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CAES SEMINAR SERIES

"Modeling Translocation and Metabolism in Plants"

Dr. Martin Gent
Forestry and Horticulture, CAES

Wednesday, February 14, 2018
12:00 noon to 1:00 p.m.

Food and coffee will be available at 11:45 a.m.

Jones Auditorium
The Connecticut Agricultural Experiment Station
123 Huntington Street, New Haven, CT

A whole-plant model of movement of water and nutrients predicts growth. A plant consists of organs; root, stem, and leaf (and perhaps others). Each organ has compartments; apoplast, cytoplast, phloem, and xylem. Diffusion leads to rapid short-distance transport of water among compartments. All metabolism of nutrients, such as sugar, nitrate, amino acid, protein, and structure, occurs in cytoplast in each organ. All transfers of water to and from cytoplast, phloem, or xylem, are through apoplast. Compartment volume and water content define water potential, and in combination with solute content, define turgor and osmotic pressure. Volume increases according to structure. Long-distance transport between organs is in xylem and phloem. Nitrate is moved from roots to leaves in xylem by transpiration. Sugars are moved from leaves to roots in phloem by translocation. Nitrate is transformed by nitrate reductase into ammonium and amino acids. Protein and structure are synthesized in the cytoplast, and cannot move between organs. Linear relations describe water potential, and short-distance movement among compartments within one organ, and long-distance transport in xylem and phloem between organs, and metabolism with each organ. These relations are programmed in VENSIM (Ventana Systems). Dr. Gent will examine the effect of external nitrate, and sunlight, on movement of water and nutrients in xylem and phloem, and on water content and metabolites in organs of an idealized plant.