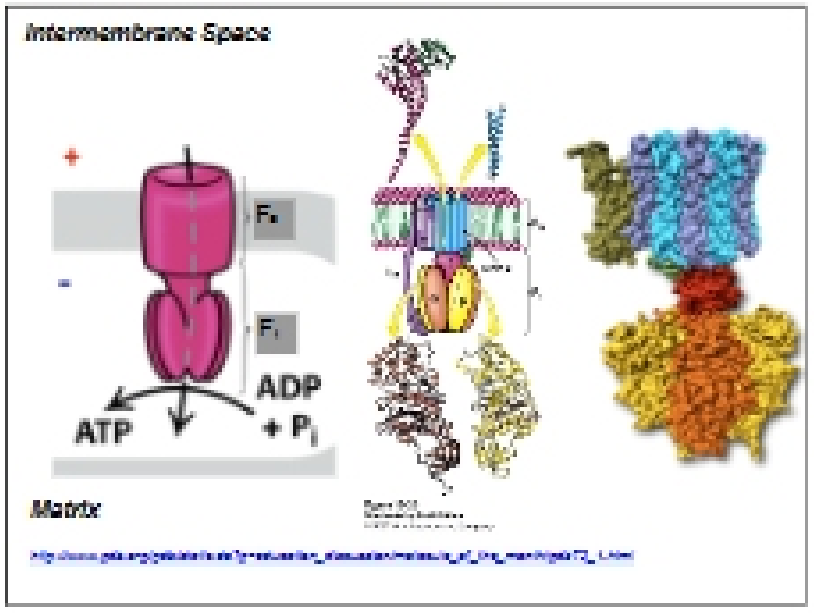
Poisons of Oxidative Phosphorylation

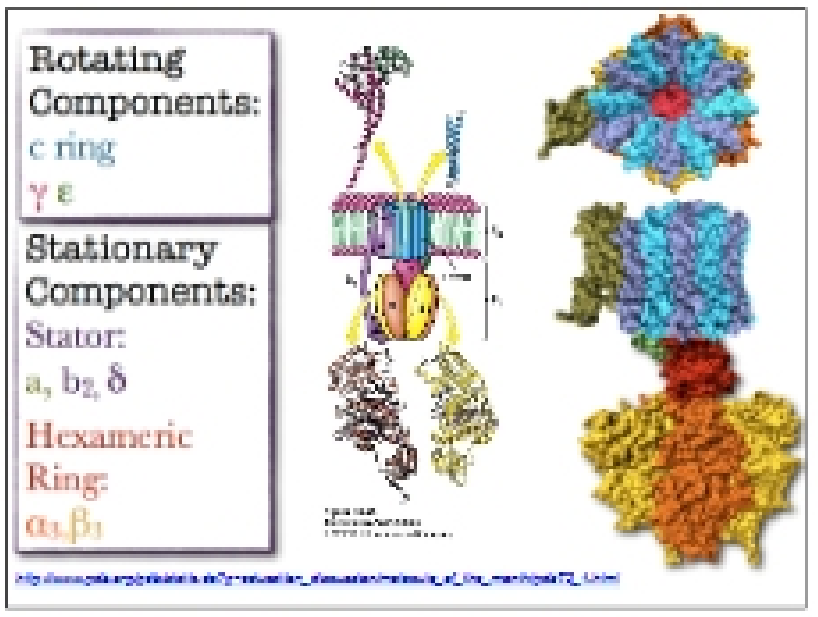


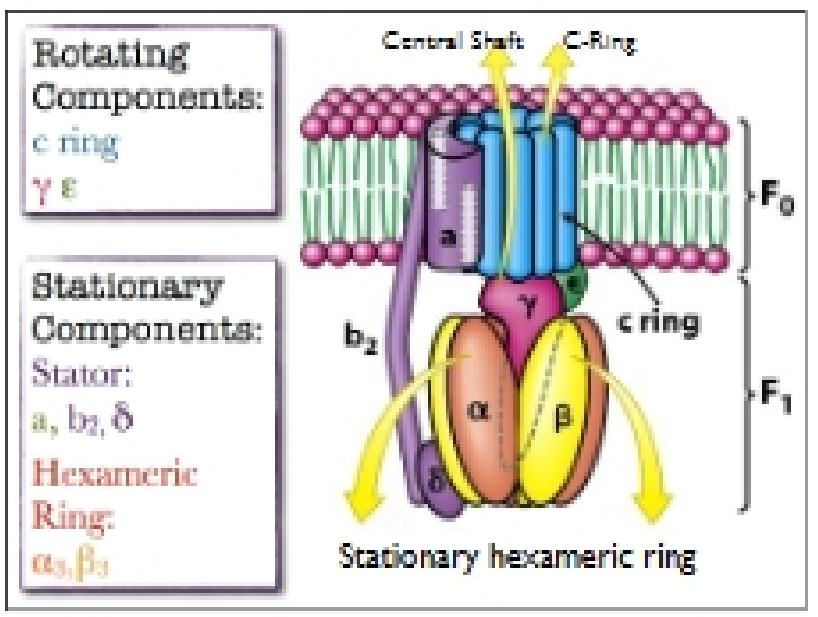
Energy released during electron transfer can be used to pump H^+ into into the inter-membrane space, creating a proton concentration gradient, and electrical potential across the inner membrane. This is called chemiosmotic potential.

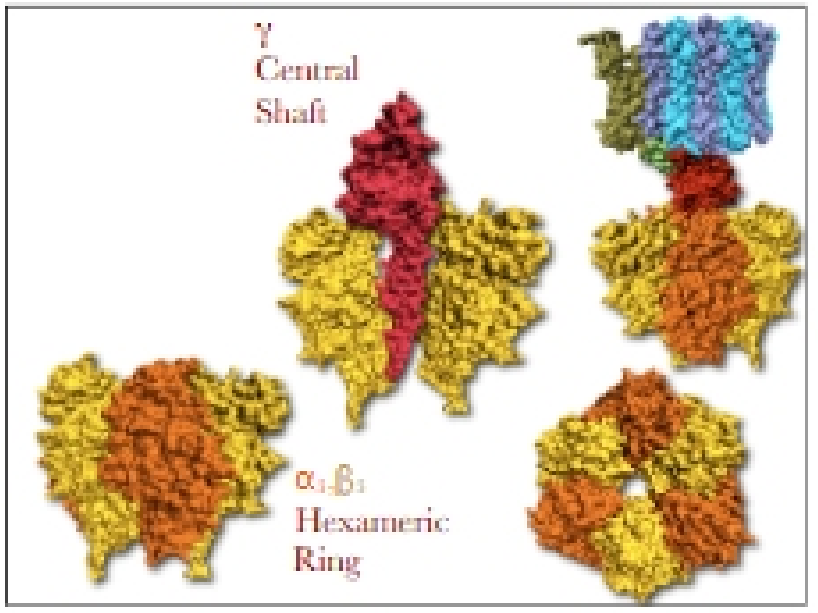


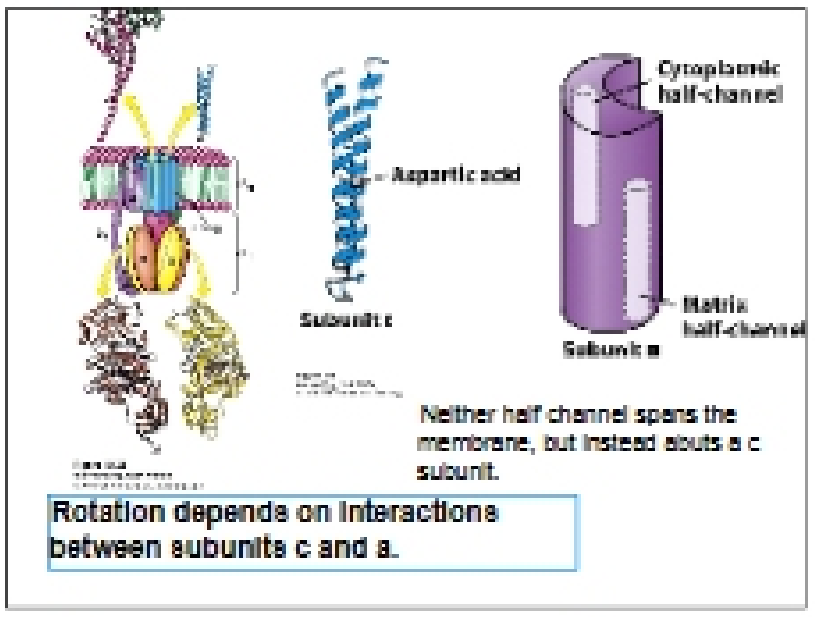
Chemiosmotic potential causes protons to flow flow back into the mitochondrial matrix, which turns a turbine-like molecular motor which helps to synthesize ATP.

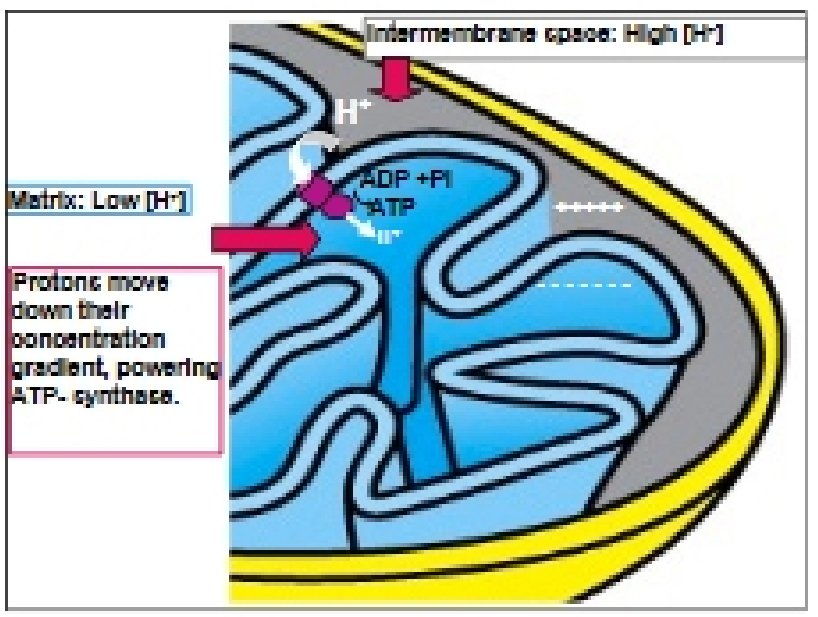


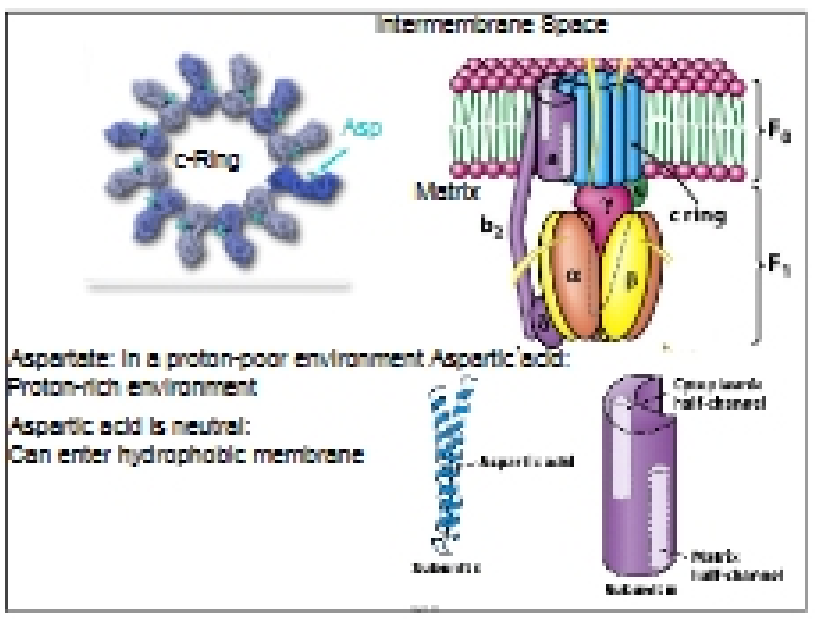

Rotating Components:
c ring
γ ε
Stationary Components:
Stator:
a, b2, δ
Hexameric Ring:
α3,β3


Rotating Components:
c ring
γ ε
Stationary Components:
Stator:
a, b2, δ
Hexameric Ring:
α3,β3
Central Shaft
C-Ring
a
γ
ε
c ring
b2
α
β
δ
F0
F1
Stationary hexameric ring


γ
Central
Shaft
α3,β3
Hexameric
Ring


Cytoplasmic half-channel
Aspartic acid
Subunit c
Matrix half-channel
Subunit a
Neither half channel spans the membrane, but instead abuts a c subunit.
Rotation depends on interactions between subunits c and a.


Intermembrane space: High [H+]
H+
ADP +Pi
ATP
Matrix: Low [H+]
Protons move down their concentration gradient, powering ATP- synthase.


Intermembrane Space
c-Ring
Asp
Matrix
b_2
c ring
F_0
F_1
Aspartate: In a proton-poor environment Aspartic acid: Proton-rich environment
Aspartic acid is neutral: Can enter hydrophobic membrane