

## Belgium

Moritz K. Nowack

VIB-UGent Center for Plant Systems Biology, Ghent, Belgium

[moritz.nowack@vib.be](mailto:moritz.nowack@vib.be)



**Please describe any new experimental resources and/or software tools available to Arabidopsis researchers that have been initiated or funded in your country in 2020 or early 2021**

- Root tip single cell RNAseq atlas <https://bioit3.irc.ugent.be/plant-sc-atlas/>
- Updated collection of GoldenGate and Gateway vectors <https://gatewayvectors.vib.be/>
- Centralized resource for plant post-translational modifications (PTMs) <https://www.psb.ugent.be/webtools/ptm-viewer/>
- Updated versions of PLAZA <https://bioinformatics.psb.ugent.be/plaza/>

**Please provide a paragraph describing the general impact of the COVID19 pandemic on the scientific community in your country**

The impact of COVID-19 on academic research and training of scientists in Belgium has been, and continues to be, severe. Several country-wide lockdowns reduced work efficiency drastically. To guarantee work safety, staff presence in institutes was reduced to as much as 30% of normal occupancy. Remote work from home was obligatory for periods of time. No face-to-face meetings have happened for lengthy periods of time, and regular seminars and lectures have been cancelled altogether for some time before online formats had been set up. Also undergrad students had to largely switch to online courses, and hands-on training in the lab was drastically reduced. Young scientists with short-term contracts (PhD students, postdocs) were hit hard as many of them could not finish projects before their contracts ended.

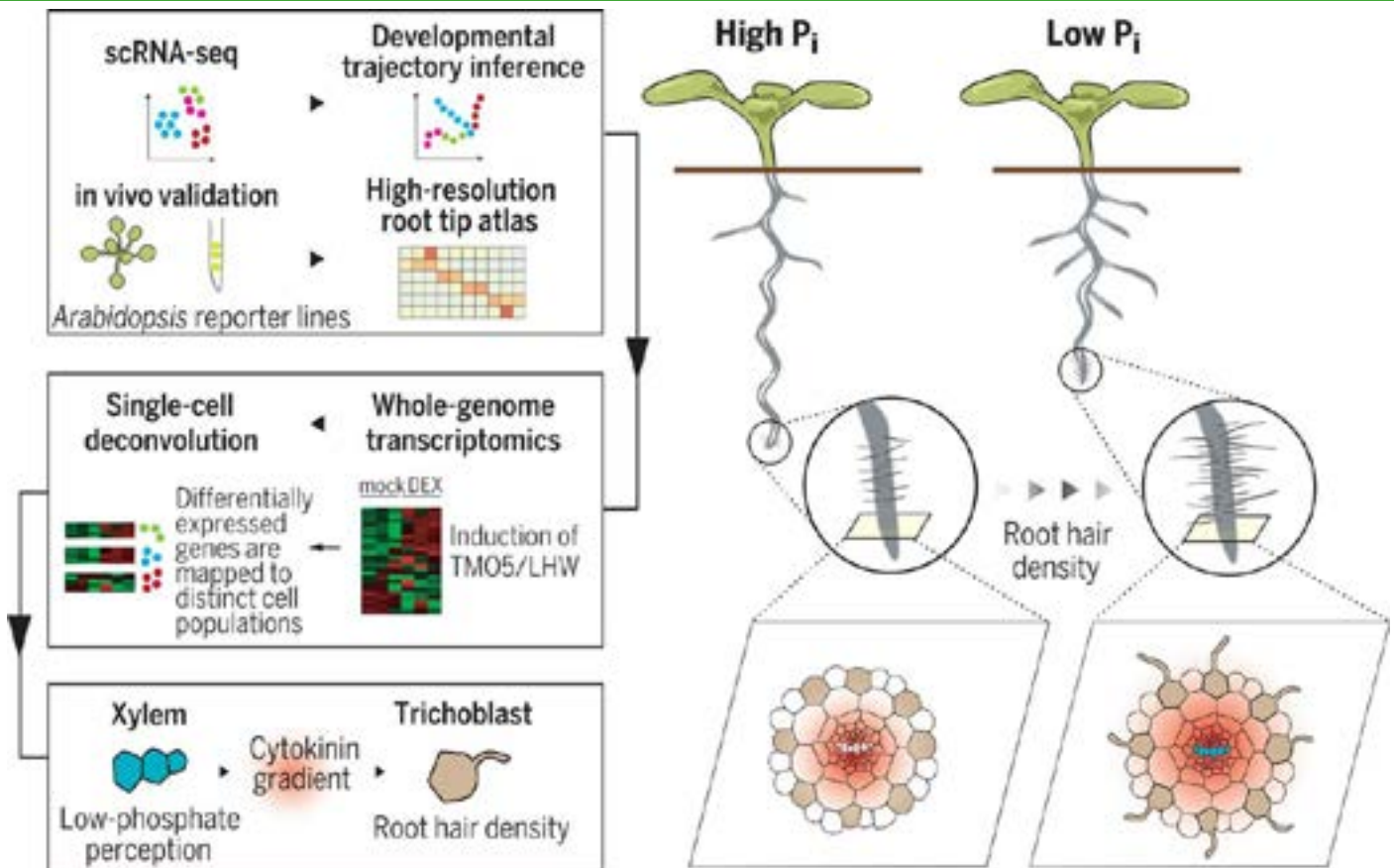
Finally also private life has suffered – for expats it was very difficult, or for periods of time impossible, to visit partners or family in other countries. Social life has been severely reduced, which is again especially hard for expats with a limited local social and family bonds. Parents of young children had to combine work with childcare and homeschooling for many months. Especially for foreigners without local family support, and for couples with both partners working full time, this situation was, and continues to be, difficult to manage.

### Planned events for 2021 and 2022

- 72nd ISPCI International Congress of Crop Protection (ONLINE) May 18, 2021 Ghent, Belgium <https://www.ugent.be/bw/plants-and-crops/ispc/en>

- Plant Science for Climate Emergency (ONLINE) June 7-9, 2021 Ghent, Belgium <https://www.vibconferences.be/events/plant-science-for-climate-emergency>

- SEB Annual Meeting 2021 June 29 – July 2, 2021 Antwerp, Belgium <https://www.sebiology.org/events/event/seb-antwerp-2021> - GCC2021



Vascular transcription factors guide epidermal responses.

A validated high-resolution single-cell gene expression atlas of the Arabidopsis root was intersected with TMO5/LHW target genes, uncovering an enrichment of epidermal-restricted expression patterns. By activating local cytokinin biosynthesis, the vascular TMO5/LHW complex was shown to regulate epidermal root hair density in response to the availability of phosphate. scRNA-seq, single-cell RNA-sequencing; mock, untreated condition; DEX, dexamethasone; Pi, inorganic phosphate.

– Galaxy Community Conference July 5-12, 2021 Gent, Belgium <https://www.vibconferences.be/events/gcc2021>

- Genome Engineering and Synthetic Biology (ONLINE) September 22-24, 2021 <https://www.vibconferences.be/events/genome-engineering-and-synthetic-biology-virtual-4th-edition>

- 4th International Brassinosteroid Conference August, 17-19 2022 Ghent, Belgium (meeting website will be set up soon)

## Selected Publications

De Clercq I, Van de Velde J, Luo X, Liu L, Storme V, Van Bel M, Pottie R, Vaneechoutte D, Van Breusegem F, Vandepoele K. *Nat Plants*. 2021 Apr;7(4):500-513. doi: 10.1038/s41477-021-00894-1

- Integrative inference of transcriptional networks in Arabidopsis yields novel ROS signalling regulators.

Wendrich JR, Yang B, Vandamme N, Verstaen K, Smet W, Van de Velde C, Minne M, Wybouw B, Mor E, Arents HE, Nolf J, Van Duyse J, Van Isterdael G, Maere S, Saeys Y, De Rybel B. *Science*. 2020 Nov 13;370(6518):eaay4970. doi: 10.1126/science.aay4970. Epub 2020 Sep 17.

- Complementary information about Arabidopsis DNA motifs, open chromatin, transcription factor-binding and expression-based regulatory interactions were combined using a supervised learning approach to generate an integrated gene regulatory network (iGRN), correctly inferring known functions for 681 transcription factors and predicted hundreds of new gene functions. Vascular transcription factors guide plant epidermal responses to limiting phosphate conditions.

Canher B, Heyman J, Savina M, Devendran A, Eekhout T, Vercauteren I, Prinsen E, Matosevich R, Xu J, Mironova V, De Veylder L. *Proc Natl Acad Sci U S A*. 2020 Jul 14;117(28):16667-16677. doi: 10.1073/pnas.2006620117. Epub 2020 Jun 29

- By generating and exploiting a high-resolution single-cell gene expression atlas of Arabidopsis roots, an enrichment of TARGET OF MONOPTEROS 5/LONESOME HIGHWAY (TMO5/LHW) target gene responses in root hair cells was revealed, and shown to increase root hair density during low-phosphate conditions by modifying both the length and cell fate of epidermal cells. Rocks in the auxin stream: Wound-induced auxin accumulation and ERF115 expression synergistically drive stem cell regeneration.

Fernandez AI, Vangheluwe N, Xu K, Jourquin J, Claus LAN, Morales-Herrera S, Parizot B, De Gernier H, Yu Q, Drozdzecki A, Maruta T, Hoogewijs K, Vannecke W, Peterson B, Opdenacker D, Madder A, Nimchuk ZL, Russinova E, Beeckman T. *Nat Plants*. 2020 May;6(5):533-543. doi: 10.1038/s41477-020-0645-z. Epub 2020 May 11.

- A combination of cellular imaging and in silico modeling demonstrates that wound-induced vascular stem cell death obstructs the polar auxin flux, and causes auxin to accumulate in the endodermis, which grants the endodermal cells the capacity to undergo periclinal cell division to repopulate the vascular stem cell pool. GOLVEN peptide signalling through RGI receptors and MPK6 restricts asymmetric cell division during lateral root initiation.

Liu D, Kumar R, Claus LAN, Johnson AJ, Siao W, Vanhoutte I, Wang P, Bender KW, Yperman K, Martins S, Zhao X, Vert G, Van Damme D, Friml J, Russinova E. *Plant Cell*. 2020 Nov;32(11):3598-3612. doi: 10.1105/tpc.20.00384. Epub 2020 Sep 21.

- Endocytosis of BRASSINOSTEROID INSENSITIVE1 Is Partly Driven by a Canonical Tyr-Based Motif.

Wei P, Demulder M, David P, Eekhout T, Yoshiyama KO, Nguyen L, Vercauteren I, Eekhout D, Gallego M, De Jaeger G, Larsen P, Audenaert D, Desnos T, Nussaume L, Loris R, De Veylder L. *Plant Cell*. 2021 Jan 25:koab005. doi: 10.1093/plcell/koab005.

- Arabidopsis casein kinase 2 triggers stem cell exhaustion under Al toxicity and phosphate deficiency through activating the DNA damage response pathway.

He H, Denecker J, Van Der Kelen K, Willems P, Pottier R, Phua SY, Hannah MA, Vertommen D, Van Breusegem F, Mhamdi A. *Plant Cell*. 2021 Mar 13:koab079. doi: 10.1093/plcell/koab079. Online ahead of print.

- The Arabidopsis Mediator Complex Subunit 8 Regulates Oxidative Stress Responses

Wang J, Yperman K, Grones P, Jiang Q, Dragwidge J, Mylly E, Mor E, Nolf J, Eekhout D, De Jaeger G, De Rybel B, Pleskot R, Van Damme D. *Proc Natl Acad Sci U S A*. 2021 Apr 13;118(15):e2023456118. doi: 10.1073/pnas.2023456118.

- Conditional destabilization of the TPLATE complex impairs endocytic internalization.

## Major Funding Sources

- Flanders Institute for Biotechnology (VIB; [www.vib.be](http://www.vib.be))
- European Union Framework Programs ([cordis.europa.eu/](http://cordis.europa.eu/))
- Belgian Federal Science Policy Office ([www.belspo.be](http://www.belspo.be))
- Research Foundation – Flanders (FWO; <http://www.fwo.be/en/index.aspx>)
- Fonds de la Recherche Scientifique (FNRS; <http://www.frs-fnrs.be>)
- European Research Council (<http://erc.europa.eu/>)

