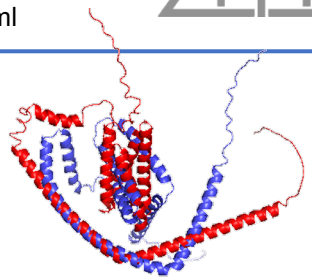
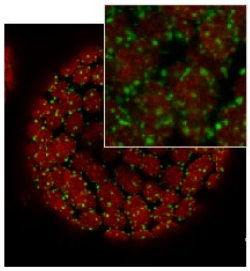
Prof. Dr. Katrin Philippar
Plant Biology - Center for Human- and Molecular Biology
Saarland University, Saarbrücken
katrin.philippar@uni-saarland.de
www.uni-saarland.de/lehrstuhl/philippar.html





Open PhD position within DFG priority program 2237

Evolution of plastid FAX (fatty acid export) proteins and the plants' conquest of land: molecular and metabolic adaptation

The colonization of land by descendants of freshwater algae was a watershed moment in earths' history. Plants encountered many environmental challenges during the conquest of the land, such as desiccation, high intensity light, UV-radiation, lack of nutrient availability, mechanical damage, and pathogen infections. In consequence, a consecutive adaptation of metabolism and morphology took place during evolution of ancestors from early Streptophyte algae to todays seed plants. Among these adjustments of land plant metabolism to terrestrial environments, changes in biosynthesis, distribution and homeostasis of lipids represent crucial steps to cope with stressful life. Fatty acid transport function of FAX (fatty acid export) proteins in the inner envelope membrane of chloroplasts [1-5] has been shown to be crucial for cellular lipid homeostasis under normal and stress conditions in the model organisms *Arabidopsis thaliana* (seed plant) and *Chlamydomonas reinhardtii* (green micro alga). However, nothing is known about FAX proteins in the organisms relevant for first plant terrestrialization steps.

To close this gap and evaluate FAX protein evolution towards adjustment of metabolism to life on land, we aim to pinpoint molecular adaptation of plastid FAX proteins in bryophytes, such as the model moss *Physcomitrium patens*. With the emergence of the prominent apo-lipoprotein α-helix bundle at the N-terminus of plastid FAX, which first appears in land algae and is conserved throughout evolution towards seed plants, we could already identify a crucial molecular element. Interestingly, the FAX apo domain is predicted to bridge the inner and outer envelope membrane of chloroplasts for fatty acid and lipid transport and might also be involved in mediating contacts to other organelles. Within the research project we now aim to identify exact membrane topology, structure and interaction with lipids, formation of hetero-oligomeric complexes as well as *in planta* function of apoFAX and FAX proteins. Via establishing work on *Physcomitrium patens,* we can follow evolutionary and molecular adaptation of FAX proteins from freshwater green microalgae via land algae and mosses towards seed plants. In the spotlight is the role in adaptation of lipid metabolism in response to stress.

References

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