PHOTOSYNTHETICA
International Journal for Photosynthesis Research

DOI 10.32615/ps.2021.024 PHOTOSYNTHETICA 59 (2): 266-267, 2021

OBITUARY

Prof. Dr. Klaus Kloppstech - Always ahead, but never pushing forward. Impressive research without a tendency to overstatement

B. GRIMM

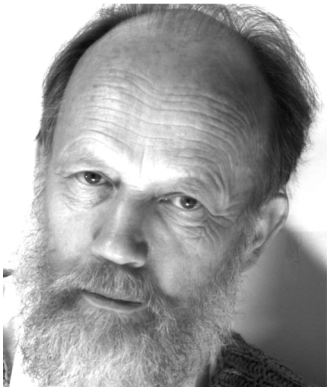
Institute of Biology/Plant Physiology, Humboldt-University Berlin, Philippstraße 13 (Building 12), 10115 Berlin, Germany
phone: +49 030 209398332, e-mail: bernhard.grimm@rz.hu-berlin.de

It happened still in the former era of molecular biology when PCR and generation of transgenic plants were not invented. And plant scientists recall times long past, when enormous efforts were necessary to extract RNA and DNA and to study translation of single mRNA species. Some milestones in the understanding of stress- and light-induced gene expression are associated with the name of Klaus Kloppstech. He sadly passed away on February 15, 2021.

Klaus Kloppstech shaped the understanding on several important, but unknown aspects in molecular plant physiology. His outstanding achievements were performed more silently and discreetly but attained a major impact in the course of more than 25 years, which he spent as professor in the Institute of Botany at the Leibniz Universität Hannover (1 October 1977–30 April 2004).

After a significantly influencing period in the department of Prof. H.-G. Schweiger at the Max-Planck-Institute for Cell Biology as a postdoctoral fellow, when pioneering work on the unicellular alga *Acetabularia* was performed (Kloppstech and Schweiger 1973), he shifted gears and explored an independent research area by studying transcriptional control of light-induced genes encoding chloroplast-localized proteins (Apel and Kloppstech 1978). These highly innovative studies related to several dominant enzymes of chloroplast biogenesis, photosynthesis, and pigment synthesis, such as light-harvesting chlorophyll-binding proteins, the small subunit of ribulose-1,5-biphosphate carboxylase/oxygenase, glyceraldehyde-3-phosphate dehydrogenase, and protochlorophyllide oxidoreductase (Viro and Kloppstech 1980, Cerff and Kloppstech 1982, Meyer *et al.* 1983).

The initial exploration of the circadian and diurnal oscillation of transcript accumulation of genes encoding plastid-localized genes is certainly accepted to be groundbreaking and paved the way for epochal research on the endogenous clock system and the contributing proteins (Kloppstech 1985, Otto *et al.* 1988). As Klaus Kloppstech always admitted, it was most certainly one of the most exciting projects, which attracted students who were keen to contribute to this important project.



Klaus Kloppstech (1939–2021)
(Right of property: Klaus Kloppstech and family)

This exciting research period continued with the more specific emphasis on the new identification and functional analysis of single genes and their encoded proteins. Many scientists connect the identification and functional analysis of early light-induced proteins (ELIPs) with Klaus Kloppstech's research. In fact, the discovery and investigations that ELIPs belong to the huge family of light-harvesting-like proteins, originated with the initial comparative assignment of ELIPs to the LHCPs at a time when alignment software program did not ease these comparisons (Meyer and Kloppstech 1984, Grimm and Kloppstech 1987).

ELIPs were defined as rapidly induced stress proteins and supported the biogenesis of thylakoid membrane and photosynthesis during high light intensities and cold stress. In parallel, small heat-shock proteins (HSPs) attracted Klaus Kloppstech's particular attention and opened the intensive cooperation with Israeli scientists. These HSPs were evidenced to protect plants from damaging effects

Acknowledgements: I am thankful for additional support and ideas from Prof. Joseph Hirschberg (Hebrew University, Jerusalem), Prof. Jutta Papenbrock (Leibniz Universität Hannover), and Dr. Achim Gau (formerly Leibniz Universität Hannover, at present Universität Bielefeld).

of high temperature light and had in common with ELIPs to be transiently expressed in response to the exogenous stress (Kloppstech and Ohad 1986, Ish-Shalom *et al*. 1990, Adamska *et al*. 1992).

Klaus Kloppstech's contacts to Israel were exceptional and unique and were partly related to the background of German historical events. But the long-lasting cooperation with Prof. Itzhak Ohad and later on with Prof. Joseph Hirschberg (both at the Hebrew University in Jerusalem) happened in a warm and sincere atmosphere and a cordial friendship. These cooperative activities were a good example for similar projects among scientists of both countries. Klaus Kloppstech spent at least two sabbaticals in Jerusalem and cooperated for many years with the laboratories of his two Israeli friends and later on with several of their offspring.

In the late phase of his professional career, he extended his international cooperation with researchers at the CEA/Cadarache in Saint-Paul-lez-Durance in Provence and continued research on ELIPs and their protective function (Montané and Kloppstech 2000). It was the hot phase of functional analysis of ELIPs and other light-induced proteins when colleagues in Cadarache supported his studies with analysis on the photoprotective mechanism.

Both international cooperations – with the Hebrew University and CEA/Cadarache – were characterized by warm-heartedness but were also extremely beneficial for the elucidation of the inducibility of the analysed stress-induced proteins and their contribution to stress defense and protective measures against excessive light intensities. At the end, these studies conclude in many explorations of adaptation and acclimation events, when different plant species were exposed to various abiotic and biotic stress scenarios and these stress symptoms were related to the expression and function of new and known stress-related proteins.

Klaus Kloppstech's research was decisive and visionary. His studies were always conclusively logical and, ultimately, were finalized with many details. It would not be an exaggeration to state that his studies are characterized to be enormously rich in their perspectives, most promising and fairly future-oriented. He sowed new seeds with his initial experiments in transcriptional control, which also were always an elegant proof of concept and subsequently with continuous studies in multiple areas of stress physiology. The seed grew with high prospects. And whatever he has sown, he could regrettably not always reap the well-deserved harvest.

I became enthusiastic about plant science by Klaus Kloppstech when he gave a realistic understanding about the molecular functioning of plants in his lectures. Klaus Kloppstech vibrantly informed in detail and with a great deal of understanding, how the design of single experiments contributed to the secrets of how plants respond to the environment and how endogenous factors trigger cellular molecular responses. It was for the first time a plausible transfer of textbook knowledge into the working atmosphere of scientific lab work. Multiple students and doctoral students graduated in his group under his supervision. They propagated his visions and perspectives. They remember with gratitude that they have been supervised from an extraordinary, insightful, and distinct scientist. He was a positive influence on these students. Many cooperation partners, particularly in foreign countries, are thankful for his cooperativity and friendship. Klaus Kloppstech will always be fondly remembered.

References

Adamska I., Ohad I., Kloppstech K.: Synthesis of the early light-inducible protein is controlled by blue light and related to light stress. – P. Natl. Acad. Sci. USA **89**: 2610-2613, 1992.

Apel K., Kloppstech K.: The plastid membranes of barley (*Hordeum vulgare*): Light-induced appearance of mRNA coding for the apoprotein of the light-harvesting chlorophyll *a*/*b* protein. – Eur. J. Biochem. **85**: 581-588, 1978.

Cerff R., Kloppstech K.: Structural diversity and differential light control of mRNAs coding for angiosperm glyceraldehyde-3-phosphate dehydrogenases. – P. Natl. Acad. Sci. USA **79**: 7624-7628, 1982.

Grimm B., Kloppstech K.: The early light-inducible proteins of barley: Characterization of two families of 2-h-specific nuclear-coded chloroplast proteins. – Eur. J. Biochem. **167**: 493-499, 1987.

Ish-Shalom D., Kloppstech K., Ohad I.: Light regulation of the 22 kd heat shock gene transcription and its translation product accumulation in *Chlamydomonas reinhardtii*. – EMBO J. **9**: 2657-2661, 1990.

Kloppstech K.: Diurnal and circadian rhythmicity in the expression of light-induced plant nuclear messenger RNAs. – Planta **165**: 502-506, 1985.

Kloppstech K., Ohad I.: Heat-shock protein synthesis in *Chlamydomonas reinhardi*: Translational control at the level of initiation of a poly(A)-rich-RNA coded 22-KDa protein in a cell-free system. – Eur. J. Biochem. **154**: 63-68, 1986.

Kloppstech K., Schweiger H.G.: Nuclear genome codes for chloroplast ribosomal proteins in *Acetabularia*. I. Isolation and characterization of chloroplast ribosomal particles. – Exp. Cell Res. **80**: 63-68, 1973.

Meyer G., Bliedung H., Kloppstech K.: NADPH-protochlorophyllide oxidoreductase: Reciprocal regulation in mono- and dicotyledonean plants. – Plant Cell Rep. **2**: 26-29, 1983.

Meyer G., Kloppstech K.: A rapidly light-induced chloroplast protein with a high turnover coded for by pea nuclear DNA. – Eur. J. Biochem. **138**: 201-207, 1984.

Montané M.H., Kloppstech K.: The family of light-harvesting-related proteins (LHCs, ELIPs, HLIPs): Was the harvesting of light their primary function? – Gene **258**: 1-8, 2000.

Otto B., Grimm B., Ottersbach P., Kloppstech K.: Circadian control of the accumulation of mRNAs for light- and heat-inducible chloroplast proteins in pea (*Pisum sativum* L.). – Plant Physiol. **88**: 21-25, 1988.

Viro M., Kloppstech K.: Differential expression of the genes for ribulose-1,5-bisphosphate carboxylase and light-harvesting chlorophyll *a*/*b* protein in the developing barley leaf. – Planta **150**: 41-45, 1980.