

Name: Dr. Ive De Smet

Division: [Plant and Crop Sciences](#)

Other Supervisor/s involved: Co-supervisor [Prof. Malcolm Bennett](#)

Project Title: **Peptide ligand–receptor kinase signalling in root development**

Description of project:

Optimized root architecture is crucial for efficient water and nutrient uptake, and strongly affects plant growth and seed yield. To improve our understanding of root branching, we will investigate peptide ligand–receptor kinase-dependent signalling cascades, which we recently showed to be important for Arabidopsis root development (De Smet *et al.* 2008, *Science* 322:594-597; De Smet *et al.* 2009, *Nature Cell Biology* 11:1166-1173). In future, the knowledge gained in this project will be translated into cereal crops, such as barley and wheat.

A first part will focus on various regulatory and interacting proteins that could modulate the ACR4-dependent signalling cascade. Initially, screening mutant collections for insensitivity to (putative) peptide ligands will allow the identification of elements within the ACR4 pathway (such as interacting proteins or ligand processing enzymes), but also in other ligand-receptor kinase modules that act on the same processes. The most promising mutants will be, after identification of the affected gene, functionally characterized on the level of root architecture, microscopic analyses of phenotypes, gene expression, protein localization, etc.

In the second part of this project, we aim to define new peptide ligand–receptor kinase pairs that play important roles in regulating asymmetric cell divisions in the Arabidopsis root, mainly focusing on lateral root initiation. While plant genomes encode >600 putative receptor-like kinases (RLKs) and >1000 potential peptide ligands, so far only very few could be shown to form pairs (Butenko *et al.*, 2009, *Trends Plant Sci* 14:255-263). Identification of peptide ligand–receptor kinase pairs is technically challenging and will require a multidisciplinary strategy that combines computational data mining, transcriptional analyses with cellular resolution, microscopic characterization of loss- and gain-of-function plant phenotypes, and cell-specific protein localization studies to identify candidate pairs, followed by biochemical assays and genetic analyses to demonstrate their physical interaction.

Award Start Date: 15<sup>th</sup> October 2011

Duration of Award: 4 years

Funding status: Funded PhD Project (European/UK Students Only)

Closing date for applications: 25<sup>th</sup> September 2011

Eligibility Requirements: high grades, good references, good command of English, certain level of experience in the proposed research field

Method by which candidates should apply: e-mail to [Ive.De\\_Smet@nottingham.ac.uk](mailto:Ive.De_Smet@nottingham.ac.uk)