

# Extramitochondrial ATP synthesis

**New insights on visual trasduction, nervous conduction, memory, sleep, neurodegenerative diseases and cancer.**

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The “chemiosmotic theory” formulated by Peter Mitchell, a Researcher with an Anglo-Saxon training in chemistry, is more than 50 years old. Even though the theory has immediately sparked several controversies, never soothed, it was universally accepted, especially after Mitchell was awarded the Nobel Prize for Chemistry, in 1978. However, the chemiosmotic theory may need revision, because of the enormous progress of the bioanalytical techniques, which have better defined the fine structure of macromolecular complexes involved.

In the last years, the discoveries carried out by the Biochemistry Laboratory, Department of Pharmacy of University of Genova have allowed to overcome a basic postulate of the chemiosmotic theory, according to which the aerobic synthesis of ATP -the molecular “currency” of intracellular energy transfer- is exclusive of mitochondria, thylakoid and bacteria. In particular, it was demonstrated that other membranes, devoid of mitochondria, conduct oxidative phosphorylation sometimes even at higher levels than mitochondria do. These new unconventional findings can shed light on the basic mechanisms of cellular aerobic metabolism and the consequences of these new paradigms for neurochemistry are massive. For example, some basic concepts in neurobiology, such as the role of myelin sheath in the axonal metabolic supply and the source of reactive oxygen species in the outer retina and axons may be reconsidered. It also opens up exciting new scenarios for the study of processes still largely mysterious as sleep and memory. In addition, the energy processing extramitochondrial seats offers interesting insights for the study of tumors.