Membrane Proteins – Epilogue

It is ironic that Mitchell's hypothesis has been proven in lac-permease and purple membrane vesicles, considering that both he and the biochemists have been concerned with the mechanism of oxidation and the synthesis of ATP in the mitochondria. It is doubly-ironic that in a recent article (Glancy et al. 2015) it is stated that the proton-motive force is expressed as a trans-membrane electrical potential on the network of mitochondria and that this is what drives muscle contraction. In this context a review by Skulatchev (Skulachev 2001), an old-hand at oxidative-phosphorylation and electrical potential is highly recommended.

A landmark in connecting proton transport to ATP synthesis in the mitochondria has been the solution of the structure of the F_1-ATPase of mitochondria (Abrahams et al. 1994). This is a huge membrane-spanning protein composed of 9 subunits. The devise by which this huge protein synthesizes ATP from ADP and inorganic phosphate is best described as a carrousel and the authors rightly call the mechanism by which it is realized rotational catalysis. ATP synthesis utilizes protons. As a matter of fact, to quote Abrahams et al., "About three protons flow through the membrane per ATP synthesized". In mitochondria the protons are supplied by cytochrome oxidase another huge membrane protein and, as mentioned already in the introductory section of this chapter, part of the respiratory chain (Calhoun et al. 1994).

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