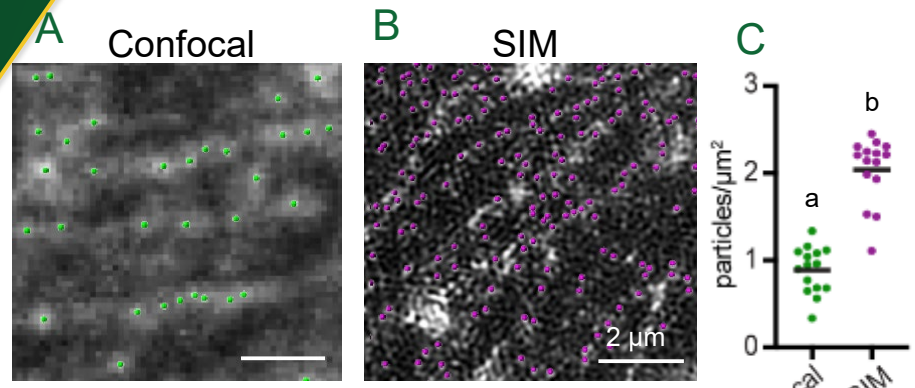
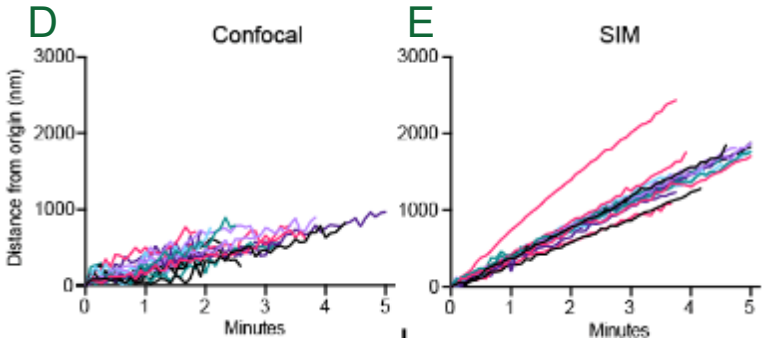
Super resolution microscopy reveals the nanoscale movements of Cellulose Synthases



SIM data show a higher density of Cellulose Synthase particles in the plasma membrane



Particle tracking of SIM data show that Cellulose Synthase particles move smoothly along linear tracks

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Scientific Achievement:

The movement of Cellulose Synthases was monitored in real time in living cells as they synthesized cellulose microfibrils by use of Structured Illumination Microscopy (SIM), a super resolution microscopy technique.

Significance and Impact:

Cellulose Synthases are more abundant and their movements are more linear than previous data suggest. These new results suggest that the enzymes may move steadily in tandem to generate larger cellulose fibrils or bundles at the cell surface. SIM data also reveal that Cellulose Synthase particles can make U turns, often in association with microtubules, a previously undescribed behavior with implications for cellulose patterning in the wall.

Research Details:

- Particles from confocal and SIM data were tracked using a particle tracking software (Imaris) and kymographs;
- Particle density, speed, and localization were compared between imaging modalities;
- Individual particle movements were observed to determine localization along microtubules and unique movements like U turns;

Duncombe, S. G., Chethan, S. G., Anderson, C. T., *Plant Cell*, **2021**, https://doi.org/10.1093/plcell/koab227