Curriculum Vitae Professor Dr Barbara Demmig-Adams

Name: **Barbara Demmig-Adams**
Date of birth: **7 October 1955**

Research Priorities: Photoprotection during photosynthesis, ecophysiology of plants, carotinoid function, xanthophyll cycle

Barbara Demmig-Adams is a German biologist at the University of Colorado who examines fundamental questions of plant physiology. Her profound investigations of the mechanisms with which plants protect themselves from too much sunlight under varying environmental conditions are considered milestones of modern plant biology.

Academic and Professional Career

since 2013	Professor of Distinction, University of Colorado, Boulder, USA
since 1998	Professor, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, USA
1994 - 1998	Associate Professor, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, USA
1994	Visiting Fellow, Research School of Biological Sciences, Australian National University, Canberra, Australia
1990 - 1994	Assistant Professor, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, USA
1989 - 1990	Research Associate, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder, USA
1989	Habilitation, Julius-Maximilians-Universität of Würzburg, Würzburg, Germany
1986 - 1989	Research Stay, Julius-Maximilians-Universität of Würzburg, Würzburg, Germany
1985 - 1986	Postdoc Scholarship, Carnegie Corporation of New York, New York, USA

1985	Postdoc Scholarship, McKnight Foundation, Minneapolis, USA
1984 - 1986	Postdoctoral Fellow, Department of Plant Biology, Carnegie Institution of Washington, Stanford, USA
1984	PhD in Plant Physiology, Julius-Maximilians-Universität of Würzburg, Würzburg, Germany
1974 - 1979	Degree in Biology and Chemistry (State Examination), Julius-Maximilians-Universität of Würzburg, Würzburg, Germany

Functions in Scientific Societies and Committees

Affiliate, Renewable and Sustainable Energy Institute, University of Colorado, Boulder, USA

Faculty Mentor for the Interdisciplinary Quantitative Biology (IQ-Biology) Program, BioFrontiers Institute, University of Colorado, Boulder, USA

Member, College of Arts & Sciences Honors Council, University of Colorado, Boulder, USA

Project Coordination, Membership in Collaborative Research Projects

2013 - 2014	Subproject “Assessing the Impact of Early, Individualized Faculty and TA Interventions for At-Risk Students”, Award “Towards a Center for STEM Education”, National Science Foundation (NSF), USA
2011 - 2015	“Increasing Teaching Effectiveness in Ecology and Evolutionary Biology”, Science Education Initiative, University of Colorado, Boulder, USA
2011 - 2013	“Assessing Functional Diversity of Algal Communities at the Single Cell Level with a Compact Multi-function Microfluidic Cytometer”, NSF, USA
2011 - 2013	“Developing a Roadmap to the Diatoms with Greatest Oil Production”, VCR Innovative Seed Program, University of Colorado, Boulder, USA
2011 - 2012	“Extractive Photobioreactor”, ConocoPhillips Company, Houston, USA
2010 - 2015	“Collaborative Research (Arabidopsis 2010): Ecological Genomics of Adaptation to the Environment”, NSF, USA
2010 - 2013	“Novel Genetic Dissection of Temperature Tolerance in the Model Plant Arabidopsis”, VCR Innovative Seed Program, University of Colorado, Boulder, USA
2009 - 2013	“Photosynthesis and Phloem Anatomy”, NSF, USA
2009 - 2010	“Optimization of Light Use Efficiency for Algal Production of Glycerol as a Precursor for Transport Fuels”, ConocoPhillips Company, Houston, USA

2007 - 2010 “Defining a Mechanistic Link Between Stand Thinning, Drought Stress, and Risk of Mortality from Pine Bark Beetles in Californian Yellow Pine”, U.S. Department of Agriculture, USA

2007 - 2008 “Identification of Novel Biomolecules for Improved Biological Production of Alternative Fuels from Solar Energy”, Energy Initiative, NREL Seed Grant Program, University of Colorado, Boulder, USA

2007 - 2008 “Towards the Establishment of a Novel Role of the Carotenoid Zeaxanthin in Signaling”, Council on Research and Creative Work (CRCW), University of Colorado, Boulder, USA

2003 - 2007 “Photosynthetic Acclimation, Photoprotection, and Phloem Loading”, NSF, USA

2002 - 2005 “Seasonal Changes in the Productivity of Evergreen Forests: Toward an Understanding of what it Takes to be ‘Evergreen’ and How Seasonal Changes are Orchestrated”, Andrew W. Mellon Foundation, New York City, USA

2000 - 2003 “Protein Phosphorylation and Xanthophyll Cycle Dynamics dependent on Lifeform”, U.S. Department of Agriculture, USA

1999 - 2001 “Protein Phosphorylation and Photoprotection during Winter Stress”, NSF, USA

1996 - 1998 “Photoprotection during Winter Stress”, NSF, USA

1994 - 1999 “Biosphere/Atmosphere Interactions: Biochemical Causes to Global Implications”, NSF, USA

1994 - 1997 “Interaction of Photoprotective Processes in Plants”, U.S. Department of Agriculture, USA

1992 - 1995 “Carotenoids and Photoprotection in CAM Plants”, NSF, USA

1992 - 1993 “The Relative Roles of Photoprotective Energy Dissipation and Repair Processes in Plants under High Light Stress”, CRCW, University of Colorado, Boulder, USA

1991 - 1992 “Remote Sensing of Actual Photosynthesis Rates of Vegetation under Changing Environmental Conditions”, Global Change & Environmental Quality Program, University of Colorado, Boulder, USA

1990 - 1992 “Carotenoids and Photoprotection in Various Crop Species”, U.S. Department of Agriculture, USA

Honours and Awarded Memberships (selection)

2016 College Scholar Award, University of Colorado, Boulder, USA

2014 Marinus Smith Award, Parents Association for services to undergraduates, University of Colorado, Boulder, USA

2013	Chancellor's Award for Excellence in STEM education, University of Colorado, Boulder, USA
2011	Boulder Faculty Assembly Excellence in Teaching Award, University of Colorado, Boulder, USA
since 2011	Member, German National Academy of Sciences Leopoldina, Germany
2008	Certificate of Appreciation for work with students with disabilities from Disabilities Services, University of Colorado, Boulder, USA
2006	The Boulder Faculty Assembly Excellence in Research, Scholarly, and Creative Work Award, University of Colorado, Boulder, USA
1997	Faculty Fellowship, Council on Research and Creative Work (CRCW), University of Colorado, Boulder, USA
1992 - 1997	Fellowship in Science and Engineering, David and Lucile Packard Foundation, Los Altos, USA
1987	Prize for Biology, Göttingen Academy of Sciences and Humanities, Göttingen, Germany

Research Priorities

Barbara Demmig-Adams examines fundamental questions of plant physiology. Her profound investigations of the mechanisms with which plants protect themselves from too much sunlight under varying environmental conditions are considered milestones of modern plant biology.

Plants have developed different strategies to protect themselves from too much sunlight. One of those strategies involves converting excess radiation energy into heat in a controlled manner, thereby removing it from the system. Zeaxanthin, an orangey pigment from the group of xanthophylls, plays an important role in this strategy. Barbara Demmig-Adams was able to show this using the example of the balsam poplar (Populus balsamifera L.), common ivy (Hedera helix L.) and the split-leaf philodendron (Monstera deliciosa Liebm.). She found that when there is strong light, zeaxanthin collects in the leaves and more heat is simultaneously expelled. By contrast, when the light becomes weaker, the relative amount of the precursor molecule violaxanthin increases. From this, Demmig-Adams concluded that plants use the so-called xanthophyll cycle to dispense with excess energy before their photosynthesis systems are irreparably damaged. Her 1987 article "Photoinhibition and Zeaxanthin Formation in Intact Leaves" was honoured as a "milestone" of modern plant biology by the journal "Plant Physiology" in 2010.

Demmig-Adams' studies on the molecular mechanisms of plant photoprotection and photoinhibition, i.e. for limiting photosynthesis when light intensity exceeds the point of light saturation, are also of great relevance when it comes to the agricultural and technical uses of plants. During her work into the differences in photoprotection between different plants and under

different environmental conditions, Demmig-Adams continually broadened her perspective. She discovered parallels between plants' photoprotection and the mechanisms with which the human eye shields itself from damage due to excessive light intensity. Here, too, zeaxanthin and the orange-coloured pigment lutein, which collect in the "yellow spot" on the macula (Macula lutea), play a pivotal role. The substantial difference is that humans, unlike plants, cannot synthesise these pigments themselves, but must instead absorb them nutritionally. Even though these complex processes are not yet fully understood, nutritional advice can still be derived from them, e.g. for preventing eye diseases such as age-related macular degeneration (AMD).

In addition to her work as a researcher, Barbara Demmig-Adams advocates for innovative teaching and learning methods. She pursues this, for example, as a part of the "Science Education Initiative" and the "Center for STEM Learning (CSL)" at the University of Colorado.