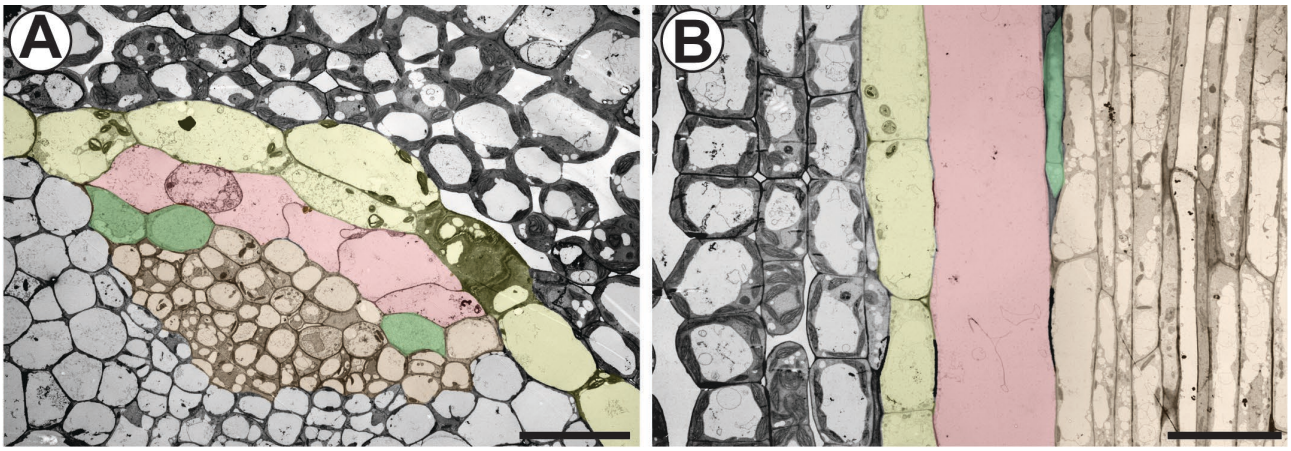
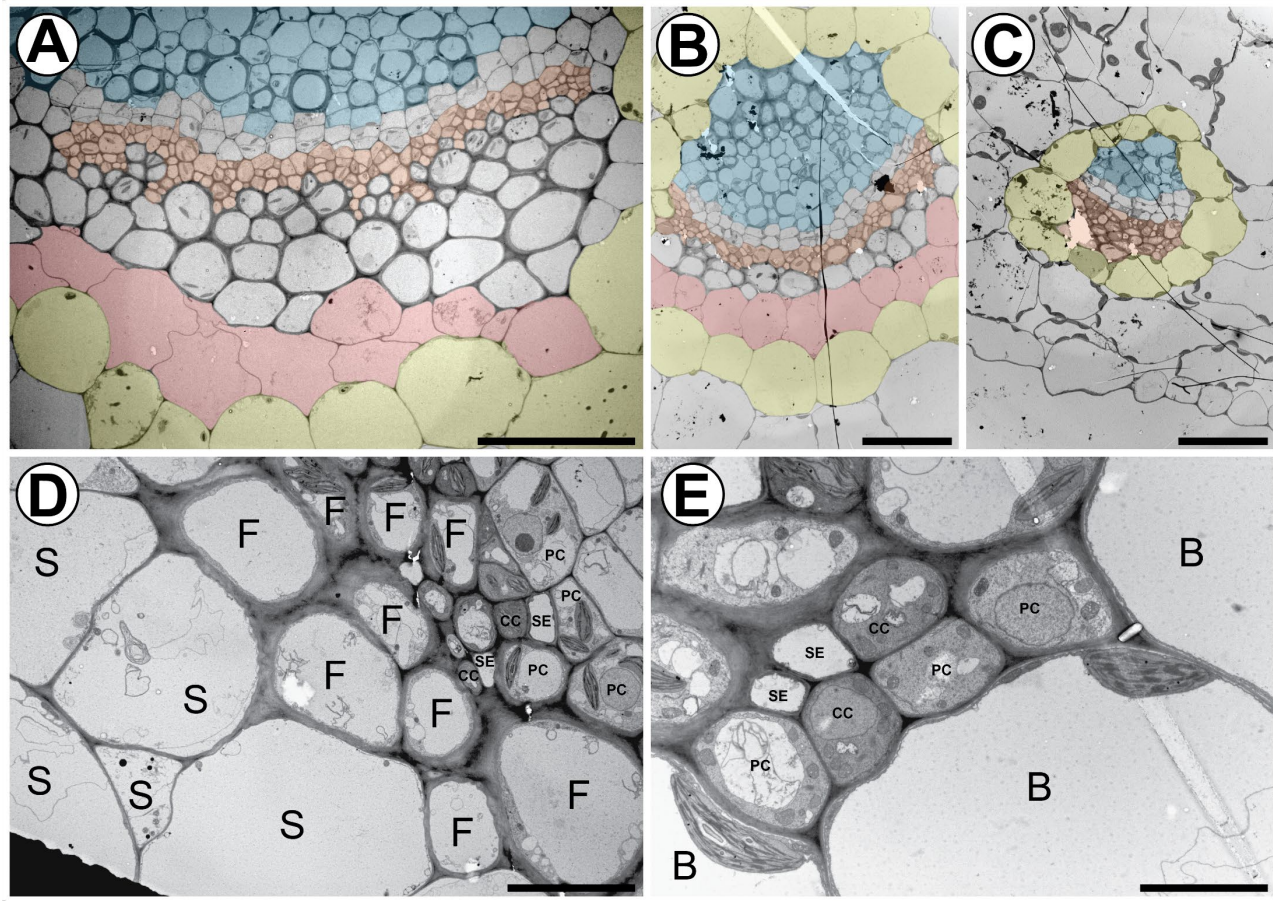
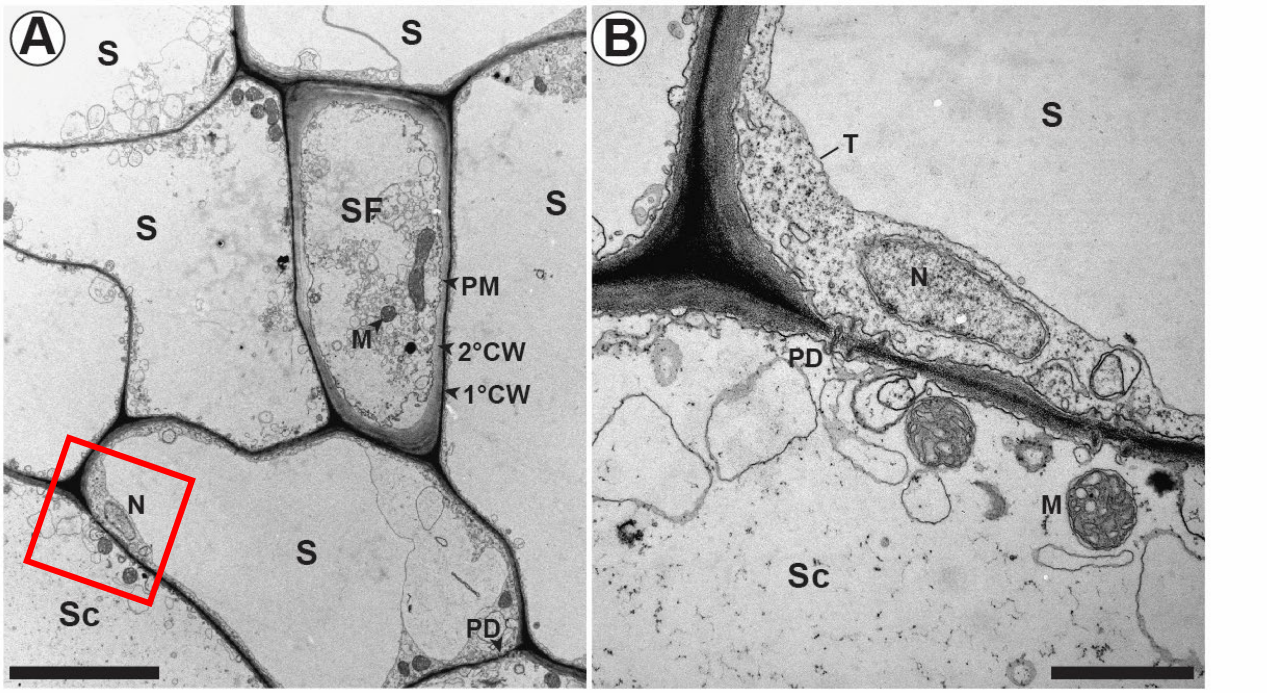
Supplementary data:



Supplementary Figure 1: Ultrastructural characteristics of S-cells in flower stalks of 6-week-old plants 5mm below the SAM (false-coloured version of the paper's Fig. 1 A and B). A, Overview of a vascular bundle in a transverse section. B, Longitudinal section of an S-cell. Inside the starch sheath (yellow), are S-cells (red), myrosinase ideoblasts (green) and the phloem, including phloem parenchyma, sieve tubes and companion cells (pale orange). Scale bars = 20 µm.



Supplementary Figure 2: Presence of S-cells in rosette leaves. A, Transverse section of a petiole. S-cells (false-coloured in red) are localized between the bundle sheath (false-coloured in yellow) and phloem (false-coloured in orange). Xylem is false-coloured in blue. Fibres form a layer between S-cells and the phloem. B, Transverse section of a mid-rib. S-cells and fibres are organized in layers between bundle sheath and phloem. C, Transverse section of a minor vein lacking both S-cells and fibres. D, S-cells of a petiole showing all characteristic features of S-cells from inflorescence stems, such as an electron-lucent cytoplasm and simple plastids. E, Phloem cap region of a minor vein. The phloem abuts the bundle sheath; there are neither S-cells nor fibres. B, bundle sheath; CC, companion cell; F, fibre, PC, phloem parenchyma cell, S, S-cell; SE, sieve element. Scale bars = A, B, C, 20 µm; D, E, 5 µm.



Supplementary Figure 3: The protoplast of S-cells is preserved at least until the formation of secondary cell walls. A, Electron micrograph of an S-cell (SF) undergoing lignification and formation of the secondary cell wall in the bottom 5 mm of 8-weeks-old flower stalks, surrounded by five S-cells (S) without secondary cell wall. B, higher magnification of the boxed area in A showing the interface between the S-cell and a starch sheath cell (Sc). The S-cell contains a nucleus (N) and a well-preserved tonoplast (T) limiting the vacuole. PD, plasmodesmata; V, vacuole; M, mitochondrion; PM, plasma membrane; 1°CW, primary cell wall; 2°CW, secondary cell wall. Scale bars = A, 5 µm, B, 1 µm.

Supplementary Video 1: Cell-coupling between CYP83A1-positive cells and S-cells revealed by photoactivation and tracing of CMNB-caged fluorescein. Overlay of chlorophyll autofluorescence (red), transmission light (grey) and fluorescein (green) channels of the same longitudinal section depicted in Fig. 3. CMNB-caged fluorescein is photoactivated in CYP83A1-mVenus-positive cells outlined in Fig. 3B starting from the first frame. Uncaged fluorescein accumulates in S-cells but not in the cortical cell or imaging medium outlined in Fig. 3B. The temporal dimension is depicted in the upper left corner of the video and corresponds to a total of 60 timepoints. Scale bar = 50 µm.