Spectroscopic studies and microscopic imaging of semi-lamellar systems as compared with the native ones

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In plants' chloroplasts, thylakoid membranes – unique assemblies of protein, pigment and lipid molecules – accommodate all light-harvesting and energy-transducing functions. In higher plants thylakoid membranes are differentiated into grana and stroma regions, also known as stacked and non-stacked regions, respectively. Various agents, including stress agents, increase the proportion of stacked regions [1,2]. The details of this mechanism (varying from plant to plant) are not yet well-known. A good model of origination of the stacked regions is modulation by concentration of magnesium ions [3].

An attempt was made to characterize stacked and non-stacked artificial systems of liposomes and to compare them with the native thylakoid membranes. Liposomes containing chloroplast membranes' lipids, such as MGDG, DGDG, and incorporated LHCII (isolated from spinach thylakoids [4]) were used as a semi-lamellar system for a multi-method study by infrared spectroscopy – FTIR, absorption and fluorescence, confocal laser scaning microscopy (CLSM) and atomic force microscopy (AFM) imaging.

Spectroscopic data showed the type of protein-protein and lipid-protein interactions during the stacking as well as possible orientation of the trimeric form of LHCII complexes within the liposome membranes. The topographic images obtained by means of AFM microscopy as well as 3D CLSM images of aggregated liposomes revealed structures very similar to the grana membranes of higher plants.

Examination of the type of interactions observed in an artificial, less complicated system, makes mechanisms of specific thylakoid membrane *in vivo* organization foreseeable.

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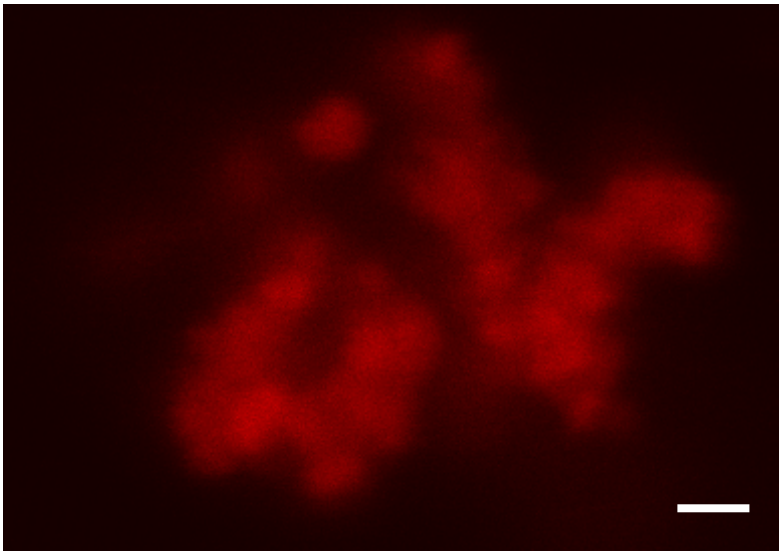

Figure 1. CLSM image of LHCII-liposomes incubated in 6mM Mg^{+2} solution. Bar 500nm.

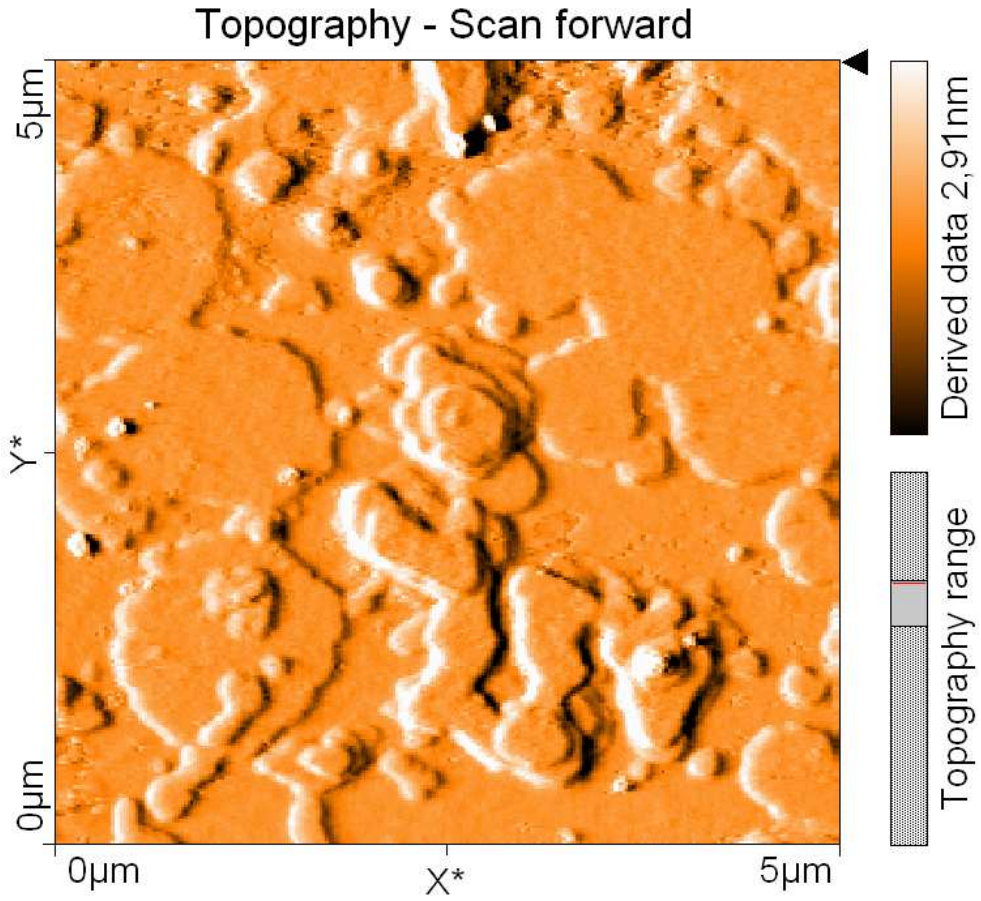

Figure 2. AFM image of LHCII-liposomes incubated in 6mM Mg^{+2} solution revealed by Nanosurf Easyscan 2 Software v1-5-1-0.

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