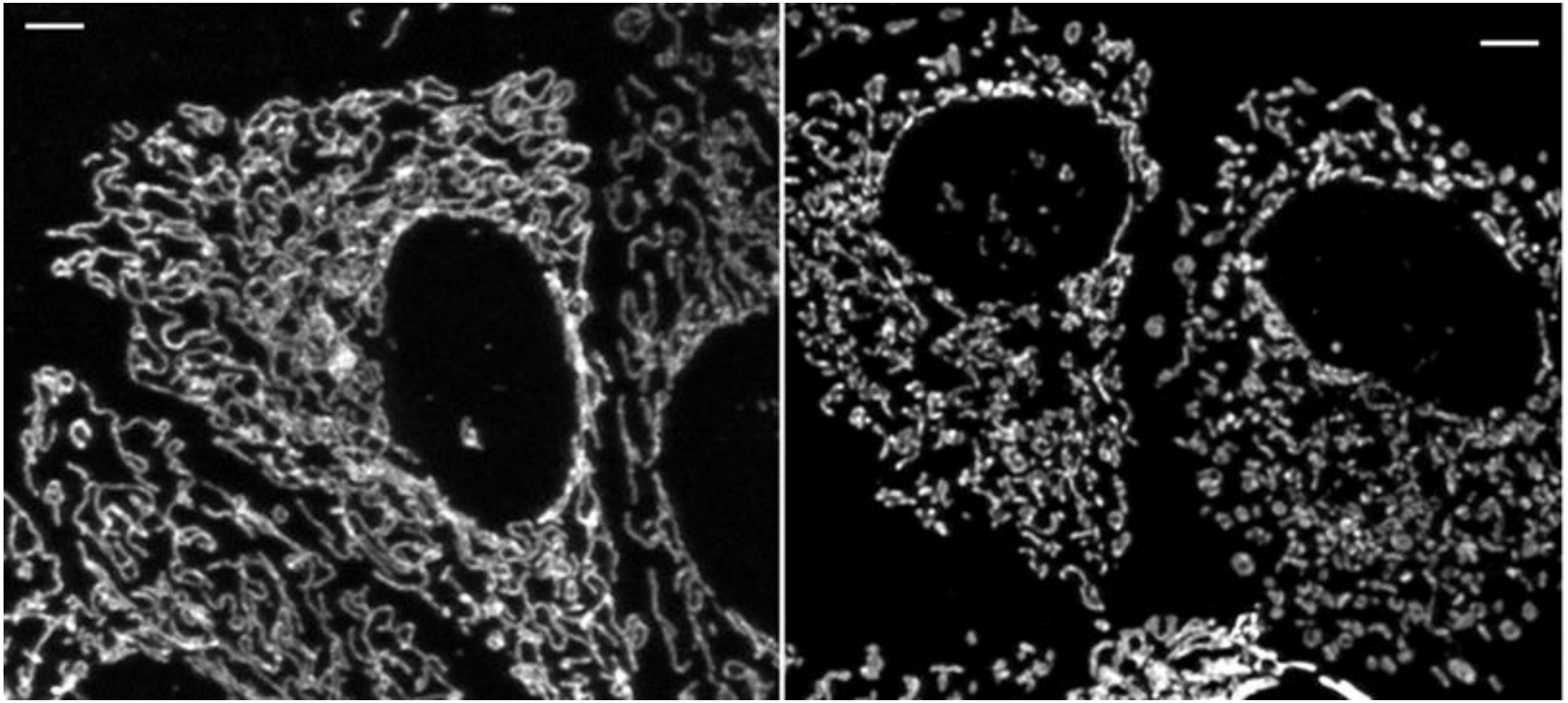
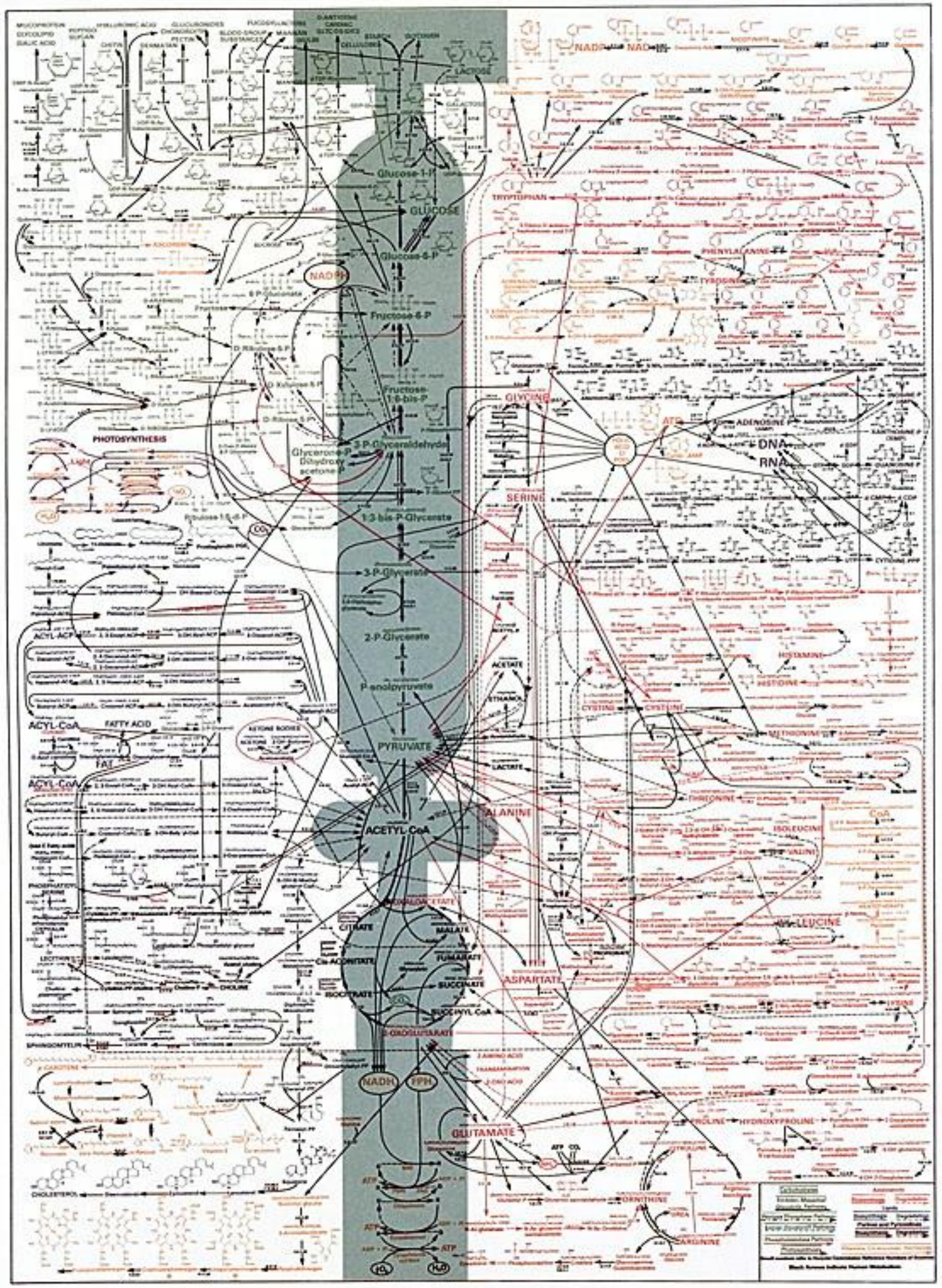
Fosforilação Oxidativa




Glucose-1-P
GLUCOSE
Glucose-6-P
NADPH
Fructose-6-P
Fructose-1,6-bis-P
3-P-Glyceraldehyde
Glycerone-P
Dihydroxy acetone-P
1,3-bis-P-Glycerate
3-P-Glycerate
2-P-Glycerate
P-enolpyruvate
PYRUVATE
ACETYL-CoA
CITRATE
Cis-ACONITATE
ISOCITRATE
MALATE
FUMARATE
SUCCINATE
SUCCINYL CoA
2-OXOGLUTARATE
NADH
FPH
GLUTAMATE
ASPARTATE
ALANINE
LACTATE
ACETATE
SERINE
GLYCINE
TRYPTOPHAN
PHENYLALANINE
TYROSINE
HISTIDINE
CYSTEINE
METHIONINE
THREONINE
ISOLEUCINE
VALINE
LEUCINE
LYSINE
PROLINE
HYDROXYPROLINE
ORNITHINE
ARGININE
DNA
RNA
ATP
NADP
NAD
PHOTOSYNTHESIS
ACYL-ACP
ACYL-CoA
FATTY ACID
FAT
KETONE BODIES
CHOLINE
SPHINGOMYELIN
CHOLESTEROL
LACTOSE

Oxidação Completa da Glicose

$C_6H_{12}O_6 + 6\ O_2 +$ $\quad\longrightarrow\quad$ $6\ CO_2 + 6\ H_2O$

$36\text{-}38\ ADP + 36\text{-}38\ P_i$ $\quad\longrightarrow\quad$ $+\ 36\text{-}38\ ATP$

Via Glicolítica gastou: 1 glicose, 2 ADP, 2 P_i, 2 NAD^+
gerou: 2 ATP, 2 NADH

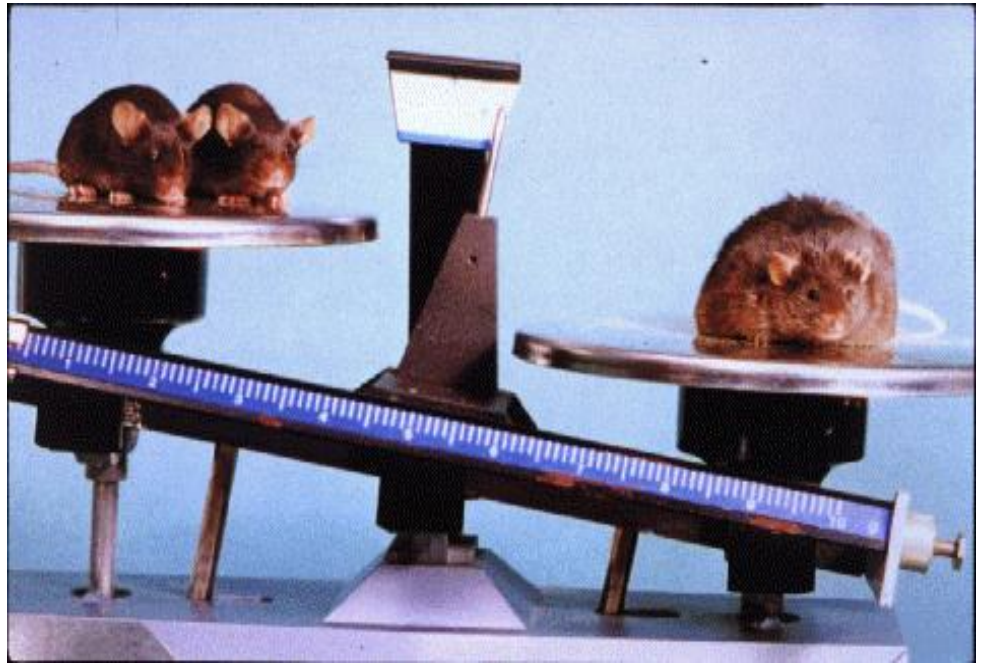
Formação de Acetil-CoA gastou: 2 NAD^+
gerou: 2 CO_2, 2 NADH

Ciclo Ac. Cítrico gastou: 6 NAD^+, 2 FAD, 2 GDP, 2 Pi, 2 AcCoA
gerou: 4 CO_2, 6 NADH, 2 $FADH_2$, 2 GTP/ATP

Ganho de Peso e Acoplamento

Levine JA, Eberhardt NL, Jensen MD. (1999) Role of nonexercise activity thermogenesis in resistance to fat gain in humans. *Science* 283:212-214.

Jucker BM, Dufour S, Ren J, Cao X, Previs SF, Underhill B, Cadman KS, Shulman GI. (2000) Assessment of mitochondrial energy coupling in vivo by 13C/31P NMR. *Proc. Natl. Acad. Sci. U.S.A.* 97:6880-6884.



Potencial de Óxido-Redução (E^0)

- Medida da afinidade por elétrons, em Volts

$NAD^+ + 2e^- \leftrightarrow NADH$ $\quad E^0 = -0,32V$

$Piruvato + 2e^- \leftrightarrow Lactato$ $\quad E^0 = -0,19V$

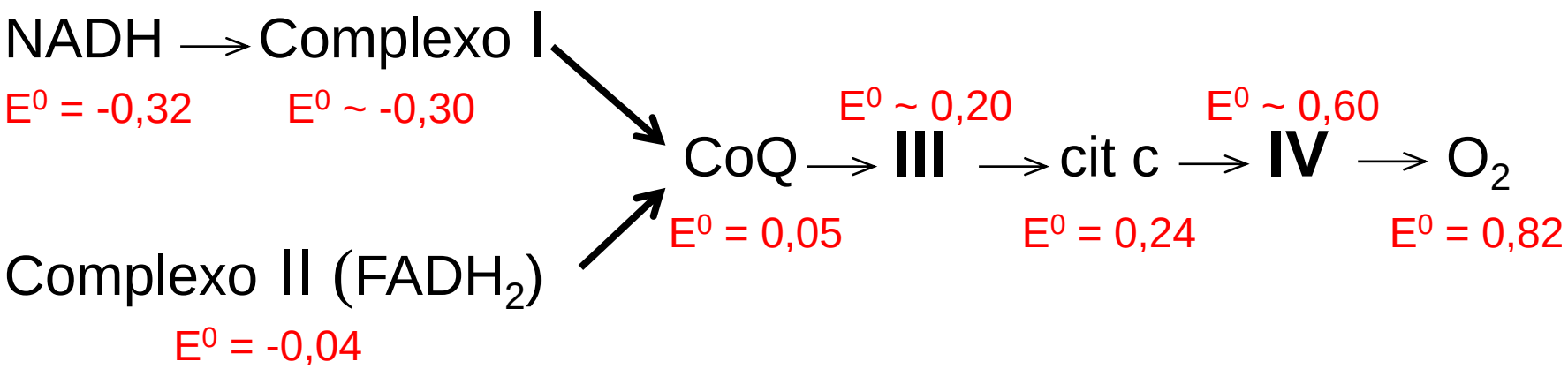
$Piruvato + NADH \leftrightarrow Lactato + NAD^+$ $\quad \Delta E^0 = 0,13V$

$\Delta G^0 = -nF\Delta E^0$, onde n = número de elétrons

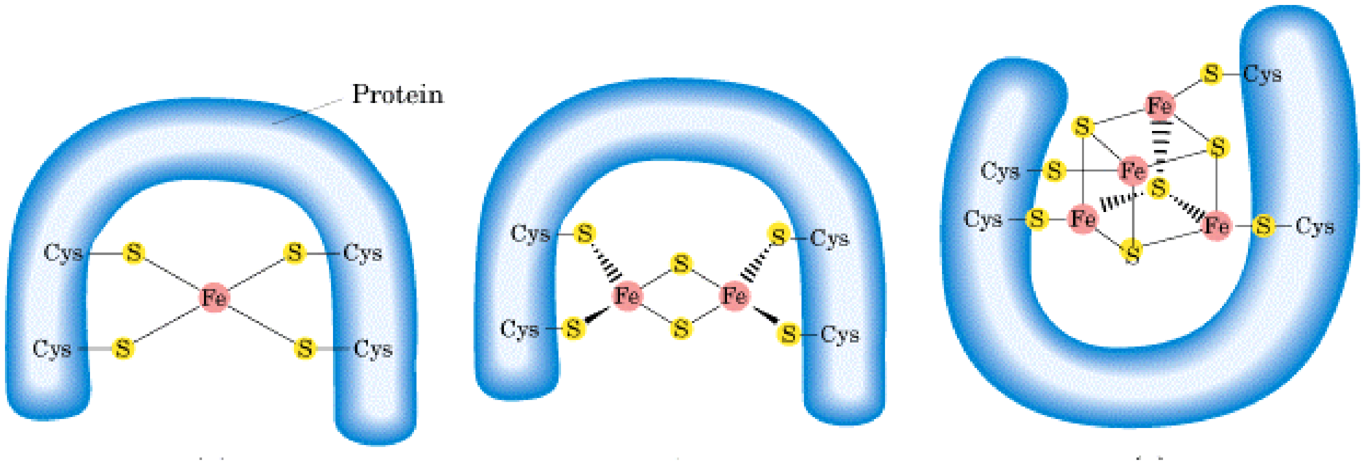
$F = 23\ kcal.V^{-1}.mol^{-1}$

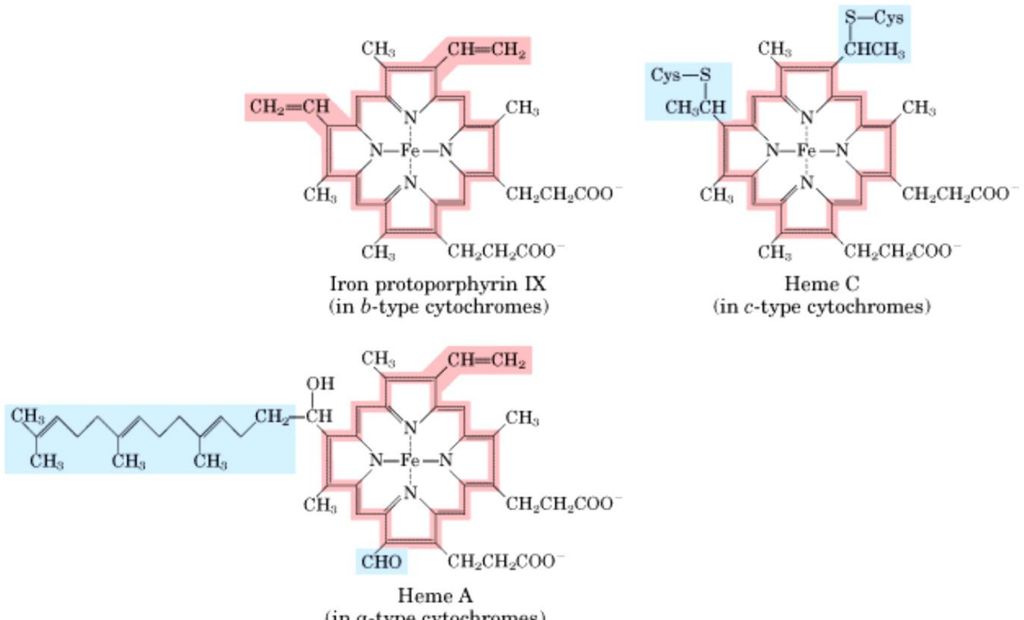
Cadeia de Transporte de Elétrons

- NADH → O_2
- Seqüência de reações de óxido-redução
- Componentes da membrana mitocondrial interna

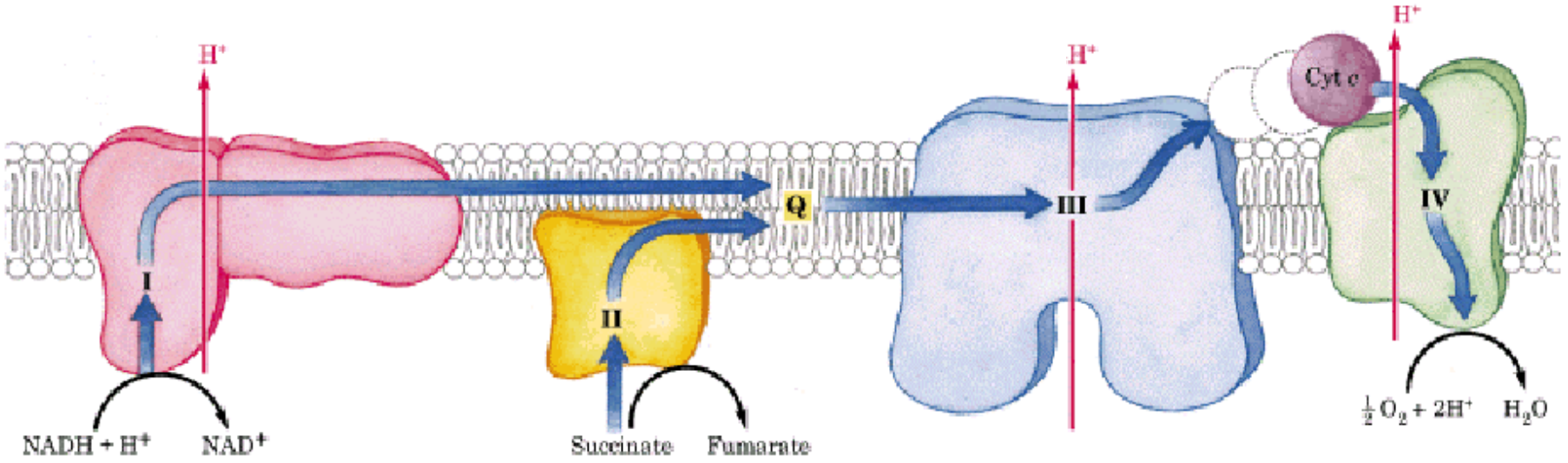


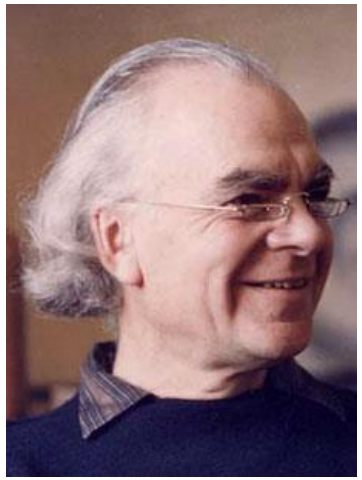
Centros Fe-S e Grupos Heme





Cadeia de Transporte de Elétrons

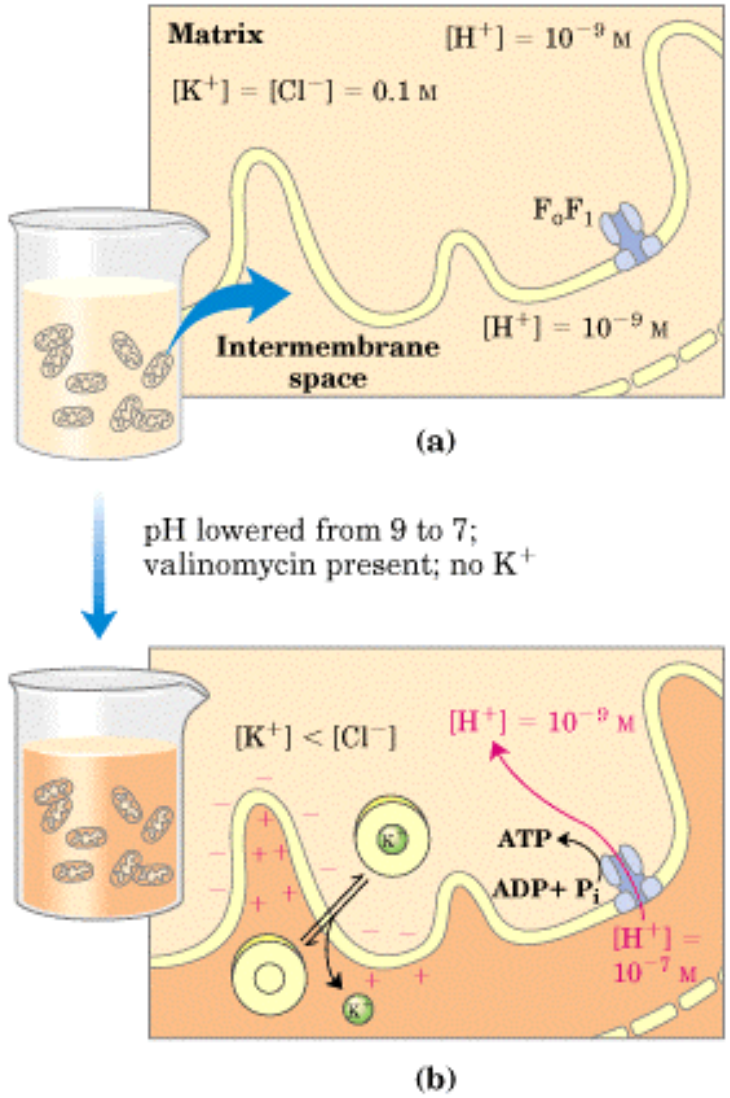




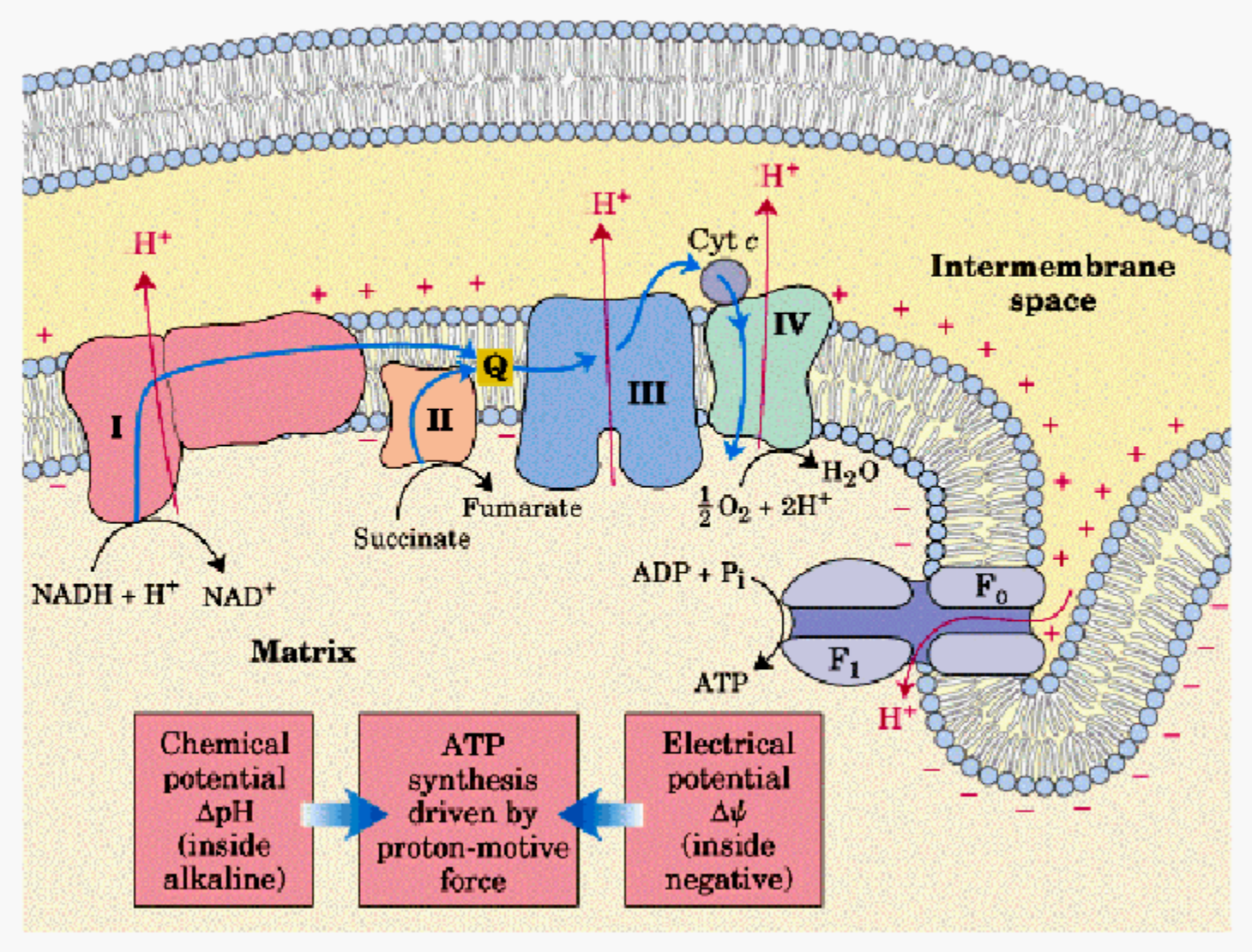
Peter Mitchell, Prêmio Nobel em Química, 1978

“Chemiosmotic hypothesis”

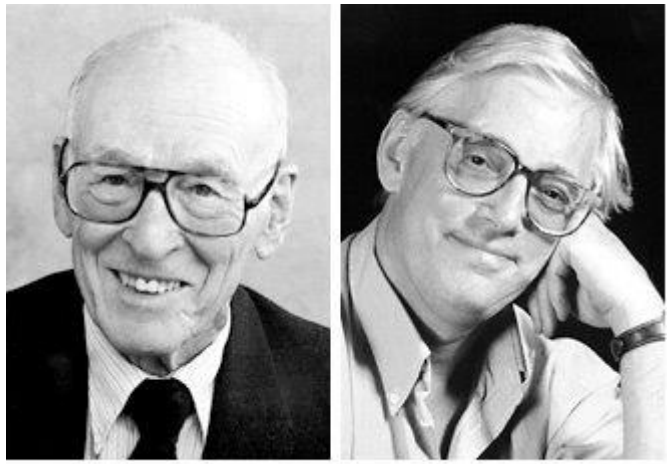
Gradiente de Prótons Mitocondrial



Gradiente de Prótons Mitocondrial



ATPsintase (ATPase)

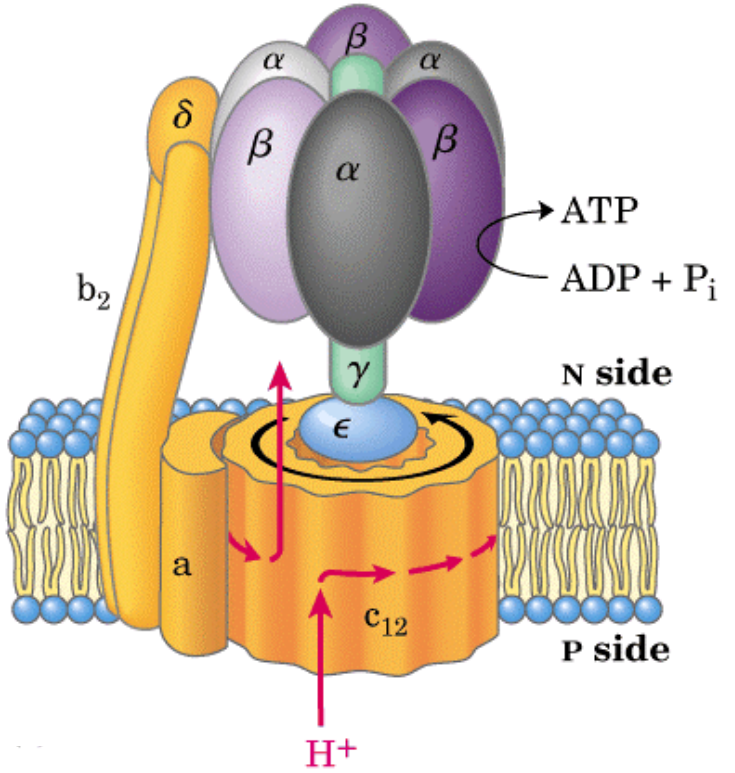


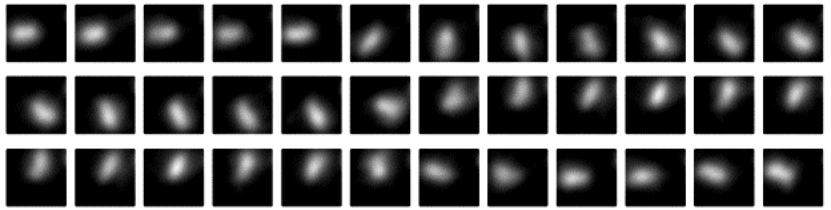
Paul D. Boyer e John E. Walker

Prêmio Nobel em Química, 1997

Estrutura e função da ATP sintase

ATPsintase (ATPase)

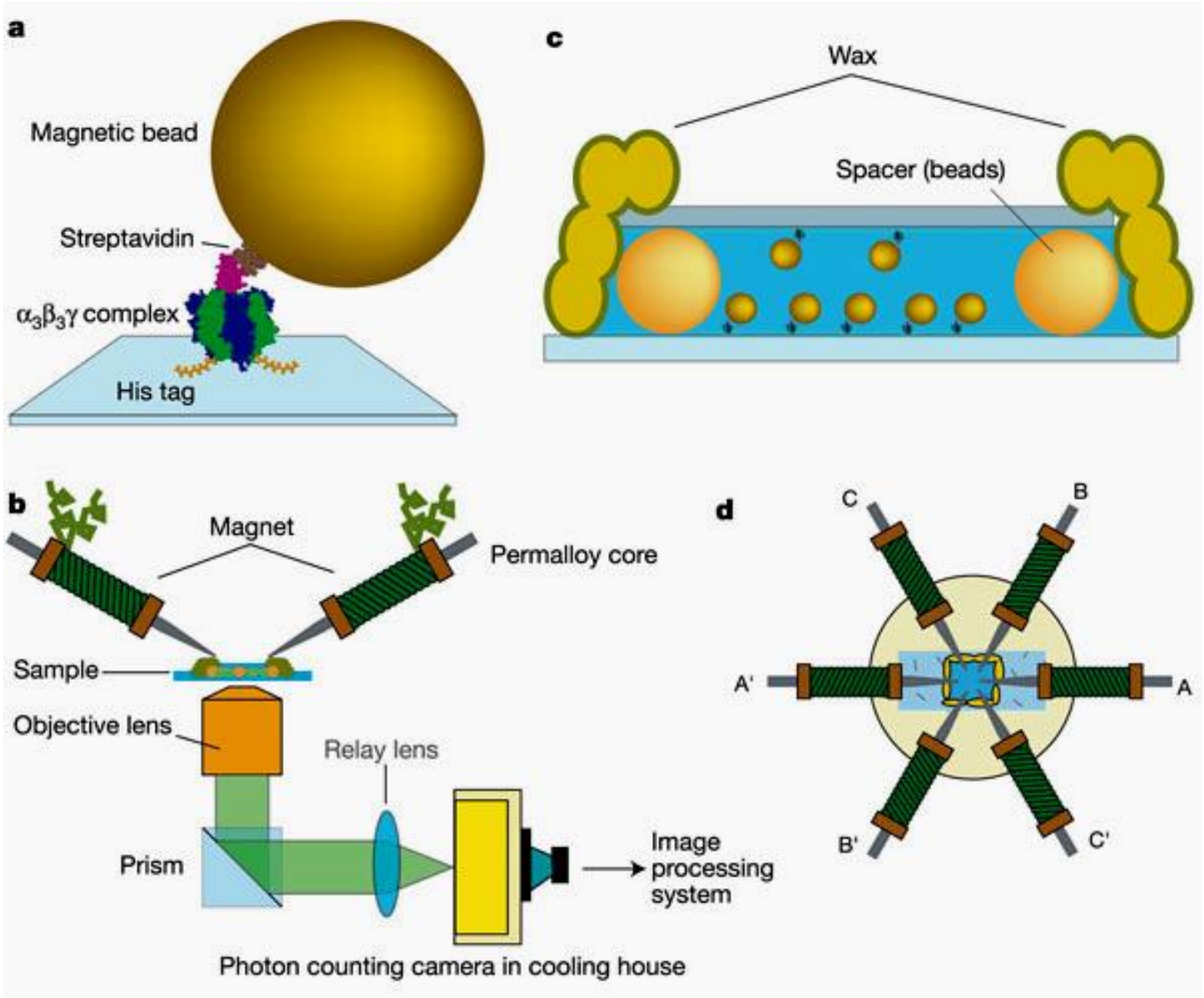




https://www.youtube.com/watch?v=0y7n-vK1AJE

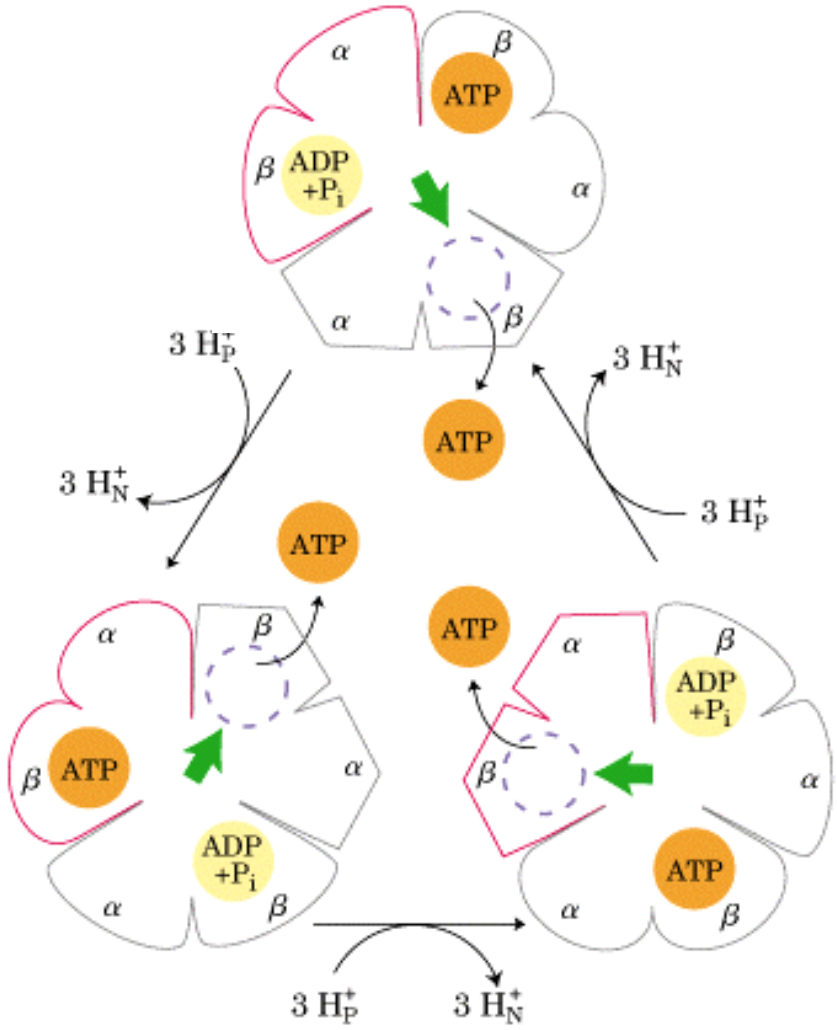
Sambongi et al., 1999, *Science* 286, 1722 -1724

ATPsintase

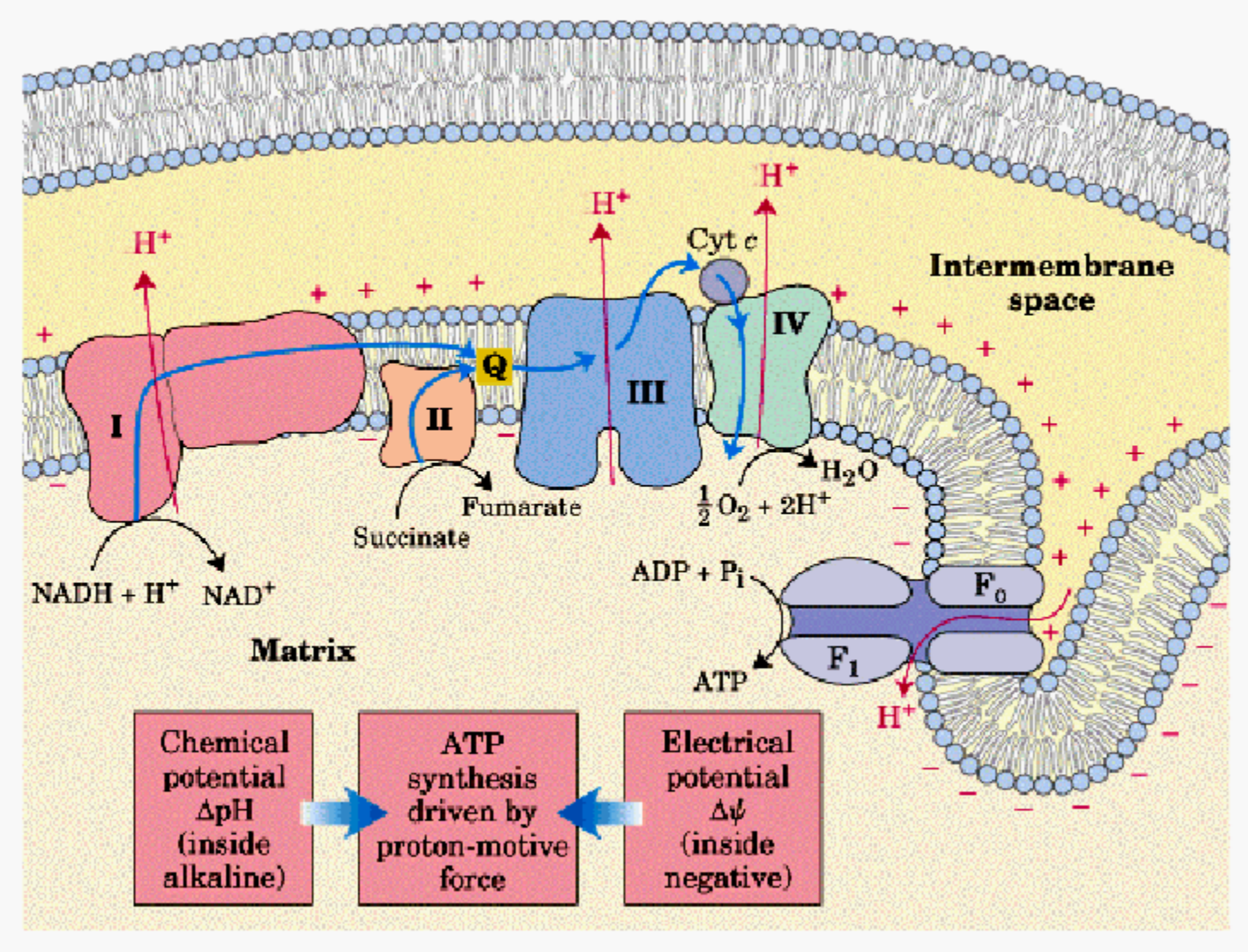


Itoh et al., *Nature* 2004 427:465-468

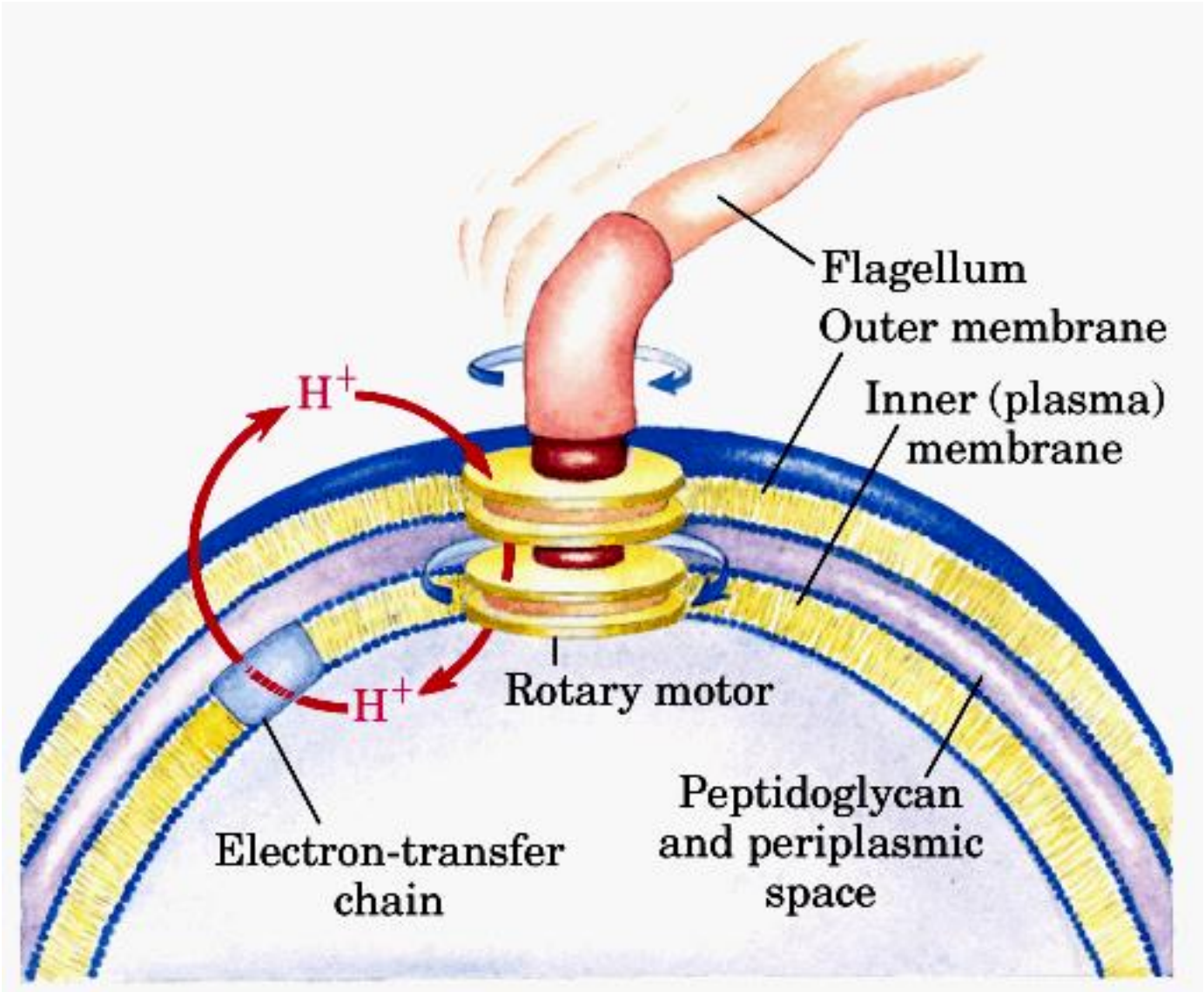
ATPsintase


α
β
ATP
β
ADP
+Pi
α
α
β
3 HP+
3 HN+
3 HN+
3 HP+
ATP
ATP
ATP
α
β
ADP
+Pi
β
ATP
α
α
ADP
+Pi
β
α
β
ATP
α
β
3 HP+
3 HN+

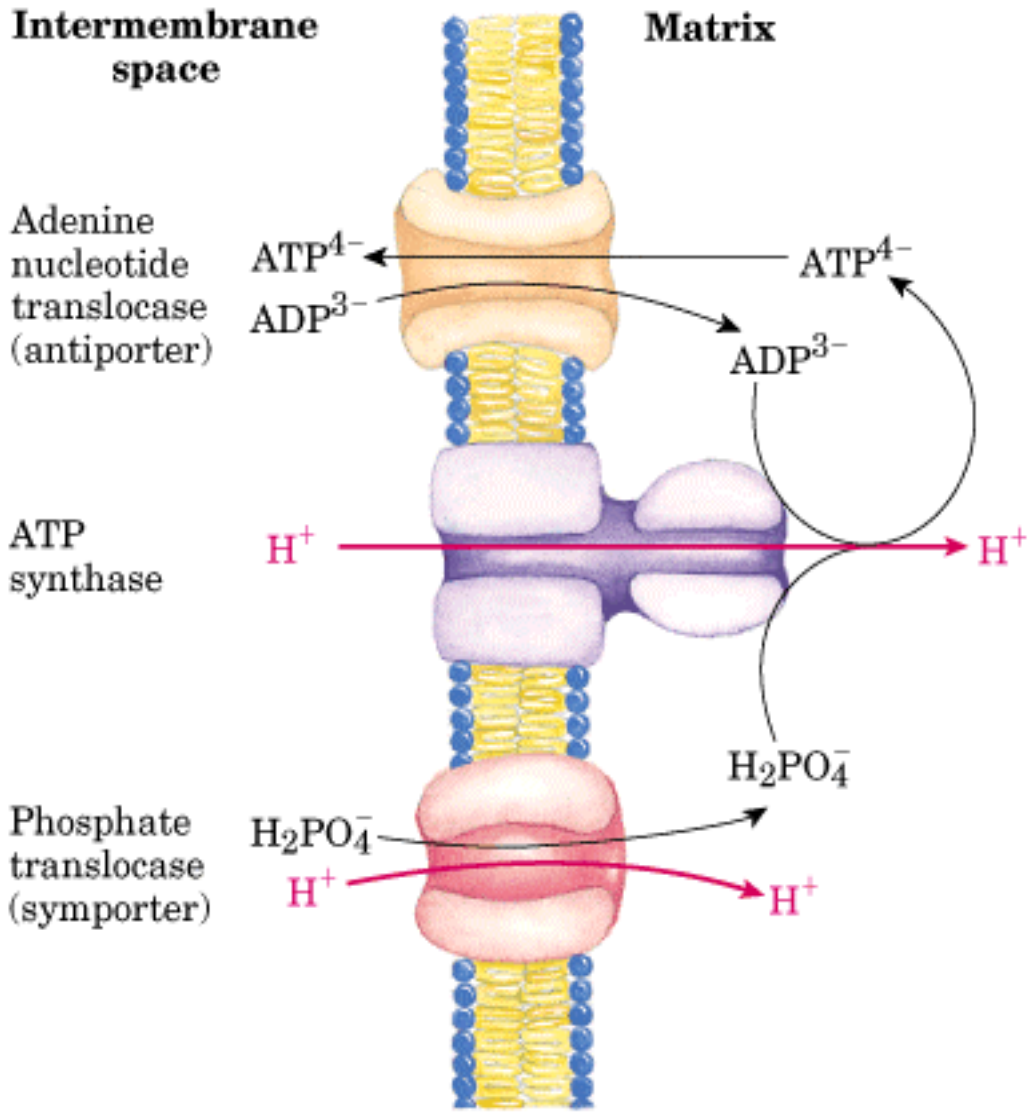
Transformações de Energia



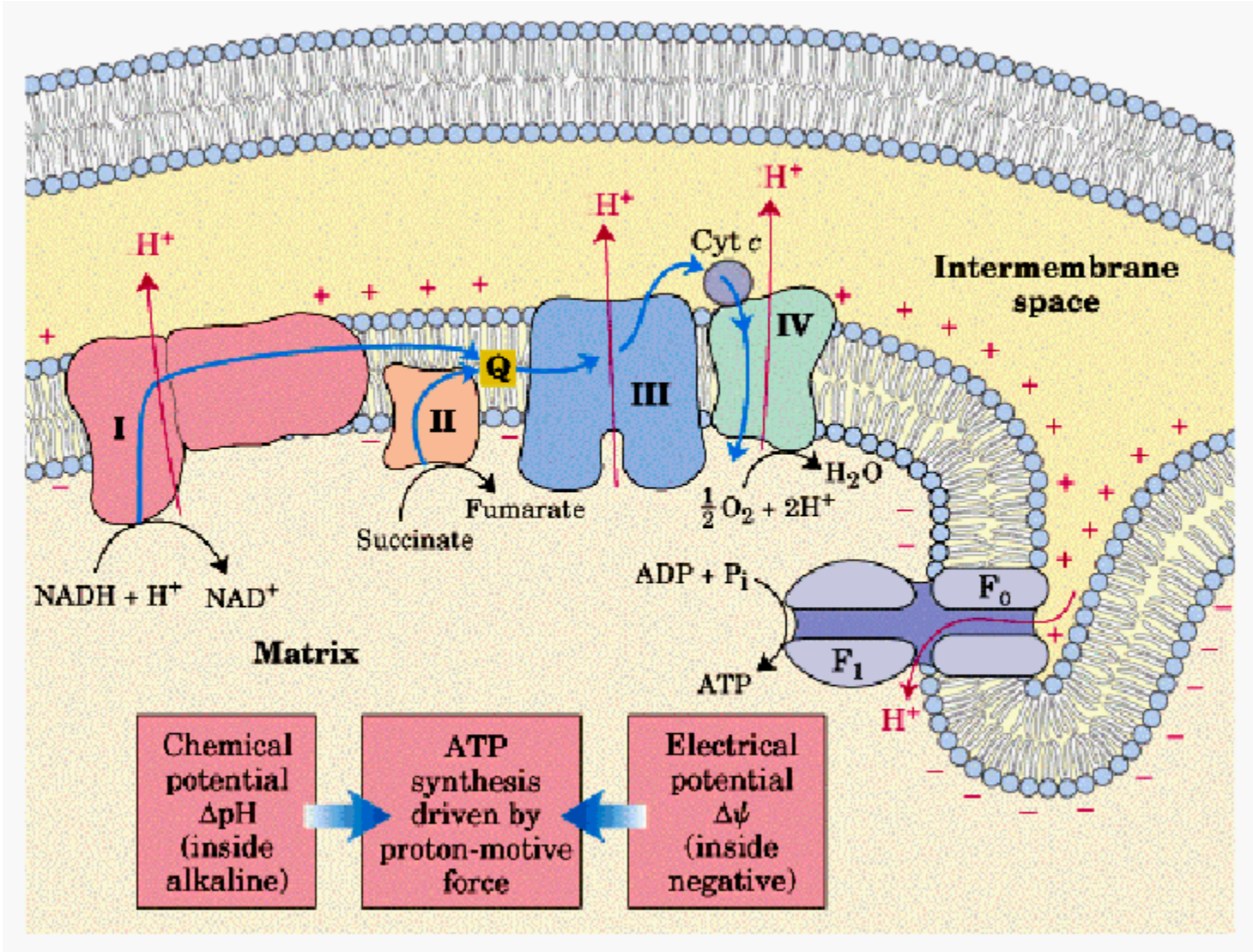
Movimentos Flagelares



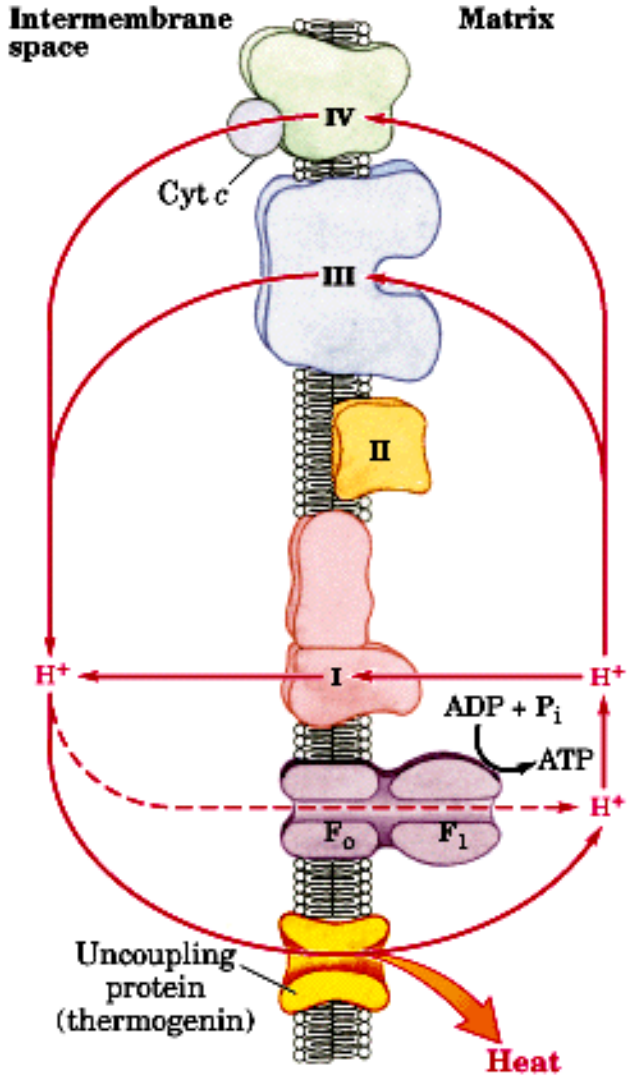
Transporte de ATP, ADP e Pi

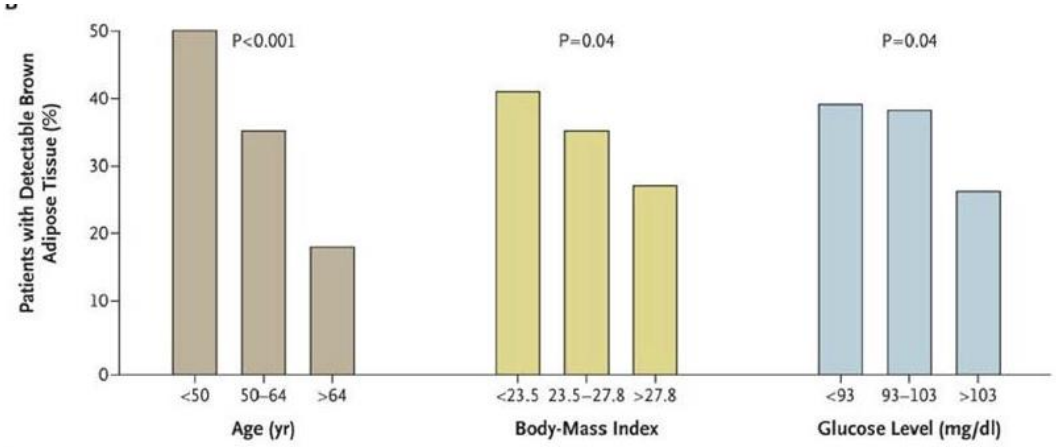


Estequiometria?



Geração de Calor pela Mitocôndria - UcP





Cypess et al., N Engl J Med. 2009 360:1509-17.


Benjamin
Cummings