Cascade:
Linked stimulus/response events
Separated in time/space
Variety of scales
The goal of the tree: Survive

Spread

Excurrent  Decurrent
Young tree:
High dynamic mass
High redundancy
Compartmentalization:
A conceptual framework for understanding how trees grow and defend themselves

A.L. Shigo
Annual Review of Phytopathology 1984
Red oak -- Tangential

Events:

Mechanical breakage—
Branch breaks
Stem snaps
Split forks
Branch pullouts
Events:

Immediate physics—
  Cavitation
  Aeration
  Tylosis formation

Black Locust--Radial

Events:

Rapid biology—
  Infection—pioneers + ?
  Cambial dieback
  Initial column boundary-
    Reaction zone
  Callus pad formation
Events:
Rapid biology—
  Metabolic shifts
  Hormone induction & interaction
Still not well understood

Hormones involved:
  Auxins
  Gibberillins
  Cytokinins
  Methyl jasmonate
  Abscisic acid
  Ethylene


Arabidopsis thaliana
12/8/16

Bore hole closed

Bore hole open

Bore hole with mushrooms!
Events:
First growing season + —
  Reduced photosynthesis
  Reduced E storage
  Spreading infection ?
  De-repression of latent buds / new shoots
Red spruce callus

Ponderosa pine


Buds with starch reserves

Starch reserves

“Pinching back” and lateral growth

Shoot tip

Axillary bud

Apical meristem

Axillary bud
Auxin (IAA) —
Promotes tip growth

Cytokinin (CK) —
Promotes lateral growth

Auxin:
Increases CK degradation
Inhibits CK synthesis

Remove the tip:
Decrease CK degradation
Promote CK synthesis
CK promotes lateral shoots
Armillaria root disease