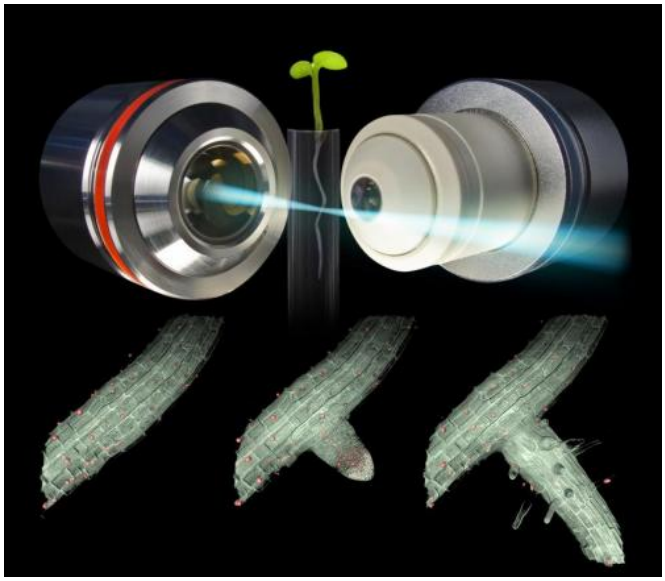
How does your garden grow?

1 July 2014



A new technique allows plants to be grown and imaged inside microscopes. Credit: Daniel von Wangenheim

Growing plants in a microscope is helping scientists to view roots developing in 3D and in real time. "With the growth conditions under our control, we can explore how roots respond to different environmental conditions", says Professor Ernst Stelzer (Goethe Universität Frankfurt am Main, Germany). "This could help plant breeders to select crops which are more resistant to drought or flooding."

Scientists already know that lateral roots in plants develop from cells deep within the main root, so that the emerging roots must force through multiple layers of tissue to reach the soil. Until now, capturing the cell-division events behind this process has proved exceptionally difficult.

The researchers grew Arabidopsis thaliana (a model organism for plant scientists) in miniature chambers placed inside fluorescence microscopes. This new technique allows root production to be observed without damaging these delicate structures.

The top of the chamber, containing the leaves, was illuminated by a timed light source to mimic the natural day / night cycle. The roots, meanwhile, were grown in a special transparent gel to resemble soil. The plants had been genetically engineered to contain special proteins (called "fluorophores") that fluoresce when exposed to specific wavelengths of light. A focused sheet of light was used to illuminate the fluorophores in a single cross section of the root, which was then photographed. Images taken at different levels of the root axis were combined to form a 3D reconstruction. The scientists were able to track the movements of the cells over more than three days, capturing the formation of new roots.

This work is to be presented at the Society for Experimental Biology Annual Meeting 2014 in Manchester on Wednesday 2nd July.

Provided by Society for Experimental Biology

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