Support for a model of pH regulation by transmembrane transport

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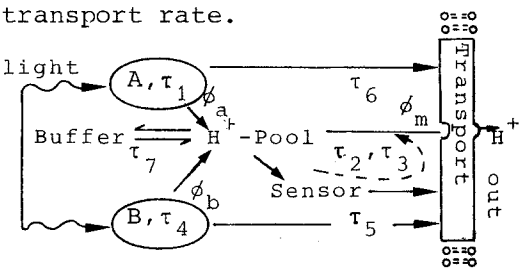
The frequency response analysis of linear light-induced changes in membrane potential of Nitella led to a model of pH regulation (1): light activates a metabolic process A and blocks B. A and B dump protons into the cytoplasm (ϕ_a,ϕ_b). At steady state, this is balanced by extrusion,ϕ_m, across the plasmalemma. Short perturbations are smoothed out by a buffer. Long term net adjustment is achieved by two straight forward pathways and a feed-back loop sensing pH and influencing transport rate.



A and B "see" the light, whereas the feed-back loop with its complex time-constants τ_2,τ_3 exists in a controlled environment. The measured data verify a prediction of the model: In contrast to τ_1, τ_4,τ_5,τ_6,the real and imaginary components of τ_2,τ_3 are scarcely dependent on light intensity.

1. Hansen,U.P. (1980) In: Plant Membrane Transport. (R.M. Spanswick et al.,eds.) Elsevier,Amsterdam p.587