

Initiation and elongation of maize primary roots under water stress

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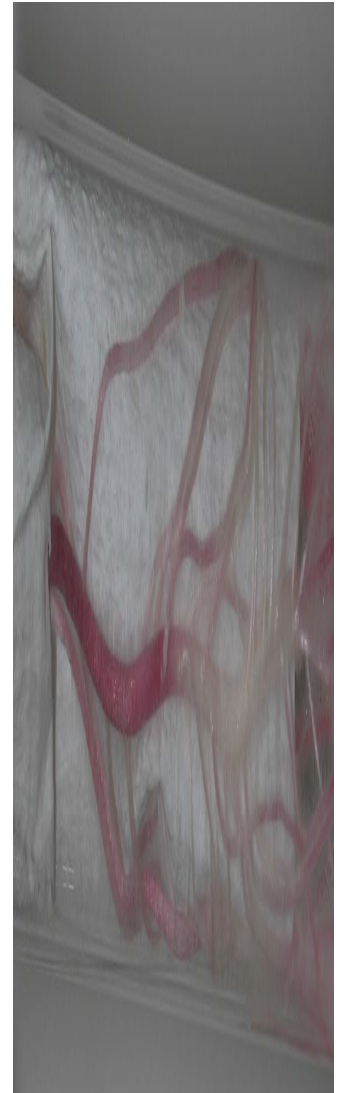


OR

What happens when poplars
won't grow roots?!

Why Roots?

- Belowground carbon sequestration
- Increased wood production from less input
- Pure intrigue



Why these organisms?

- Poplar - popular in lumber industry
 - Fast growth
 - Water-loving
- Maize - popular crop plant (that's easy to study)

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Populus, the model tree

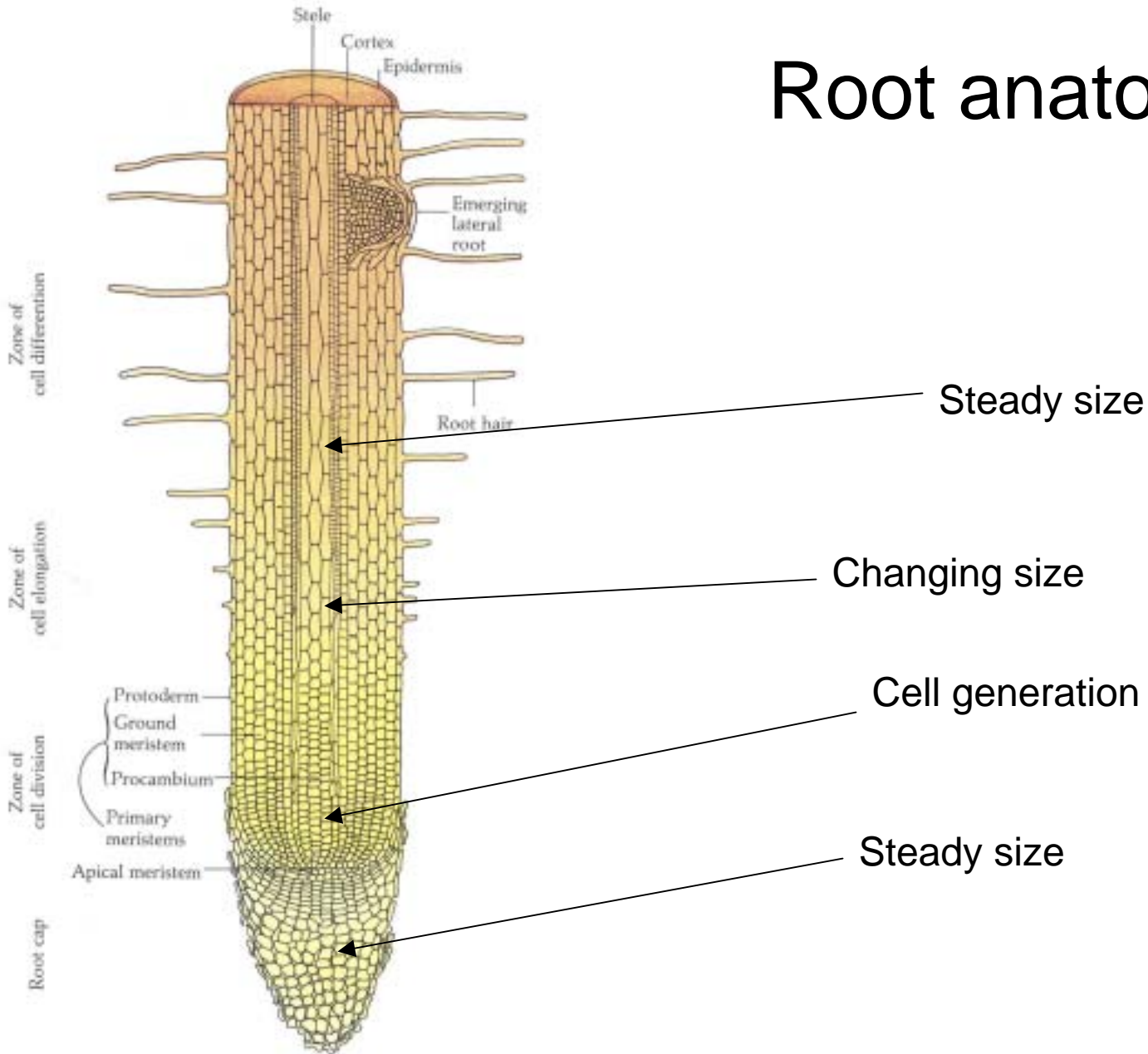
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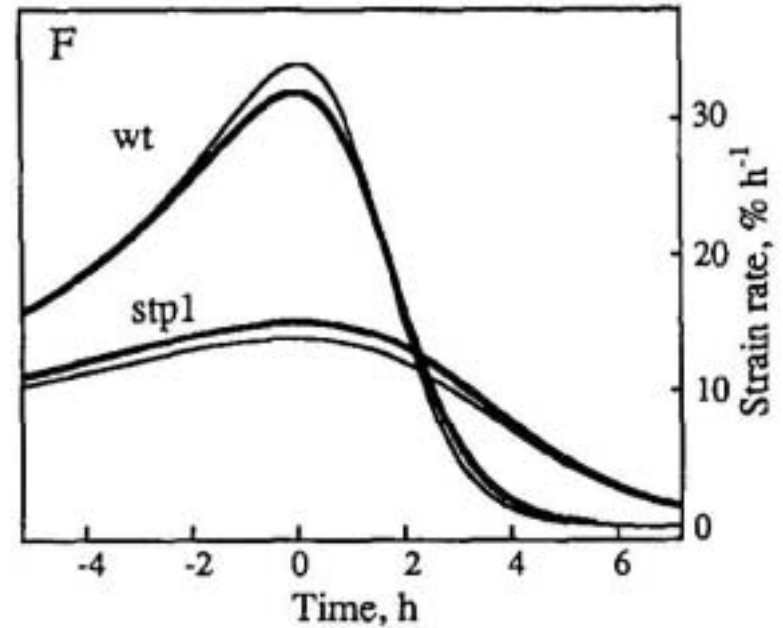
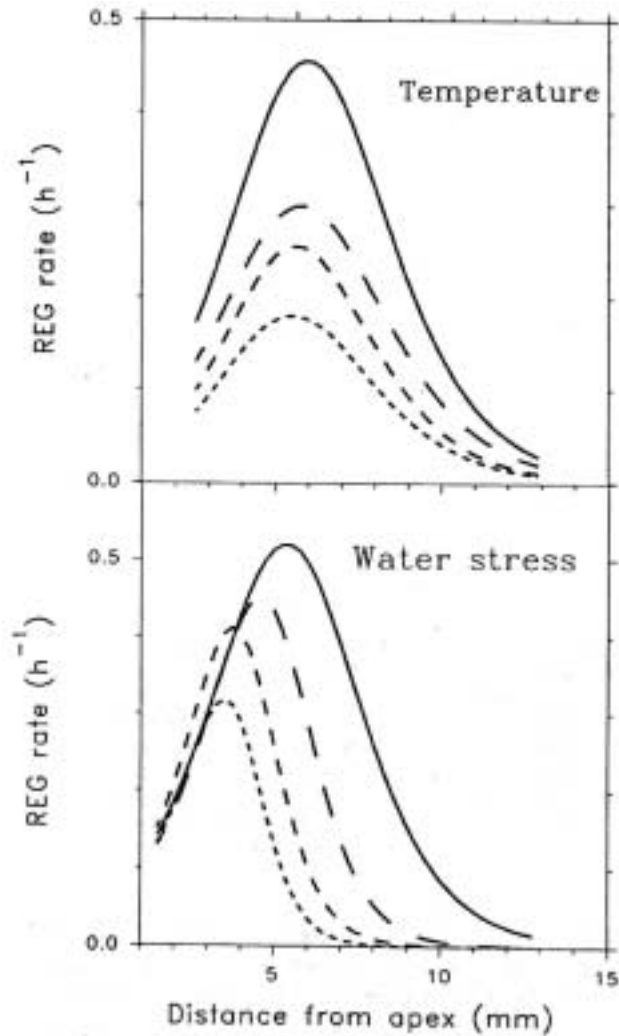
Early setups



Root anatomy



Stress response in roots



Silk WK. 1992. Steady form from changing cells.
International Journal of Plant Science 153(3):S49-S58.

Baskin TI et al. 1995. *STUNTED PLANT 1*, a gene required for expansion in rapidly elongating but not in dividing cells and mediating root growth responses to applied cytokinin.
Plant Physiology 107:233-243.



t = 0 hr



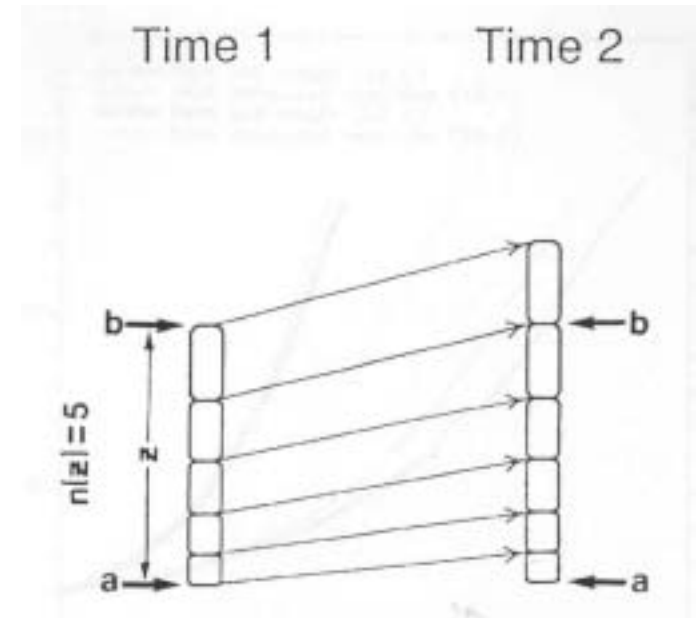
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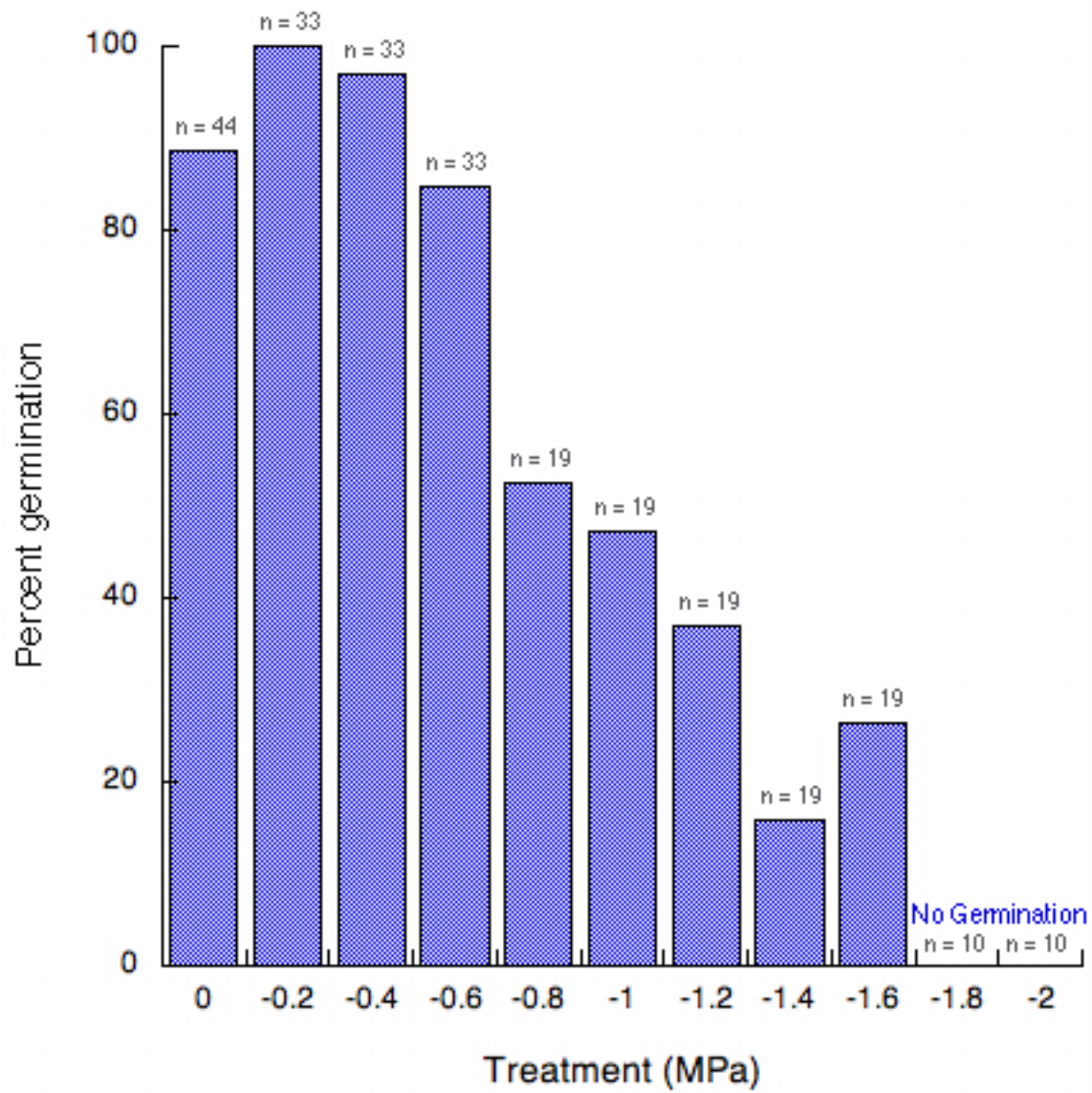
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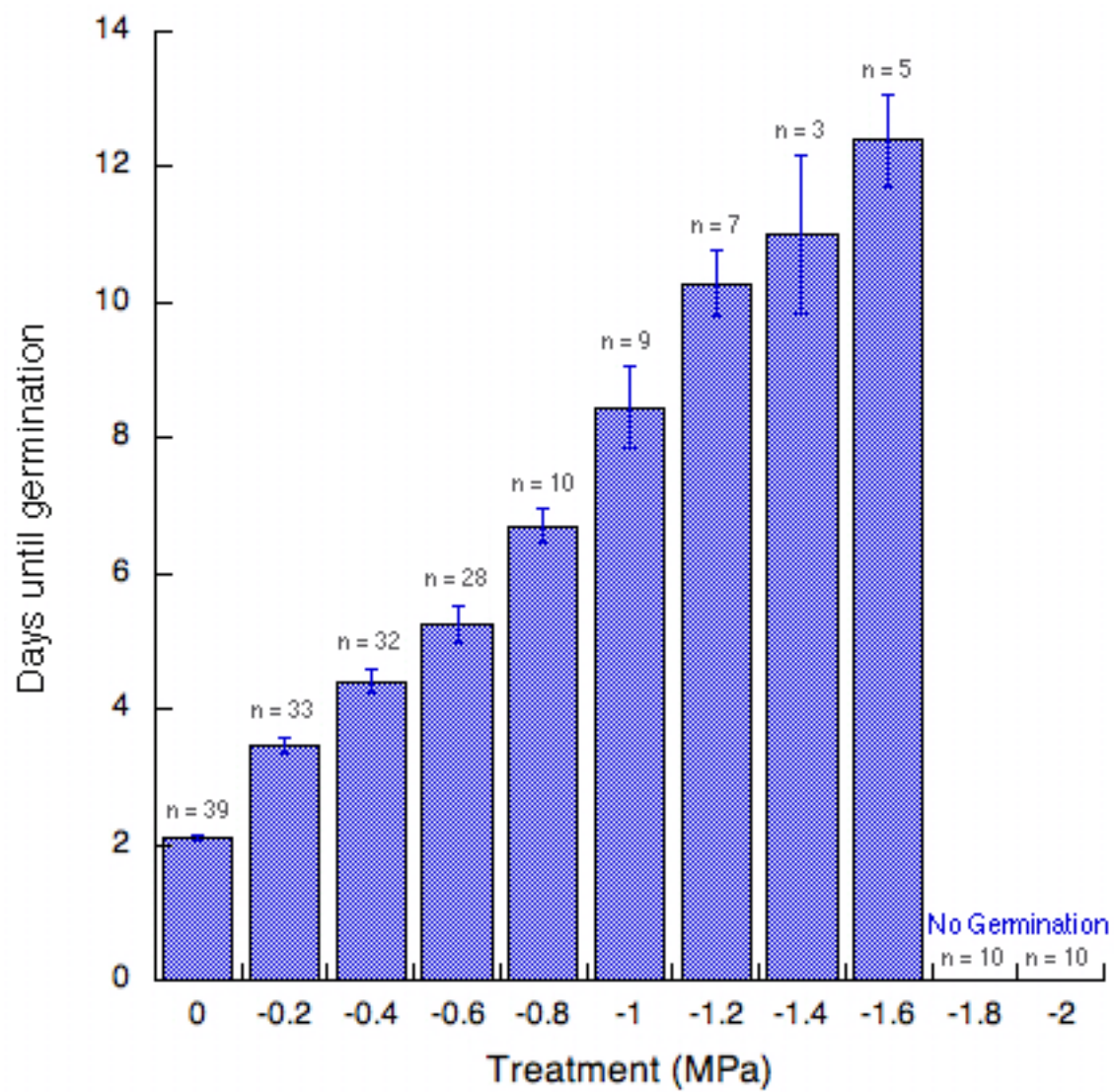


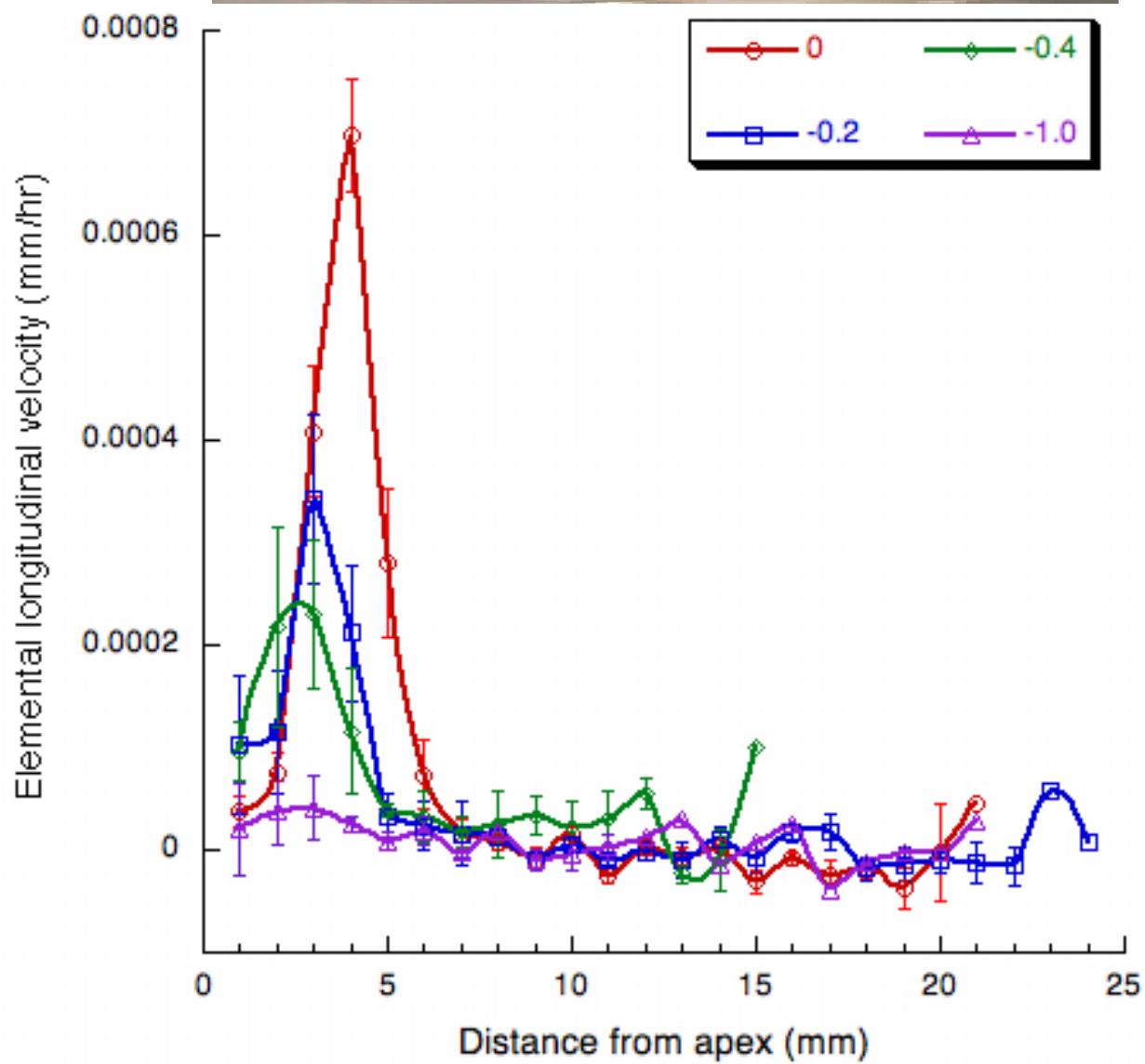
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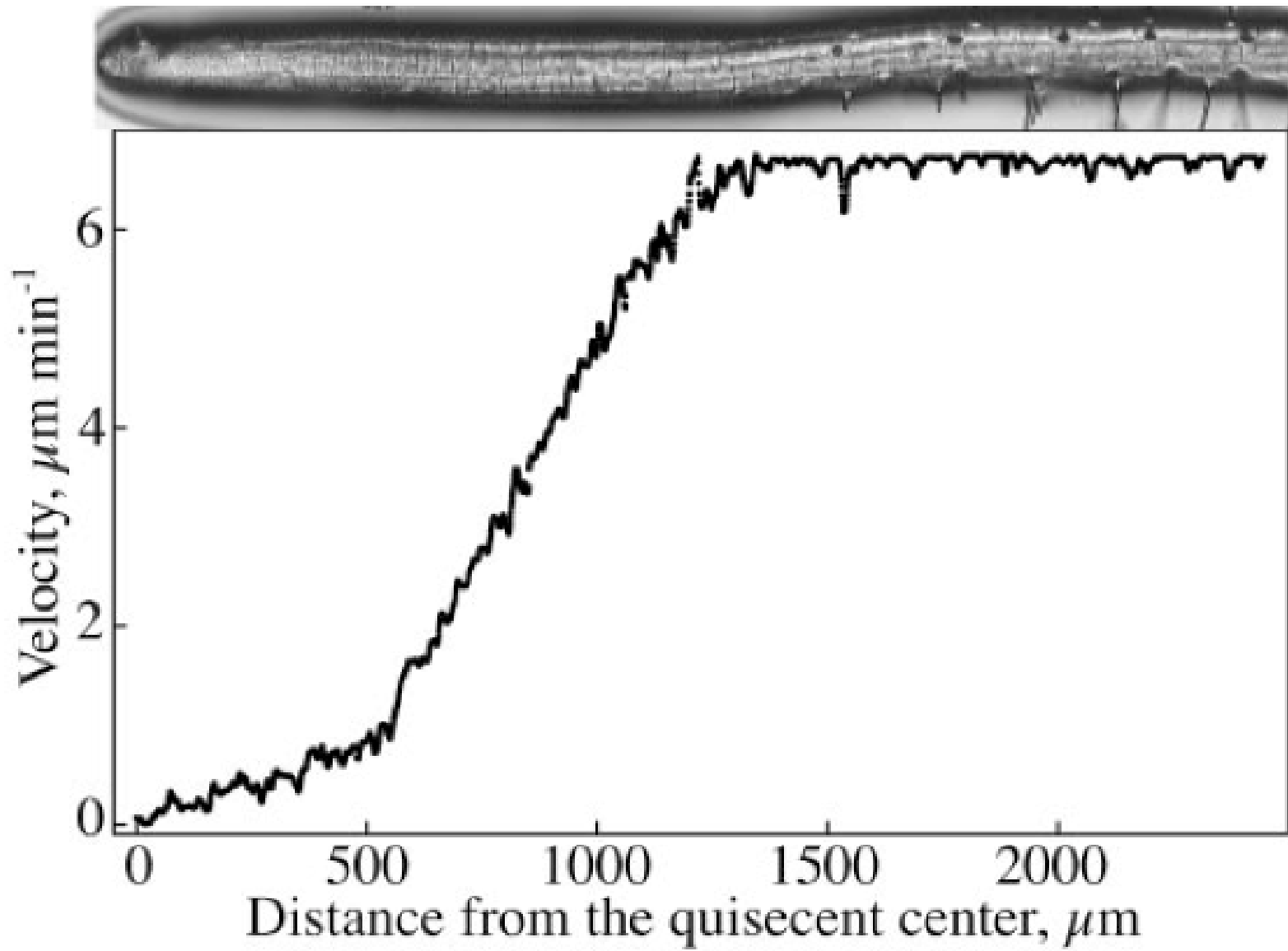


Silk WK. 1992. Steady form from changing cells. *International Journal of Plant Science* 153:S49-S58.









van der Weele CM, Jiang HS, Palaniappan KK, Ivanov VB, Palaniappan K, Baskin TI. 2003. A new algorithm for computational image analysis of deformable motion at high spatial and temporal resolution applied to root growth. Roughly uniform elongation in the meristem and also, after an abrupt acceleration, in the elongation zone. *Plant Physiology* 132:1138-1148.

Further Research

- Determination of impacts of water stress on cell size
- Biochemical assays
- Functional genomics
- Application of techniques to *Populus* spp.

Acknowledgments

- Stan Wullschleger (ORNL)
- Tim Tschaplinski, Lee Gunter, Ramie Wilkerson (ORNL)
- GCEP: Jeff, Milt, Mary

Life Lessons

- #1: Always have a backup plan
- #2: Always have not 2 but 3 computers
- #3: Always give your audience worthwhile life lessons

References

Baskin TI et al. 1995. *STUNTED PLANT 1*, a gene required for expansion in rapidly elongating but not in dividing cells and mediating root growth responses to applied cytokinin. *Plant Physiology* 107:233-243.

Campbell NA. *Biology*, vol. 1. Menlo Park CA: Benjamin/Cummings, p. 688.

Silk WK. 1992. Steady form from changing cells. *International Journal of Plant Science* 153(3):S49-S58.

van der Weele CM, Jiang HS, Palaniappan KK, Ivanov VB, Palaniappan K, Baskin TI. 2003. A new algorithm for computational image analysis of deformable motion at high spatial and temporal resolution applied to root growth. Roughly uniform elongation in the meristem and also, after an abrupt acceleration, in the elongation zone. *Plant Physiology* 132:1138-1148.