Leopoldina
Nationale Akademie
der Wissenschaften

Curriculum Vitae Professor Dr Marja Timmermans

Image: Markus Scholz | Leopoldina

Name: **Marja C. P. Timmermans**

Research Priorities: Pattern formation, morphogens, small-RNA signals, stem cell homeostasis, differentiation

Marja Timmermans is a Dutch plant geneticist. One focus of her work addresses how plant leaves develop at the molecular biological level.

Academic and Professional Career

since 2015	Alexander von Humboldt Professorship, University of Tübingen, Tübingen, Germany
2015 - 2018	Adjunct Professor, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA
2009 - 2015	Professor, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA
2005 - 2009	Associate Professor, Cold Spring Harbor Laboratory Cold Spring Harbor, USA
2001 - 2004	Assistant Professor, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA
1998 - 2001	Independent Fellow, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA
1996 - 1998	Postdoctoral Fellow, Yale University, New Haven, USA
1996	PhD, Rutgers University, New Brunswick, USA
1990 - 1996	Graduate Fellow, Waksman Institute, Rutgers University, New Brunswick, USA

Functions in Scientific Societies and Committees

since 2020	Member, Scientific Board “DataPlant” (German research data infrastructure platform), Tübingen, Germany

2017 - 2019 Director, Center for Plant Molecular Biology, University of Tübingen, Tübingen, Germany

2011 - 2016 Member, Executive Committee, Maize Genetics, Ithaca, USA

2008 - 2015 Director, Independent Fellows Program, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA

Project Coordination, Membership in Collaborative Projects

since 2021 Applicant, Subproject "Regulation of Maize Shoot Apical Meristem Structure and Function", Research Units (FOR), German Research Foundation (DFG), Germany

since 2018 Head, Project "Specificity in intercellular small RNA mobility (C06)", Collaborative Research Centres (SFB) 1101, DFG, Germany

2016 Leader, Project "Klimakammer Mais 1", DFG, Germany

2016 Leader, Project "Klimakammer Mais 2", DFG, Germany

2016 - 2019 Head, Project "Yield stability in dynamic environments", Ministry of Science Baden-Württemberg, Stuttgart, Germany

2014 - 2017 Host, Project "A Comprehensive Study of the Maize Shoot Apex – Deciphering Genes Underlying Shoot Apical Meristem Allometry", DFG, Germany

2013 - 2018 Member, Project "Genetic Networks Regulating Structure and Function of the Maize Shoot Apical Meristem", National Science Foundation (NSF), USA

2008 - 2012 Member, Project "Genomic Analysis of Shoot Meristem Function in Maize" NSF, USA

2003 - 2008 Member, Project "Functional Analysis of Genes Involved in Meristem Organization and Leaf Initiation", NSF, USA

Honours and Awarded Memberships

since 2020 Member, German National Academy of Sciences Leopoldina, Germany

2020 Elected Member, Heidelberger Academy of Sciences, Heidelberg, Germany

since 2018 Member, European Molecular Biology Organization (EMBO)

2015 - 2021 Alexander von Humboldt Professorship, Alexander von Humboldt-Stiftung, Bonn, Germany

2009 James M. and Cathleen D. Stone Award for Significant Research Achievements by a Junior Scientist, Cold Spring Harbor Laboratory, Cold Spring Harbor, USA

2007 Demerec-Kaufmann-Hollaender Fellowship in Developmental Genetics

2002 - 2004 Perkin Fellowship for Women in Science, Harry Perkins Institute, Nedlands, USA

Research Priorities

Marja Timmermans is a Dutch plant geneticist. One focus of her work is how leaves develop in plants at the molecular biological level.

Plant leaves are highly efficient solar panels that convert light energy into chemical energy via the production of sugars. Marja Timmermans studies the signalling events that coordinate gene activities in space and time at the shoot stem cell niche of the growing plant tip to understand how leaves develop and attain their distinctive flattened architecture. Her team was able to show that the so-called small RNAs function as mobile instructive signals in this process. Now they want to understand how small RNAs are able to move from cell to cell to trigger the formation of diverse developmental patterns.

Marja Timmermans describes her approach as follows: The formation of stable, precisely defined boundaries between two distinct cell fates is a fundamental feature of plant and animal development. Such cell fate boundaries coordinate the differentiation and growth of the tissue or organ. In this regard, development of flat leaf architecture poses an unusual and mechanistically challenging problem; namely, how to create a stable dorsoventral (top-bottom) boundary within the plane of a long and wide, but shallow structure?

Marja Timmermans and her team have shown that the positional information needed to establish dorsoventral polarity is provided in part by small RNAs. These generate – not unlike classical Morphogens – sharply defined domains of target gene expression via an intrinsic and threshhold-based readout of their mobility gradients. An obvious advantage of using small RNAs as mobile signals in plant development is their distinctive specificity and direct mode of action.

In addition, the scientists have shown that the mobility of small RNAs is regulated via mechanisms distinct from those controlling the movement of proteins. Small RNA mobility is gated at individual cell-cell interfaces. This creates the directionality which gives a pattern to their activity within stem cell niches. Her Team now seeks to understand how small RNAs move, what gates their mobility, and how the threshold-based readout is realized. They use a combination of theoretical and experimental approaches to understand how the regulatory network underlying dorsoventral polarity emerges during organogenesis at the shoot stem cell niche in space and time and, furthermore, how this controls the subsequent differentiation of specialized leaf cells.