

問題

- 呼吸鎖では種々のチトクロームが反応に関与している。NADHからチトクロームへの電子の流れの順序を決める方法を概説せよ。
- ミトコンドリアを調整し、NADHをいれて酸素消費を調べた。また、ここに、ロテノンという薬剤をいれ、そこにTMPDとアスコルビン酸を入れた。このときの、アスコルビン酸の役割説明し、ロテノンを入れた場合と入れない場合のATP産生の量比を答えよ。また、酸素消費の量比も答えよ。

答案用紙に名前を書くのを忘れないこと。

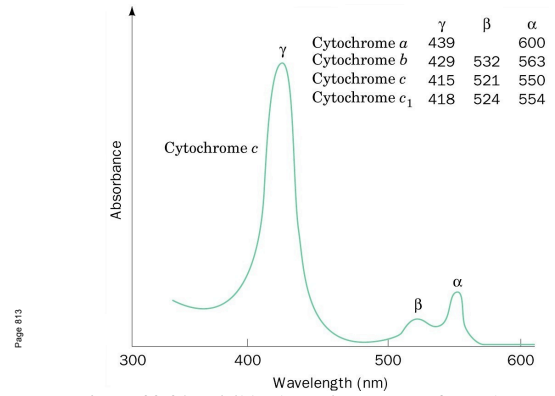


Figure 22-21a Visible absorption spectra of cytochromes.
(a) Absorption spectrum of reduced cytochrome *c* showing its characteristic α , β , and γ (Soret) absorption bands.

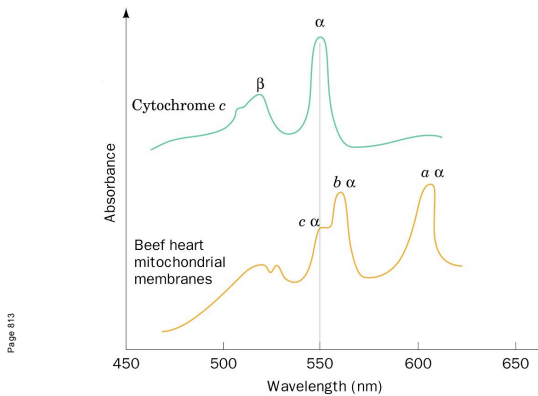


Figure 22-21b The three separate α bands in the spectrum of beef heart mitochondrial membranes indicate the presence of cytochromes *a*, *b*, and *c*.

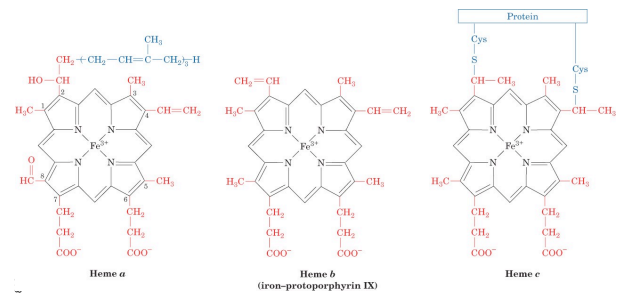


Figure 22-22a Porphyrin rings in cytochromes.
(a) Chemical structures.

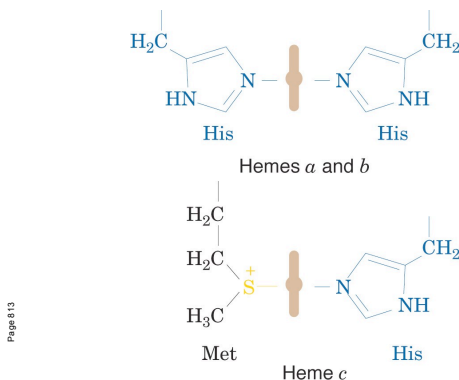
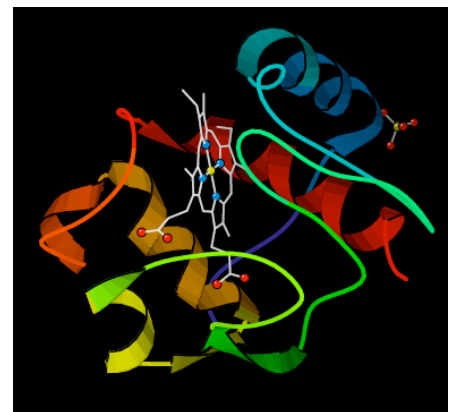


Figure 22-22b Porphyrin rings in cytochromes.
(b) Axial liganding of the heme groups contained in cytochromes *a*, *b*, and *c* are shown.



Cytochrome Cの構造

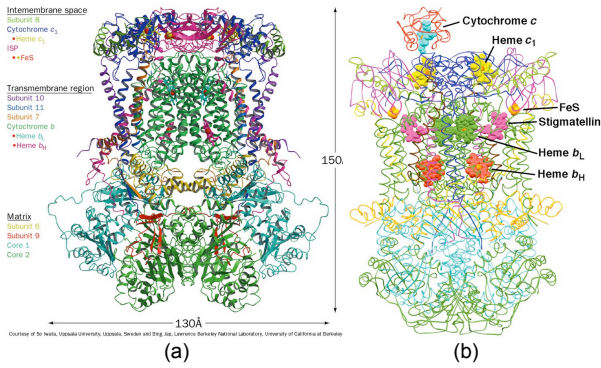
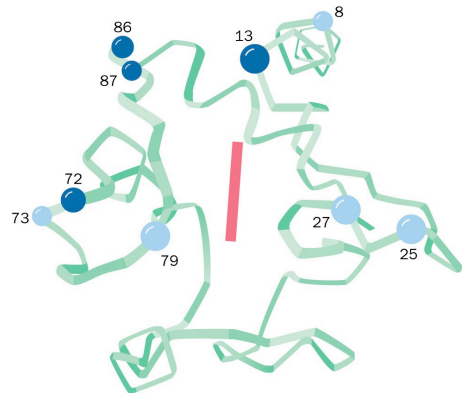
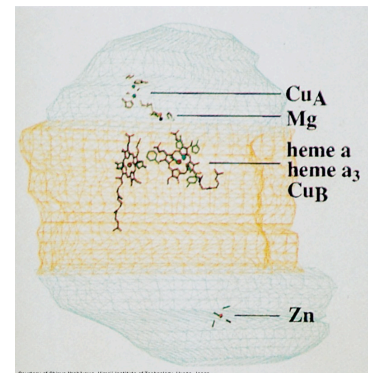
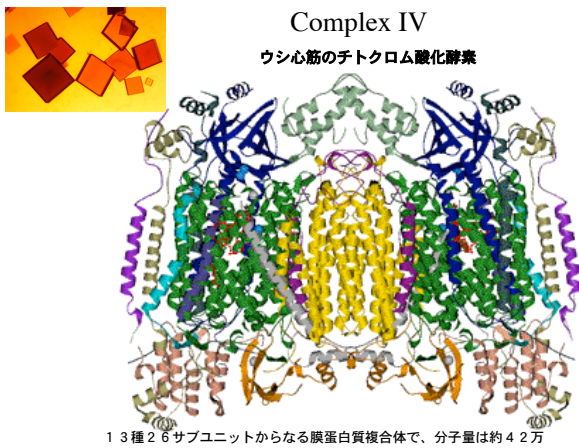


Figure 22-23 X-ray structures of cytochrome bc_1 . (a) The dimeric bovine complex. (b) The yeast enzyme in complex with cytochrome c



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Figure 22-24 Ribbon diagram of cytochrome c showing the Lys residues involved in intermolecular complex formation.



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Figure 22-25c X-Ray structure of fully oxidized bovine heart cytochrome c oxidase. (c) A protomer viewed similarly to Part a showing the positions of the complex's redox centers.

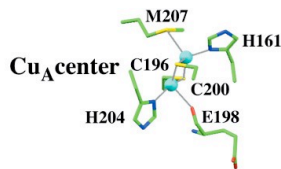
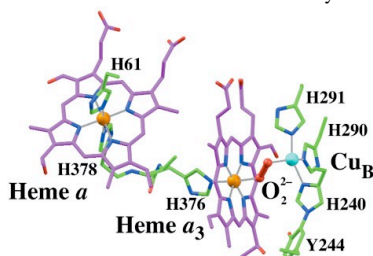
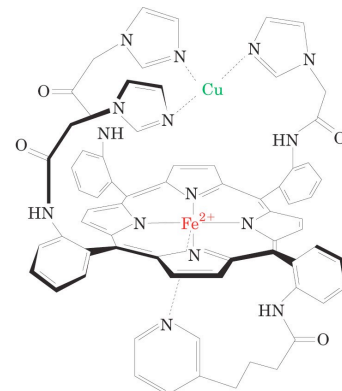


Figure 22-26 The redox centers in the X-Ray structure of bovine heart cytochrome c oxidase.

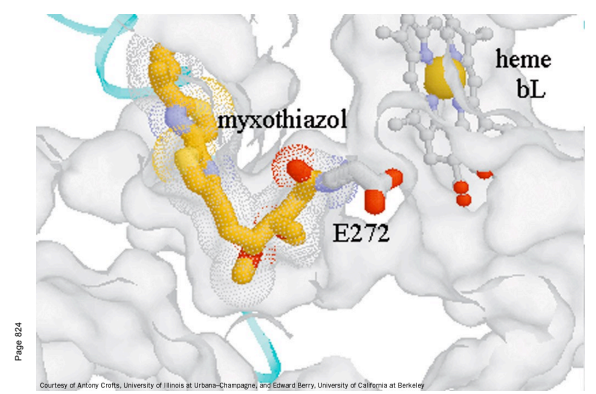
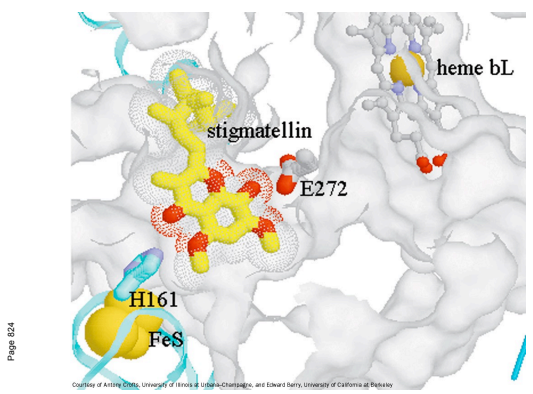
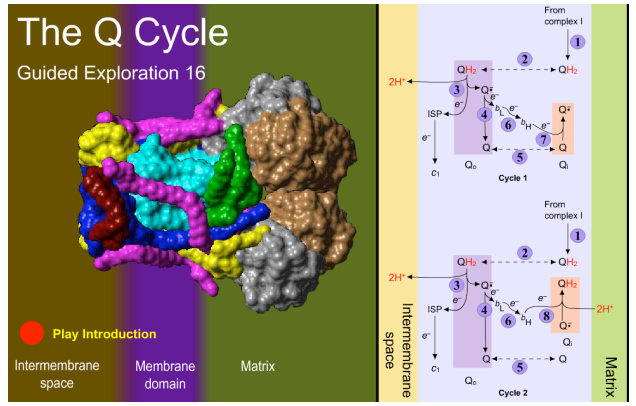
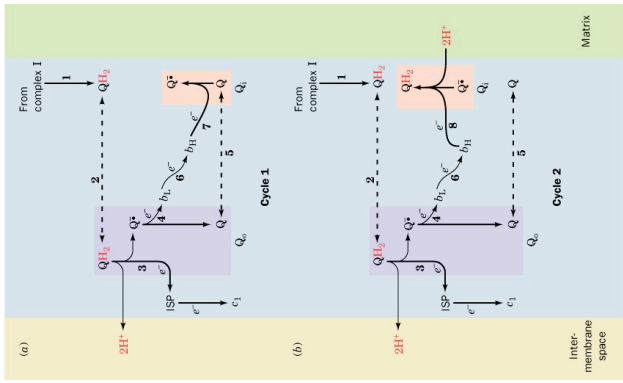
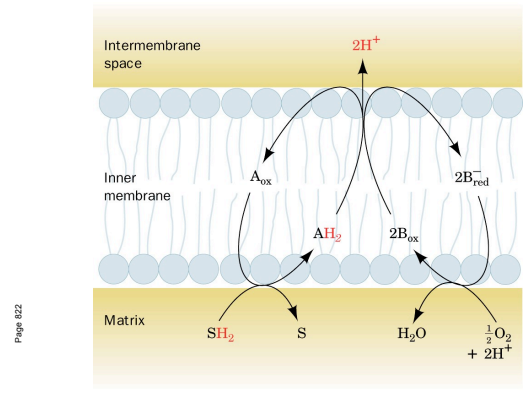
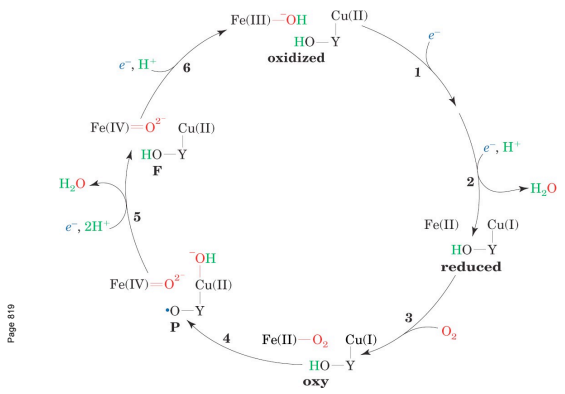


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Figure 22-27 Synthetic model of the cytochrome a_3 - Cu_B binuclear complex.



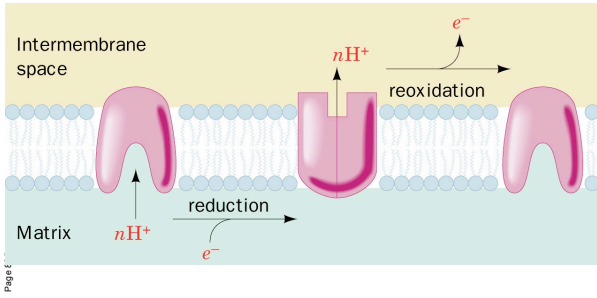


Figure 22-33 Proton pump mechanism of electron transport-linked proton translocation.

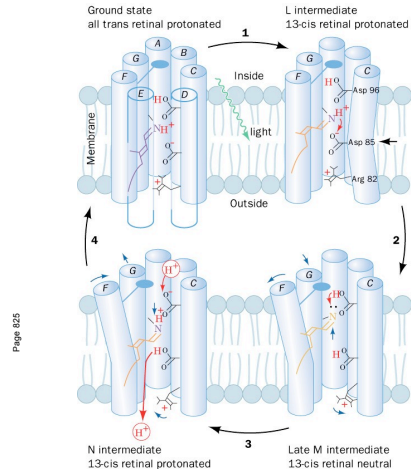


Figure 22-34 Proton pump of bacteriorhodopsin.

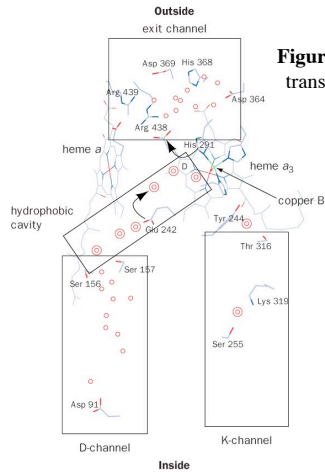


Figure 22-35 The proton-translocating channels in bovine COX.

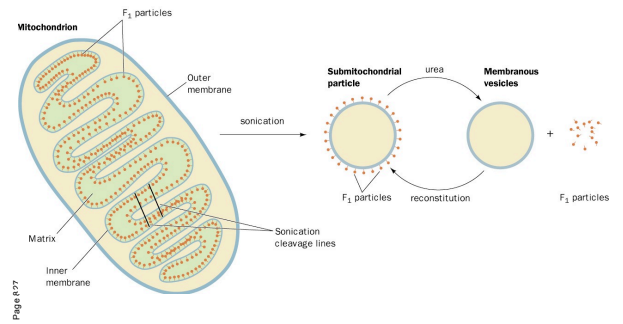


Figure 22-36 Interpretive drawings of the mitochondrial membrane at various stages of dissection.

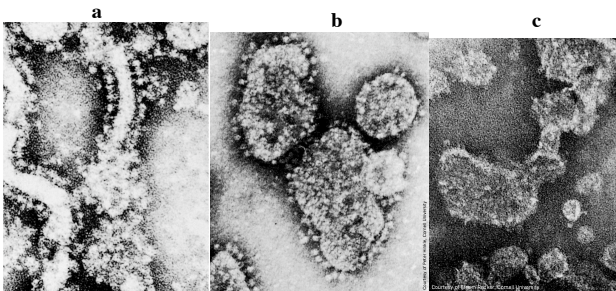
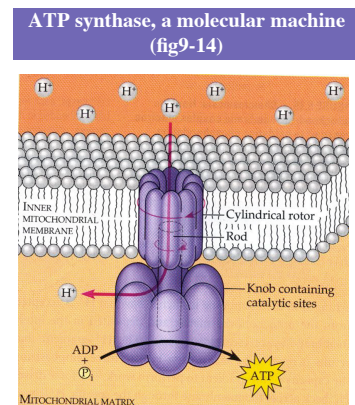
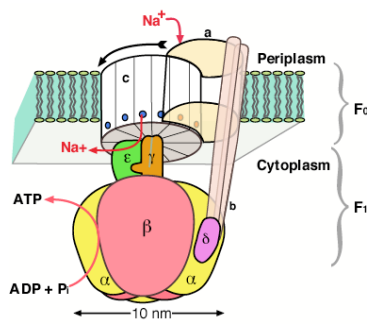


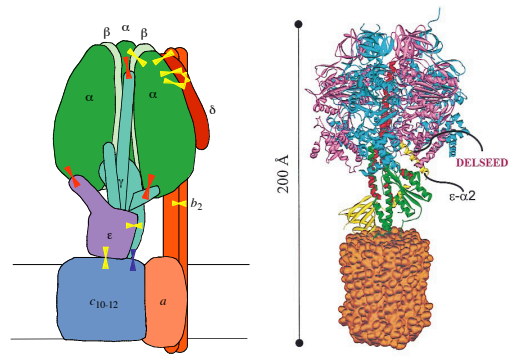
Figure 22-36 Electron micrographs of cristae from (a) intact mitochondria showing their F1 "lollipops" projecting into the matrix, (b) submitochondrial particles, showing their outwardly projecting F1 lollipops, and (c) submitochondrial particles after treatment with urea.



F型ATPaseモーターの構造



F型ATPase



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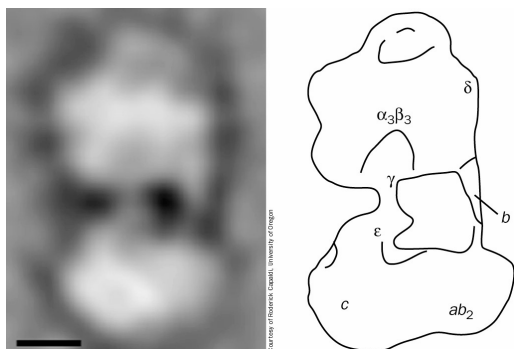


Figure 22-37 Electron microscopy-based image of *E. coli* F₁F₀-ATPase.

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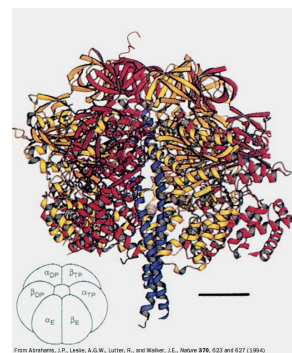


Figure 22-38a X-Ray structure of F₁-ATPase from bovine heart mitochondria. (a) A ribbon diagram.

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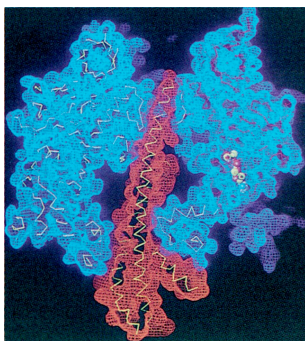


Figure 22-38b X-Ray structure of F₁-ATPase from bovine heart mitochondria. (b) Cross section through the electron density map of the protein.

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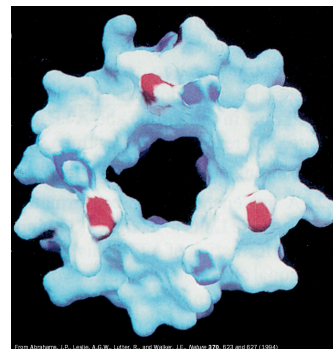


Figure 22-38c X-Ray structure of F₁-ATPase from bovine heart mitochondria. (c) The surface of the inner portion of the $\alpha_3\beta_3$ assembly.

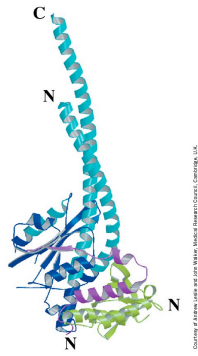


Figure 22-39 The γ , δ , and ϵ subunits in the X-ray structure of bovine F_1 -ATPase.

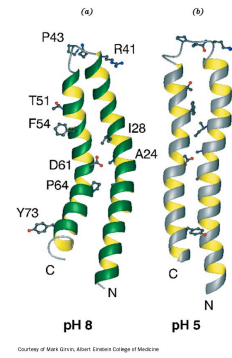


Figure 22-40 NMR structures of the c subunit of *E. coli* F_1F_0 -ATPase.

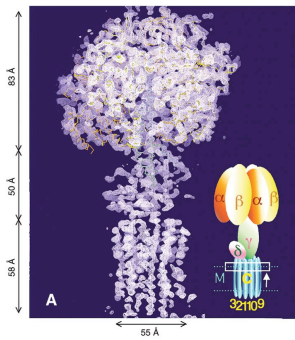


Figure 22-41a Low (3.9 Å) resolution electron density map of the yeast mitochondrial F_1 - C_{10} complex. (a) A view from within the inner mitochondrial membrane with the matrix above.

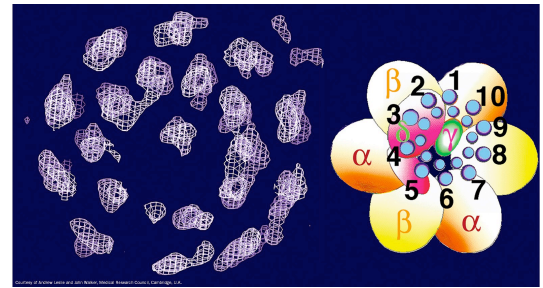


Figure 22-41b The electron density map of the yeast mitochondrial F_1 - C_{10} complex. View of the boxed section in Part a from the intermembrane space.

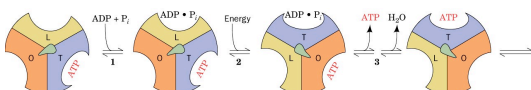
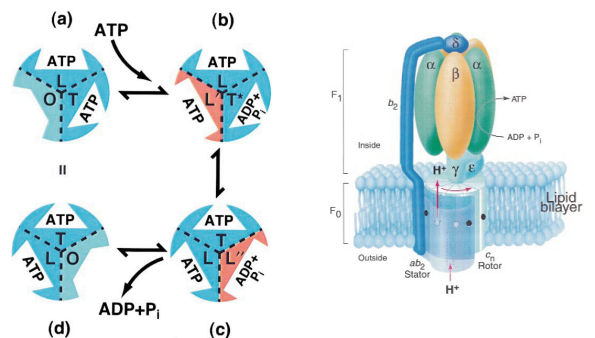


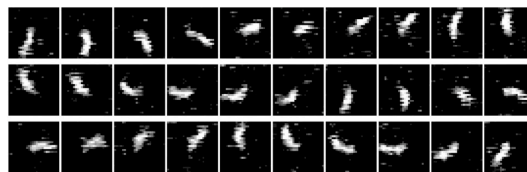
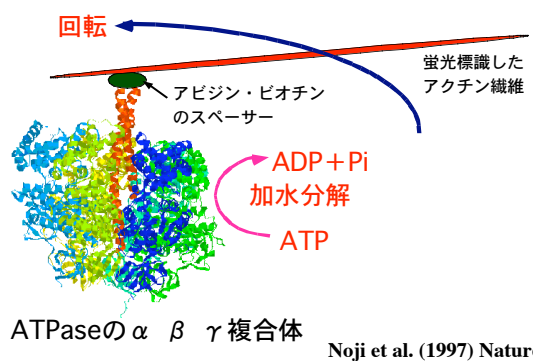
Figure 22-42 Energy-dependent binding change mechanism for ATP synthesis by proton-translocating ATP synthase.

ATPaseの構造変化と触媒活性モデル



O(オープン) 型: 触媒不活性で基質・生成物に親和性なし
 L(ルーズ) 型: 弱い親和性をもつが、触媒活性なし
 T(タイト) 型: 強い親和性をもち、触媒活性をもつ

F型ATPase回転実証の実験系



Courtesy of Masamitsu Futai, Osaka University, Osaka, Japan

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Figure 22-44b Rotation of the *c*-ring in *E. coli* F_1F_0 -ATPase. (b) The rotation of a 3.6- μ m-long actin filament in the presence of 5 mM MgATP.