

# 1. Molecular bioenergetics

## Colloquium 1.1. Respiratory chain

### C1.1.1. STRUCTURAL AND FUNCTIONAL INSIGHTS INTO MITOCHONDRIAL COMPLEX I

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The molecular mechanism of complex I (NADH:ubiquinone oxidoreductase) is still elusive. Mutational analysis, spectroscopic studies and emerging structural information provide important clues on the parts of the machinery that links electron transfer to proton translocation. Based on its more positive and pH-dependent midpoint potential, iron-sulfur cluster N2 has long been discussed as one of the key components of the pump. However, removal of the redox-Bohr group did not affect the proton pumping stoichiometry. Structural studies with complex I from the strictly aerobic yeast *Yarrowia lipolytica* suggest an unexpected position of the ubiquinone reduction site near the interface between the PSST and the 49 kDa subunits far up in the peripheral arm of complex I. We propose a two-state mechanism of energy conservation for complex I that is based on long range conformational changes of the enzyme and that is driven by stabilization changes of ubiquinone intermediates. This stabilization change mechanism inherently provides a rationale for the forward and reverse mode of complex I.