

The Research Group
Structural Biology Brussels

has the honor to invite you to the public defence of the PhD thesis of

Kim Mignon

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

**Molecular basis of DNA recognition
by *Arabidopsis thaliana* SOG1:
the master regulator for DNA damage control in plants**

Supervisor:

Prof. dr. Remy Loris

The defence will take place on

**Wednesday, December 3, 2025 at
5:30 p.m.**

VUB Etterbeek campus, Pleinlaan 2, Elsene,
Auditorium D.0.03

Members of the jury

Prof. dr. Joris Messens (VUB, chair)

Prof. dr. Joske Ruytinx (VUB)

Dr. Daria Ezerina (VUB)

Prof. dr. Wim Versées (VUB)

Prof. dr. San Hadži (University of Ljubljana, SI)

Prof. dr. Jelle Hendrix (UHasselt)

Curriculum vitae

In 2019, Kim obtained her MSc in Bio-Engineering Sciences: Cell and Gene Biotechnology at the Vrije Universiteit Brussel. At the end of 2020, she began her PhD in the MoRe research group under the supervision of Prof. Dr. ir. Remy Loris. Her research focuses on the plant transcription factor SOG1. In 2021, Kim was awarded an FWO Fellowship for Fundamental Research to support her doctoral project. She has published in two peer-reviewed journals, from which one as joint first author, and currently has a manuscript under revision, also as joint first author. She participated in three international conferences, supervised one MSc thesis, and assisted in practical courses for both bachelor's and master's programs.

Abstract of the PhD research

DNA is the most important molecule in every living cell. DNA damage leads to abnormalities and diseases. Therefore, every organism needs to protect its DNA. Upon damage, the DNA must be repaired as soon as possible and the division of cells with damaged DNA must be stopped. Plants and animals achieve this through the DNA Damage Response (DDR) pathway. In animals, this pathway is centrally controlled by the well-known transcription factor p53, but in plants this is less clear. Here, the transcription factor SOG1 was proposed as the master regulator responsible for a correct DDR.

The SOG1 protein belongs to the NAC protein family, a large plant-specific family of transcription factors implicated in the development and stress resistance of plants. All NAC proteins consist of a structured NAC domain and an intrinsically disordered C-terminal domain (CTD). The NAC domain is responsible for DNA binding and dimerization, while the CTD is considered the transcriptional regulatory region since specific phosphorylation of this domain activates SOG1 *in vivo* upon genotoxic stress.

Despite its important function, little is known about SOG1 and the way it functions. In this project, the structure-function relationship of the SOG1 protein of *Arabidopsis thaliana* is investigated, with special attention to its DNA binding specificity *in vitro*, to answer the question how SOG1 is able to differentially regulate over 300 genes.

The specificity of SOG1 and its subdomains for different DNA sequences was studied as well as the structure of its NAC domain in complex with target DNA. In addition, the influence of the different phosphorylation states of the CTD on the DNA binding and conformation of SOG1 was examined. Together, this study leads to novel insights into the DNA binding mechanism and action of SOG1, as well as into the action of NAC proteins in general, which in the future could potentially result in applications to make plants more stress resilient and increase crop yields.