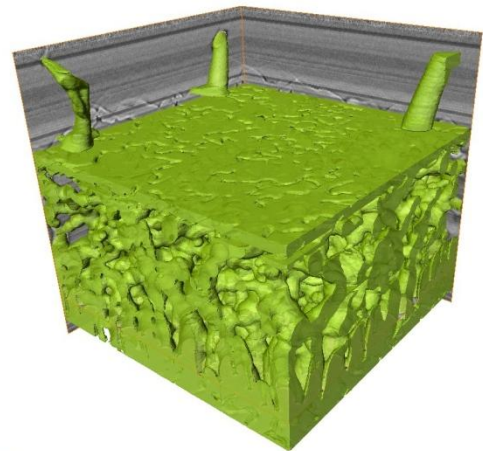


MULTISCALE MODELLING OF LIGHT PROPAGATION IN PHOTOSYNTHETIC TISSUE

Transport of light into plant tissue plays an essential role in the oldest and most advanced green energy production process, better known as photosynthesis. The light falling onto a leaf first has to pass the epidermis before it can enter the chloroplasts where it is absorbed by the chlorophyll. At each interface between two different materials (different refractive index) part of the incident light will be reflected and another part will be transmitted into the tissue under a different angle (refraction). This interaction of the light with the tissue microstructure complicates the relation between the intensity of the incident light and the energy (number of photons) available for the photosynthetic reactions in the different chloroplasts. The photosynthetic activity is a measure of the freshness of leafy vegetables, and a better understanding of photosynthesis during postharvest may lead to methods to improve the shelf-life of these products.

As there is, to date, no good method to measure *in vivo* internal light fluxes in plants, a mathematical modelling approach would provide an alternative to predict the internal light distribution in a leaf and get better insight in its photosynthetic efficiency. Multiscale light propagation models are basically a hierarchy of models which describe the light propagation at different spatial scales. The models are coupled via *in silico* experiments, in which the model parameters relevant to a particular spatial scale (e.g., apparent diffusion parameters at the macroscale) are computed from numerical experiments at the microscale.



The objective of this doctoral research project is (i) to develop a 3-D model for the light propagation in photosynthetic tissue based on synchrotron microtomography images, and (ii) use this model to study the effect of the light propagation in the tissue on its photosynthetic efficiency. Tomato (*Solanum lycopersicum* L.) leaf will be chosen as model system in a first phase of the project, but in a later phase leafy vegetables such as spinach will be investigated.

- Development and application of models of light propagation through the epidermis and the intercellular pore space into the chloroplasts using finite elements software;
- Carrying out experiments and perform model validation studies;
- Dissemination of results to the international research community and industry

PROFILE

We are looking for an enthusiastic candidate with preferably a Master degree in engineering or exact sciences, with a keen interest in biology and who is able to combine experimental skills with mathematical modelling. International candidates with a MSc degree who have distinguished themselves during their education are encouraged to apply.

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