David W. LAWLOR

- **Internationally recognised expert in plant physiology, biochemistry and**
- **plant-environment interactions.**
- **Experience in the scientific analysis of crop production under field conditions.**
- **Specialist in photosynthesis, water relations, nutrition, climate change.**
- **Extensive research experience, demonstrated with ca. 100 publications, including an important text-book.**
- **Long-term involvement in science development through teaching, particularly in developing countries.**

CURRICULUM VITAE

Mail: david.lawlor@bbsrc.ac.uk
Date and Place of Birth 28th April, 1941: London, England.

University
Imperial College, University of London, **B.Sc** Honours Botany Degree 1960-63; Graduated with First-Class Honours. Demonstratorship in Plant Ecology 1963-66 and temporary Assistant Lecturer 1966-67 (6 months); teaching methods in plant physiology, organisation of courses and practical equipment. **Ph.D.** topic "Growth and water relations of grasses", supervisor Professor A.J. Rutter, Imperial College. Ph.D. Degree (awarded January 1967), University of London.

Work Address
Department of Plant Science (was Crop Performance and Improvement Division), Rothamsted Research, Harpenden, Herts, AL5 2JQ, UK Tel. 01582 763133 extn. 2366; FAX 01582 760981; E-

Career at Rothamsted Research
- Last Position: Senior Principal Scientist Individual Merit (UG6, IMP, Biotechnology and Biological Science Research Council, awarded 1992, reconfirmed 1998).
- Special lecturer, School of Agriculture, Sutton Bonington, University of Nottingham, U.K (to 2001).
- Group coordinator (to October 2000): Photosynthesis and Productivity Group Leader.

Present Position
Retired 28/04/2001; Visiting Scientist IACR-Rothamsted (coordinator of EU MARAMA project until 2004)

WoS record
Results found: 105
Sum of the Times Cited : 4457
h-index: 36

Recent studies: the interacting effects of environmental factors (CO_2, temperature, water stress and nutrition) on photosynthetic biochemical and physiological processes and mechanisms and their integration into crop productivity. Mathematical modelling of plant responses to environment and specifically climate change. Crop responses to climate change, experimental studies in controlled environments and simulation of natural conditions. Biochemical analysis of mechanisms of physiological acclimation to climate change conditions and analysis of the role of nutrition in the processes.
Analysis of genetically modified plants: effects of decreased phosphoribulokinase (PRK) enzyme activity on photosynthetic rate and carbon and energy metabolism. Analysis of the effects of water-stress on photosynthesis and plant metabolism (collaboration with University of Caracas,

Venezuela). Coordinator of programme on polyamines in genetically modified wheat plants (collaboration with DuPont Company). Coordinator of EU InCo DC project MARAMNA, analysing the biology of marama bean a southern African legume.

Committees European Science Foundation, Plant Adaptation to Environment (1998-2001; BBSRC Representative). Society for Experimental Biology, Plant Biology Committee. Programme Advisor: International Foundation for Science, Sweden. Forestry Commission/Department of Trade and Industry Committee on biomass for energy (1997-1998). Joint NERC/BBSRC CO_2 facilities programme. European Science Foundation Whole Plant Physiology Network (Ended 1996). Joint SEB/Bios Scientific Publications Committee.

Career & Scientific Studies

- **April 1967-68** Research Associate to Professor P.J.Kramer, Duke University, Durham, North Carolina, U.S.A.
- **April 1968-69** Science Research Council (G.B.) NATO Fellow for work at Duke University. Measurement of plant water stress and its control by polyethylene glycol solutions, their uptake by plants and toxicity; effects of water deficits on growth processes.
- **March 1969-1973** Rothamsted Experimental Station (Agricultural Research Council), Harpenden, Herts. U.K. Studies: measurement of plant water status with construction of an automatic thermocouple psychrometer, ß-ray gauging, *in situ* leaf psychrometry, control of water status with construction of a radiation cooled growth cabinet. Analysis of the effects of evaporation rate and soil water on plant water status, stomatal conductance and leaf energy balance. Biochemical analysis of the changes in carbon metabolism caused by water stress, in relation to photosynthesis and photorespiration (infra-red gas analysis) including measurements of ^{14}C in glycolate pathway intermediates and sucrose and the effects of O_2 and CO_2 concentration.
- **1974** Scientific co-worker with Professor Dr H. Fock, University of Kaiserslautern, West Germany, to 3 work on Deutsche Forschungsgemeinschaft Project "Physiological Adaptation of Plants to Water Stress". Studies: Biochemical and physiological interactions during water stress; measurement of gross and net photosynthesis and photorespiration of C3 (sunflower) and C4 (maize) plants under controlled stress and O_2 and CO_2 concentrations. Incorporation of ^{14}C into metabolites (3-phospho-glyceric acid, ribulose bisphosphate, glycine, serine, alanine, sucrose, organic acids) and enzymatic and gas chromatographic measurements of their mass and radio-specific activity. Quantitative measurement of the contribution of storage compounds to photorespiration in stressed leaves.
- **1975-1987** Rothamsted Experimental Station. Agronomic studies: Field experiments in collaboration with the Physics Department, developing and using mobile rain shelters; analysis of the effects of soil-water deficits on productivity of barley, interactions between plant and crop growth, agronomic yield, photosynthesis, respiration and selected biochemical components. Multidisciplinary experiments on the factors affecting yield of winter barley. Agronomic study of the effects of seven factors including sowing date, nitrogen amount and timing, growth regulator and disease control. Field studies of the agronomic effects of water deficits and nitrogen supply on growth and yield of winter wheat. Analysis of growth, yield and productivity under drought, and the interaction with nitrogen fertilisation etc. Detailed analysis of the crop production system in terms of light interception, photosynthesis, leaf protein content etc. And tissue water relations, to provide data for estimating the importance of partial processes in crop production.
- **1981- present** Physiological and biochemical studies. Development of multichannel, controlled gas exchange facilities for photosynthesis measurements. Analysis of plant processes in controlled environments: **effects of nitrogen** supply on wheat; plant composition including proteins (enzymes e.g. ribulose bis-phosphate carboxylase-oxygenase, glutamine synthase), pigments, amino acids, sugars etc. In relation to photosynthetic rate, photorespiration and carbon fluxes, in collaboration with Dr A.J. Keys (Rothamsted) and Professor N.R. Baker, CASE award with University of Essex. Field studies of the effects of

nitrogen on growth productivity, yield and quality of winter wheat: inter-relations between leaf photosynthesis, ribulose bisphosphate carboxylase-oxygenase amount and activity, nitrogen content, etc. Studies of the effect of foliar sprays of urea on leaf function and photosynthetic rates. Analysis of the **effects of water stress** on photosynthetic light reactions, photosystem activity, cellular energetics (reductants and ATP - pyridine and adenylate nucleotides) and photosynthesis, photorespiration and carbon assimilation and fluxes; chlorophyll a fluorescence under stress and with applied photosynthetic inhibitors, projects with Visiting Workers and PhD (Tezara). **Regulation of photosynthesis by phosphate.** Analysis of the stomatal and metabolic regulation of photosynthetic rate in plants grown with abundant or deficient phosphate; with Commonwealth Scholar (Jacob) and British Council supported PhD (Pieters, current). **Genetic control of photosynthesis**: analysis of photosynthesis and its control in genetically manipulated potatoes, with Biochemistry Department.Photosynthetic regulation in sunflower hybrids under water stress (collaboration with Professor E. Ferreres and Dr. C. Gimenez, Cordoba, Spain). Regulation of the photosynthetic rate in tobacco mutants selected for low photorespiration (in collaboration with Professor H. Medrano, Palma, Mallorca). Analysis of the effects of reduced activity of photosynthetic (Calvin cycle) enzymes, e.g. PRK and triosephosphate translocator (with Dr M. Paul, RES). **Low temperature effects on photosynthesis**; studies of the response of plants to low temperature, the relation of photosynthesis to assimilate accumulation and regulation of growth rates. Analysis of the **effects of elevated CO_2 and temperature** on the growth of cereals and sugar beet (1990-present). Development of controlled environment facilities for experimental programme on CO_2 and temperature interactions Establishment of a on the analysis of the effects of CO_2 on growth and productivity including modelling of responses to environment; detailed analysis of the physiology and biochemistry of photosynthetic proc esses in relation to elevated CO_2 and temperature with reference to acclimation.

Study Periods & Consultancies

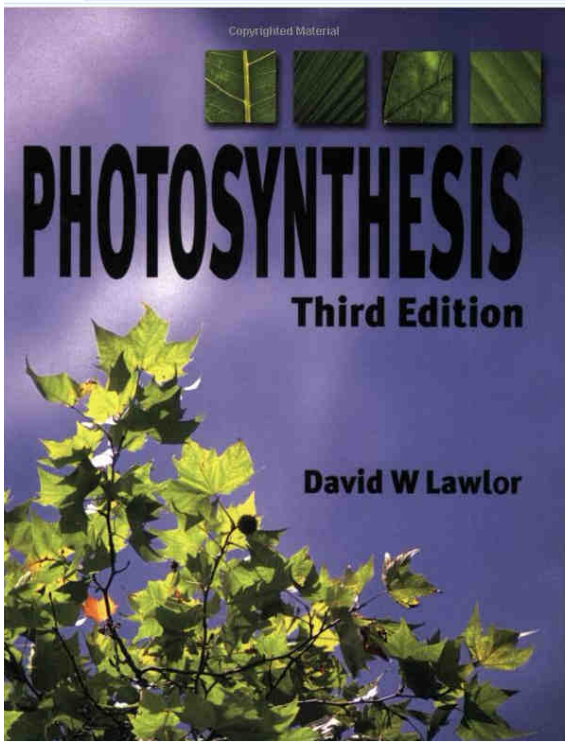
- 1974: University of Kaiserslautern.
- 1981: Australian National University, 4 Canberra, five months with Professor C.B. Osmond.
- 1982: Visiting Scientist, Institute of Soils and Water, Volcani Institute, Israel.
- 1984: Visiting Scientist, Division of Plant Physiology, United Nations Development Programme, Indian Agricultural Research Institute, New Delhi, India (6 months) advising on physiological methods, teaching plant water stress, photosynthetic metabolism, crop productivity and water relations.
- 1985: OECD Fellowship at the University of Paris to study metabolism of water-stressed plants.
- 1986: British Council Fellowship to the German Democratic Republic to study interactions of basic plant sciences and agriculture.
- 1988: British Council Visiting Specialist, Centre du Recherche du Genie Rural, Tunisia. Advising and training in crop production and water relations.
- 1988: Royal Society/USSR Academy of Sciences and Academy of Agriculture. Lecture and study tour at the invitation of the USSR Academy of Agriculture.
- 1989: Guest of the Finnish Academy of Sciences to visit laboratories in Finland.
- 1990: Senior Visiting Scientist at the Smithsonian Environmental Research Centre, Maryland, USA with Dr B. Drake to study the long-term effects of elevated CO_2 on the photosynthetic processes in natural vegetation (6 months). Visiting lecturer in plant water relations and photosynthesis, International Atomic Energy Agency, Vienna. Lecturer in Advanced Course in Photosynthesis, Palma, Mallorca, Spain.
- 1991: Consultant to the Nuclear Research Institute, Malaysia for International Atomic Energy Agency, Vienna.
- 1992: Invited lecturer to the 1st Asian Pacific Conference on Plant Physiology, Kuala Lumpur, Malaysia. International Atomic Agency Consultant to the Tea Research Institute, Sri Lanka, for International Atomic Energy Agency. Topic: "Physiological basis of tea plant production".

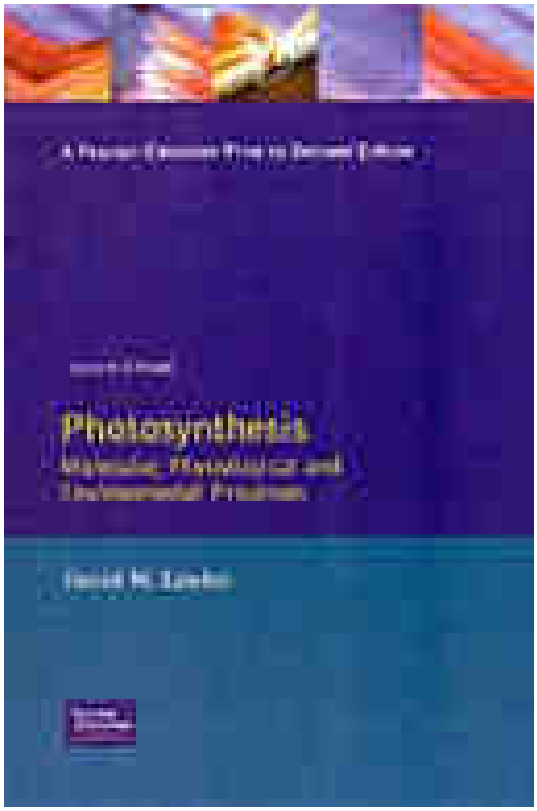
- 1993: British Council funded link with the University of Chile, Santiago, Chile. Invited lecturer at the Chilean Biological Society Meeting in Peuheueje, Chile.
- 1994: International Atomic Energy Agency consultant to the Tea Research Institute, Sri Lanka. Visiting lecturer at the University of Turku, Turku, Finland.
- 1995: Final British Council exchange with the University of Chile. Invited speaker and committee member of European Science Foundation meeting in Ireland (programme termination). Invited lecturer at the Charles University of Prague, Czech Republic.
- 1996 Invited lecturer Japanese Society for Bioscience, Biotechnology and Agrochemistry, 21st Meeting Kyoto Japan. Invited Speaker The Society of Agricultural Meteorology of Japan Symposium, Food Production and Environmental improvement under Global Climate Change, Ube, Japan combined with a lecture tour of eight Institutions in Japan, funded by The Great Britian Sasakawa Foundation. Special Lecturer, Institute of Biology and Ecology, University of Caracas, Venezuela.
- 1997 Invited Speaker International Meeting on Breeding for Crop Improvement, Pakistan Atomic Energy Authority, Tando Jam, Pakistan. Invited Speaker, Symposium, Climate Change and Atmospheric Pollution, Holland. Invited Speaker, First Balkan Botanical Congress, Thessaloniki, Greece. UK/South Africa Research Fund collaboration with University of Cape Town, research and teaching programme.
- 1998 Invited lecturer, Rank Prize Meeting, Grassmere, UK "energy in Agriculture". Invited Keynote speaker at Czech Society of Plant Science Annual Meeting, Olomuc, Czech Republic. British Council/Greek Ministry of Agriculture funded exchange with the National Agricultural Research Organization of Greece, Cereals Breeding Institute, Thessaloniki. Portuguese Research Foundation, Lisbon (Grant evaluations). Invited British Council/Italian National Research Council meeting, Viterbo, Italy on “Plant Responses to stress”
- 1999. Study/lecture visit to the University of Western Sydney, Australia, Professor J. Conroy (climate change studies 2 months). European Science Foundation, co-organizer of Meeting in Kevo, Finland, “Adaptation to biotic stress: tolerance and avoidance”. Dec 1999, Food and Agriculture Organization, Assessor of Phytotron Project (FAO, UNDP and Government of India, Indian Council for Agricultural Research).
- Dec 1999: Lecturer at Indian Agricultural Research Institute, New Delhi.March 2000, invited lecturer Rank Prize Fund meeting, “Water and Plants”. Invited lecturer, Annual Conference of the Post Graduate Institute of Peridinya, Kandy, Sri Lanka, NOctober 2000. Organizer of European Science Foundation `Plant Adaptation Programme, C4-CAM, meeting, Granada, Spain .,
- November 2000. Coordinator of EU INCO-DC Project with South Africa, Namibia , Botswana and Greece, MARAMA (3 years, 778,000 Euro, 3 year): finished 2005. Lecturer on biochemistry teaching at the Federation of European Plant Physiological Science meeting, Krakow, Poland,
- 2004. Invited lecturer Slovenian Biochemical Sciences meeting, Lipica, Slowenia, 2005.

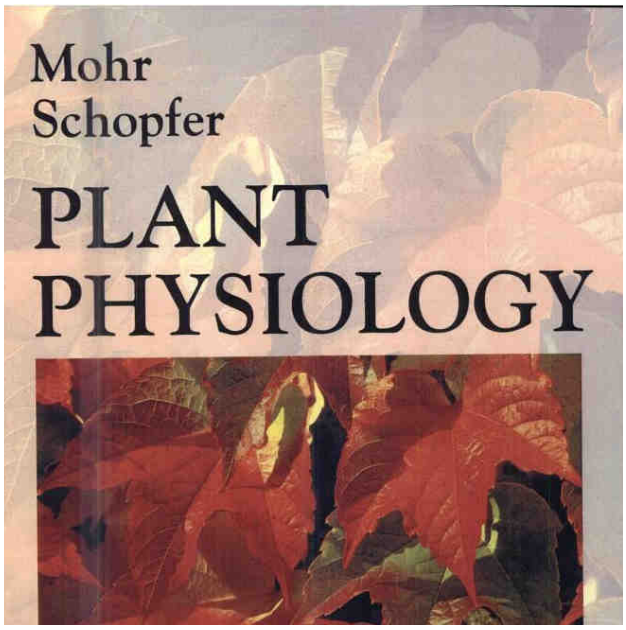
Research Grants/Funding Awarded (post 1993)

- BBSRC BAGEC: Climate change and root crops and their weeds (with Broom's Barn) 1993-1997, (48 months) Rothamsted proportion of grant £k 100.
- BBSRC BAGEC: Acclimation of Photosynthesis and Climate change 1993-1996 (36 months) £k 100.
- EU grant `CROPCHANGE' 1992-94 (24 months) £k 94.
- EU grant `ESPACE' 199-97 (32 months) £k 90.
- MAFF Commission `Climate Change and Crop Modelling' 1992-1997 Approximate value £k420. Rothamsted International - Short term funds for extension to W. Tezara's PhD £k 3 and 1 year's funding for Dr H Siadat, Iran £k 9. Other Funding for students and advanced research at Rothamsted : International Atomic Energy Agency funded trainees from Sri Lanka European Science Foundation Whole Plant Physiology network funded Students from University of Malaga, Spain and Muncheberg, Germany. Tea Research, Sri Lanka funded `Split' PhD studentship (J. Mahotti)

- CONICIT Venezuela funded PhD studentship (W. Tezara). British Council with the University of Caracas, Venezuela, funded PhD studentship (A. Pieters) Commonwealth Scholarship PhD student (J. Jacob, India) Commonwealth Scholarship Fellow (Dr. Sharma, India), EU exchange with States of Former Eastern Europe (Professor Natr, Prague). EU INCO-DC Project with South Africa, Namibia , Botswana and Greece, MARAMA (3 years, 778,000 Euro)
- 2007 Plant physiology consultant on DIFID (UK)-funded DELPHI programme, “Capacity building in teaching and research for the application of plant molecular biology and physiology for the improvement of yields of cowpea under drought in Southern Africa”, with University of Pretoria, South Africa and the University of Maputo, Mozambique (coordinator).




Photosynthesis


Mohr
Schopfer
PLANT
PHYSIOLOGY

Plant Physiology
upravil: Hans Mohr,Peter Schopfer

Professor Dr. HANS MOHR
Professor Dr. PETER SCHOPFER

Biologisches Institut II der Universität
Lehrstuhl für Botanik
Schänzlestraße 1
79104 Freiburg

Translated by:

GUDRUN LAWLOR
South Bank University
Wandsworth Road
London SW8 2JZ, UK

Dr. DAVID W. LAWLOR
Biochemistry & Physiology Department
Rothamsted Experimental Station
Harpenden, Herts AL5 2JQ, UK

Title of the original German edition:
Hans Mohr, Peter Schopfer
Pflanzenphysiologie, 4. Auflage (Springer-Lehrbuch)

ISBN 3-540-58016-6 Springer-Verlag Berlin Heidelberg New York

Library of Congress Cataloging-in-Publication Data. Mohr, Hans, 1930– [Lehrbuch der Pflanzenphysiologie. English] Plant physiology / Hans Mohr, Peter Schopfer ; [translated by Gudrun and David W. Lawlor]. p. cm. Includes bibliographical references (p.) and index. ISBN 3-540-58016-6 (Berlin). – ISBN 0-387-58016-6 (New York) 1. Plant physiology. I. Schopfer, Peter, 1938– . II. Title. QK711.2.M6413 1994 581.1–dc20 94-21765