Press release

Grossbeeren, 22 April 2021

How do plants sense ambient temperature and how do they respond?

Prestigious ERC project on temperature sensing and perception in plants awarded to scientist Philip Wigge in Brandenburg

Philip Wigge, department head at the Leibniz Institute of Vegetable and Ornamental Crops (IGZ) in Grossbeeren and Professor at the University of Potsdam, has been awarded a prestigious ERC Advanced grant. The cutting-edge research in the project "TIPTOP - Temperature Integration via Phase Change and Translation of Proteins in Plants", will receive EUR 2.14 million EUR in support from the European Commission over a period of 5 years. These ERC Advanced Grants are intended to support pre-eminent senior researchers across Europe to carry out cutting edge research.

In his ambitious "TIPTOP" research project, Philip Wigge will elucidate the molecular mechanisms by which plants measure temperature and adapt to their environment. In the course of evolution, plants have developed a variety of mechanisms to adapt to changing temperatures. Plants need to be able to quickly capture information about the local temperature and adapt their metabolism and development to survive. Plants use temperature information to make seasonal decisions such as when to flower and grow, as well as short term changes to protect themselves against cold and heat stress. For all these responses, plants must be able to sense temperature.

Research on the mechanisms by which plants sense temperature and adapt their behaviour is particularly relevant to agriculture during an era of rapid climate change. Plants are particularly vulnerable to rapid changes in temperature. For example at least one third of the French wine production worth €2bn was wiped out in the last few weeks due to freezing temperatures. Heat stress can also cause crop losses of about 10 % for every additional 1 ºC increase in temperature. Since extreme weather events are becoming more frequent due to climate heating, it is paramount that we understand how plants sense and use temperature information so that we can breed climate resilient crops.

In the TIPTOP project, Philip Wigge investigates how plants determine a correct temperature signal, even if the surrounding macro- and microclimate fluctuates for a short periods. So far unknown are also the processes how the different temperature signals determined in individual cells are integrated over the entire plant and how this leads to a coordinated reaction in growth and development processes. The project builds on recent advances by the team in understanding how individual proteins and RNA molecules can act as miniature temperature sensors, and uses synthetic biology to re-engineer temperature responsive circuits in the cell.

Philip Wigge is head of the Programme Area “Functional Plant Biology” at the IGZ with a research focus on temperature sensors of plants. With his group, Philip Wigge deciphers the underlying mechanisms of temperature perception and uses this knowledge to develop breeding concepts for climate-resistant crops in horticulture.

Cutting-edge research in Brandenburg

This year, the state of Brandenburg was particularly successful in the European competition for ERC funding, as in addition to the IGZ, the Leibniz Institute for Astrophysics Potsdam (AIP) has acquired funds from the renowned ERC program. Top European research is positioned in Brandenburg, covering topics as diverse as the formation of galaxies (at the AIP) and the elucidation of the temperature sensors in a single plant cell (at the IGZ).

ERC Advanced Grant

The "ERC Advanced Grant" is an instrument of the European Research Council (ERC) of the European Commission and supports excellent researchers with an outstanding scientific profile to deliver new knowledge in visionary, groundbreaking and scientifically risky research areas. The ERC's funding program is one of the most important and demanding in Europe. ERC Advanced Grants have been awarded to all scientific disciplines since 2009. In the current call, 2678 applications were submitted across whole Europe. (https://erc.europa.eu/news/erc-2020-advanced-grants-results)

Leibniz Institute of Vegetable and Ornamental Crops (IGZ)

The IGZ is a research institute of the Leibniz Association and contributes with scientifically sound knowledge from fundamental and applied research to the solution of current global challenges such as the conservation of biodiversity, climate change, urbanization and malnutrition. The institute is jointly financed by the Brandenburg Ministry of Science, Research and Culture (MWFK) and the Federal Ministry of Food and Agriculture (BMEL). (https://www.igzev.de/)

University of Potsdam

The University of Potsdam is the largest university in Brandenburg, is strong in acquiring third-party funding and pays particular attention to technology and knowledge transfer. With around 22,000 students and its three locations - Am Neuen Palais, Griebnitzsee and Golm - the University of Potsdam is an outstanding development driver for the region. (https://www.uni-potsdam.de/)

Leibniz Association

The Leibniz Association connects 96 independent research institutions that range in focus from natural, engineering and environmental sciences to economics, spatial and social sciences and the humanities. Leibniz Institutes address issues of social, economic and ecological relevance. They conduct basic and applied research, and collaborate with universities, with industry and other partners at home and abroad. Because of their importance for the country as a whole, the Leibniz Association Institutes are funded jointly by Germany's central and regional governments. The Leibniz Institutes employ around 20,000 people, including 10,000 researchers. The financial volume amounts to 1.9 billion euros. (https://www.leibniz-gemeinschaft.de/)

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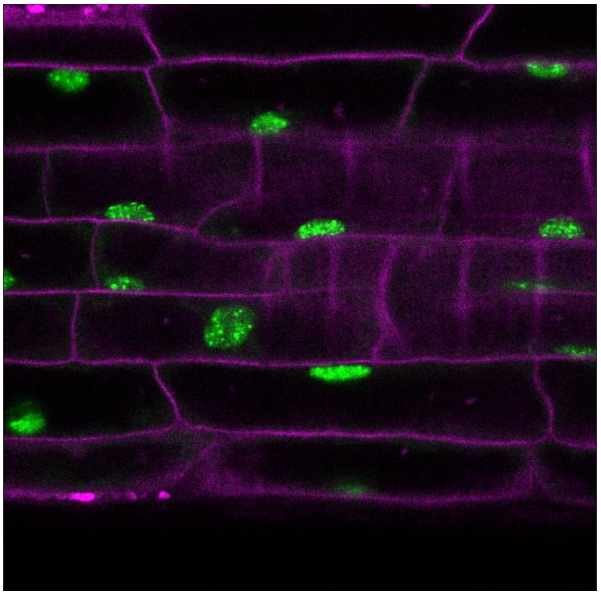
ERC press release	https://erc.europa.eu/news/erc-2020-advanced-grants-results

Prof. Philip A. Wigge. Credit: Mike Thornton



Philip Wigge and his group identified individual proteins and RNA molecules that can act as miniature temperature sensors in plant cells. Here, plant cells are visualised containing temperature sensing proteins (in green). The cells are at higher temperature, and the proteins make speckles in response to temperature. This introduces changes in gene expression in the plant, enabling it to adapt to heat. (Credit: Maolin Peng)

Plants must be able to react to changes in temperature to ensure their survival. They also adapt their life cycle, such as flower development and growth phase, to the changing temperatures of the seasons. Plants look significantly different at higher or lower temperatures, here for example *Arabidopsis thaliana*: The plant on the left grows at 22ºC; it flowers late and grows more slowly. The plant on the right side was kept at 27ºC for the same growth period and has already developed flowers. (Credit: Mingjun Gao)