



**University of Stuttgart**

Stuttgart Research Center Systems Biology



## Systems Biology Seminar Talk

# Peroxiredoxin: a case study in modelling kinetics, enzyme oligomerisation, ROS detoxification and signalling

Visiting Professor Johann Rohwer

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**Thursday, 23.10.2025**

**14:00 CET**

**Host:**

**Prof. Jürgen Pleiss**

**Room 1.177, UG**

**Allmandring 31**

**Stuttgart**

### Abstract:

Peroxiredoxins (Prxs) play central roles in the detoxification of reactive oxygen species. These proteins exist in multiple oligomeric forms, depending on their state of oxidation/reduction. The most common of these are dimers and decamers, with decamers predominating under reduced conditions; there is a 100-fold difference in activity between dimers and decamers. By re-analysing published data, we were able to obtain kinetic rate constants for the dimer-decamer transition and developed an approach that greatly reduces the number of species needed to model the Prx oxidation cycle. Simulation of oxidation assays showed that the dimer-decamer transition had an inhibition-like effect on peroxidase activity. Further, modelling this cycle enabled us to almost perfectly reconcile experimental and simulated responses of PRDX2 oxidation state to hydrogen peroxide insult, thus mechanistically resolving a discrepancy between experimental data and kinetic simulations. Additionally, we have demonstrated that Prx decamer dissociation occurs within a time-frame relevant to peroxidase assays and other oxidation experiments and needs to be considered when working with Prx in a laboratory.

### CV:

Johann Rohwer is Professor in the Laboratory for Molecular Systems Biology at Stellenbosch University, South Africa. He obtained his PhD in 1997 from the University of Amsterdam under the supervision of Hans Westerhoff. Johann's main research interests are the construction of kinetic models of cellular function with emphasis on plant and microbial central carbon metabolism, cellular redox networks, and steroid receptor signalling. His lab has developed a method applying NMR spectroscopy to obtain enzyme kinetic parameters for whole metabolic pathways from reaction time-courses. In collaboration with Jürgen Pleiss, he works on the development of tools for FAIR management of enzymology data. He is a recipient of the President's Award from the South African National Research Foundation, the Silver Medal of the South African Society of Biochemistry and Molecular Biology, and a research fellowship from the Alexander von Humboldt Foundation, which partially funds his current stay as a Visiting Professor at the University of Stuttgart to continue his collaboration with Pleiss. In 2024, Johann was elected a member of the Academy of Science of South Africa (ASSAf).