

Preface

Photosynthesis is the source of energy for nearly all life on Earth and the source of the carbon in all the organic compounds within the bodies of organisms. Photosynthesis is the biochemical reaction through which all green plants, including trees, live and grow. We started field measurements of photosynthesis in Hyytiälä, the Forestry Field Station at the University of Helsinki, in the year 1972, and this was the beginning of a still continuing work in the forests around the station. We had the vision that physical and physiological knowledge in addition to the quantitative methods, especially field measurements and dynamic modelling, should have an important role in forest ecology. We introduced into our vision the important role of mass and energy fluxes when we studied the Chernobyl fallout in the summer of 1986. The construction of the SMEAR II measuring station clarified our vision, and we included the fluxes in the soil and between the soil and trees into our approach.

Some members in our team have had good knowledge in tree physiology, and they introduced the physiological aspect into the research. We have been lucky to work with physicists who are deeply interested in the role of physical phenomena in forests. Dr. Taisto Raunemaa (1939–2006) started common projects with us, and the physicists become a natural component in our research team. The co-operation between the Academy of Finland and Soviet Academy of Sciences enabled common research in Finland, Soviet Karelia and Estonia. Physicists, Academician Juhan Ross (1925–2002), Dr. Leo Kaipiainen (1932–2004) and Dr. Tiit Nilson have been the key persons in the team.

The co-operation with physicists was intensified when Dr. Markku Kulmala began to lead the team of young aerosol physics at the Department of Physics, Helsinki University. He was the other principal planner of the measuring systems SMEAR I and II. In addition, he is interested in the role of boreal forest in the formation and growth of aerosols. Dr. Timo Vesala introduced the important role of measurements of ecosystem fluxes with the Eddy Covariance method. He is also interested in the role of nitrogen in forest ecosystems.

The feedback from our measurements has been clear and positive. The developed model structures have been able to explain well the behaviour of trees and ground vegetation in field conditions. We have published our results in international

literature, although some of the most relevant papers have remained unpublished in scientific journals. During the last 20 years, we have actively participated into European research co-operation.

The Academy of Finland and Helsinki University have been the main financial supporters during the whole long period.

Our first reader, Dr. John Grace from Edinburgh, has made valuable comments on our manuscript and we express our gratitude to him. We acknowledge Dr. Kourosh Kabiri Koupaei, for his contribution to the editing of the book.

Our book is the summary of our work during 40 years at the present Department of Forest Sciences, previously Department of Forest Ecology and Department of Silviculture at Helsinki University. Our vision stressing the importance of physics and physiological knowledge, quantitative methods, material and energy fluxes and field working in the forests has had the central role in the planning of the research.

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