Dynamics of the SHR-SCR network controlling asymmetric cell division

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In Arabidopsis roots, a small network of genes regulated by the transcription factors SHORTROOT (SHR) and SCARECROW (SCR) controls the divisions of the immediate progeny of the ground tissue stem cells. These divisions are asymmetric, in that the daughter cells go on to produce distinct cell lineages, the cortex and endodermis. Over 20 years of genetic research have elucidated the topology of this network, yet little is known about how network components act together dynamically to effect cell division and fate specification. We are using light sheet microscopy to measure, in real-time, the timing and levels of changes in protein expression of network components as cells divide in both wild-type plants and in response to SHR induction. The reduced phototoxicity and photobleaching of light sheet microscopy allows for long-term imaging of living roots, which has been challenging with traditional confocal laser scanning microscopy.