IN MEMORIAM

Absurd and violent death interupted on March 17th 2002 the life of Prof. Dr. Sci. Karl-Heinz Süss, one brilliant scientist in plant physiology, biochemistry and molecular biology. During his scientific expedition in the Rain Forest in Costa Rica he drowned in ocean costal water.

Karl-Heinz Süss was born on February 26, 1950 in Olbernhau, Germany. He studied Biology and Biochemistry at the Martin-Luther-University Halle. In the same University he became Dr. rer. nat. (Biology, 1978) and Dr. habil degrees (Plant Biochemistry, 1991) and *Facultas docendi*. In 1985 he became Dr. sc. nat. degree (Biochemistry) in East German Academy of Sciences.

Since 1973 till 1997 he was working in Institute of Genetics and crops plant research, Gatersleben, Germany as a scientist and was head of of the Department of „Isotope Laboratory" 1984–1986). Later on he was Head of Laboratory of Protein Biochemistry in the Department of Molecular Cell Biology at the same Institute. In the period of 1997–1999 Karl-Heinz was Professor of Biochemistry and Molecular Biology, Department of Biological Sciences in University of Kuwait, Kuwait. Since 2000 he was Head of Research and Development, Concipio GmbH, Sangerhausen, Germany.

Prof. Süss was not only skilled scientist, but also an excellent teacher. With his achievments he leaves deep traces in different fields of Plant physiology, Biochemistry and Molecular biology. It is worth mentioning some of them.

Isolation and characterization of several chloroplast membrane proteins active in electron transport and ATP synthesis (1976); First X-ray small-angle scattering study on a F_1-ATPase (1978); Isolation and characterization of membrane-bound ferredoxin-$NADP^+$ reductase from chloroplasts (1979); Determination of the subunit structure of chloroplast H^+-ATP synthase (1982) – a prerequisite for Boyer's "binding-change mechanism" of ATP synthesis; Characterization of biochemical changes caused by heat stress and heat adaptation in chloroplasts; Discovery of chloroplast-specific heat shock protein 21; Evidence that acquired thermotolerance is attributed to changes in the glycolipid composition of chloroplast membranes as well as spatial reorganization of chloroplast enzymes (1986); Evidence that Calvin cycle enzymes bind to integral thylakoid membrane proteins *in vitro* (1990); Evidence for the presence of a single epsilon subunit in the H^+-ATP synthase *in organello* and its regulatory function for

the CF_1-ATPase activity (1992); Evidence that Calvin cycle enzymes form multi-enzyme complexes on the stromal surface of chloroplast membranes *in situ*. Purification, cloning, characterization, and crystallization of the amphibolic chloroplast enzymes pentose-5-phosphate 3-epimerase (RPEase) and transketolase (1995) First high-resolution crystal structure and catalytic mechanism of a pentose phosphate 3-epimerase, evidence for a common origin of epimerases and other pentose phosphate pathway enzymes (1998). Evidence is obtained indicating that ribulose-1,5-bisphosphate carboxylase/Oxygenase forms a tubular network in plant chloroplasts (1999). Crystallization of cytosolic RPEase from higher plants (1999);

It is important to give some details on the considerable contributions given by Prof. Süss and co-workers studying of Calvin cycle enzymes. It is well known that Ribulose-1,5-bisphosphate carboxilase/oxigenase (Rubisco) catalyses the initial reaction of the photosynthetic CO_2 fixation and photorespiratry carbon oxidation pathway. Using cryo-scanning and immunogold electron microscopy it was shown that a network of Rubisco strands form the chloroplast matrix that interconnected the inner envelope and thylakoid membranes as well as the existence of large stroma protein clusters on the extended areas of the chloroplast matrix that do not possess thylakoid membranes.These protein clusters lead to the formation of solvent channels, which should allow for translocation of proteins, ions and metabolites. Modelling the docking of Rubisco molecules *via* their equivalent head surfaces around the central channel and rotating one molecule by 45^o relative to the other can generate polymers with tight molecular intefaces. The central channel of polymerized Rubisco is predominantly formed by polar amino acids, suggestive of a transport channel for anionic compounds. Cryo-scanning electron microscopy of spinach leaf tissuee provides direct evidence for the existence of network of strands with the approximate diameter of a Rubisco molecule.These results indicate that a tubular Rubisco network maintains the spatial integrity of thylakoid membrane system and thereby stabilises the shape of chloroplasts, thus providing aqueous avenues for chloroplast proteins to move unimpeded towards their sites of function and may allow CO_2, O_2 and metabolites to be transported across the organelle by an anion transport chanel (1998–1990).

Prof. Süss and co-workers have been able to isolate a Calvin cycle multienzyme complex containing ribose phosphate isomerase, ribulose-5-phosphate kinase, Rubisco, glyceraldehyde-3-phosphate dehydrogenase, seduheptulose-1,7- bisphosphatase and electron transport protein ferredoxin -$NADP^+$ reductase which are organized into stable CO_2-fixing multienzyme complex with a molecular mass of about 900 kD. Limited trypsinolysis combined with immunoblotting revealed that all chloroplast stromal ribulose-5-phosphat kinase and GAPDH is located in enzyme complexes.It was established that Calvin cycle enzymes are predominantly associated with nonappressed thylakoid membranes and that Rubisco and Rubisco activase are evenly distributed in the stroma of higher plant chloroplasts. In contrast, minor Calvin cycle enzymes are localysed at the stroma exposed surfases of thylakoid membranes along

with Rubisco and Rubisco activase molecules. Hence, it turns out that two forms of Rubisco consist in chloroplasts. The membrane-associated Rubisco is thought to be active as a ribulosebisphosphate carboxilase in association with other Calvin cycle enzymes The in situ location of minor Calvin cycle enzymes suggests that all Calvin cycle reactions may occur close to thylacoid membranes. The Rubisco molecules located away from thylakoid membranes and Calvin cycle complexes may have a different function than carboxylation of ribulose-bisphosphate. These Rubisco form(s) along with Rubisco activase and carboanhydrase may function in a CO_2-concentrating mechanism that provides CO_2 to thylakoid-associated Calvin cycle complexes, perhaps by channeling.

Prof. Karl-Heinz Süss and co-workers have presented for the first time the identification, cloning and properties of a cytosolic d-ribulose-5-phosphate 3-epimerase (cyt-RPEase) from rice and presence of its homologues in other plant species. Since plant cyt-RPEase is more closely related in its primarry structure to homologous enzymes in animal and yeast cells than to the chloroplast RPEase, the plant nuclear gene coding for cytosolic and chloroplast RPE-ases were most likely derived from eubacteria and cyanobacteria respectively. In contrast to the light-activated enzymes of Calvin cycle, the activity of amphibolic chloroplast enzymes EPEase and transketolase is not redox-dependent.

The contributions of Prof. Süss are sumarised in more than seventy papers published in many important International Journals and Monographs. He has also many Zoological publications, especially in ornitology.

Prof. Karl-Heinz Süss have had many long-term visits in different countries of the world – Bulgaria, Russia, Hungary, Israel, USA, India, Japan, Kuweit, Australia e.t.c. During his staying there he consulted many young scientists how to improve their studies in mehodological, as well as in theoretical aspects. He gave also many lectures and some courses in plant biochemistry, physiology and molecular biology.

Everybody who was contacted with Prof. Dr.Sci. Karl-Heinz Süss will remember him as a very civilized man, always ready to discuss scientific problems and to share his rich experience with the colleagues.

Ivan Yordanov, Prof., Dr. Sci.