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Correlated electron and proton transport in cytochrome c oxidase: Coulomb proton pump with kinetic gating[1]

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I will discuss correlated transport of electrons and protons in cytochrome c oxidase, the terminal enzyme in the respiratory electron transport chain of aerobic organisms. This enzyme catalyzes the reduction of atmospheric oxygen to water in our cells, and utilizes the free energy of oxygen reduction for the creation the membrane proton gradient by pumping protons across the membrane. The proton gradient subsequently drives the synthesis of ATP. The details of the mechanism of this redox-driven proton pump are unknown. Computer simulations and theoretical modeling point to a possible mechanism of this biological molecular machine in which electron transport is coupled to proton translocation.

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