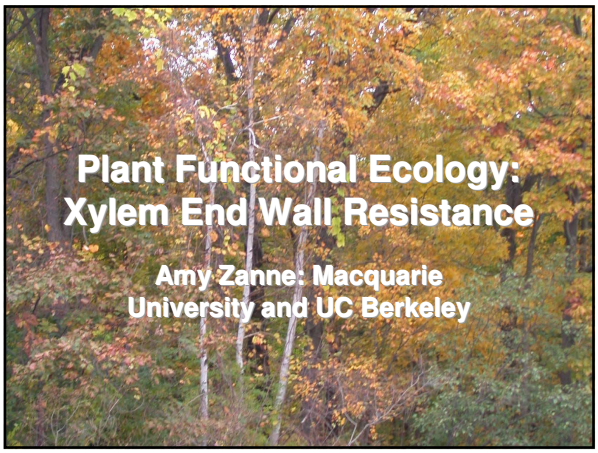
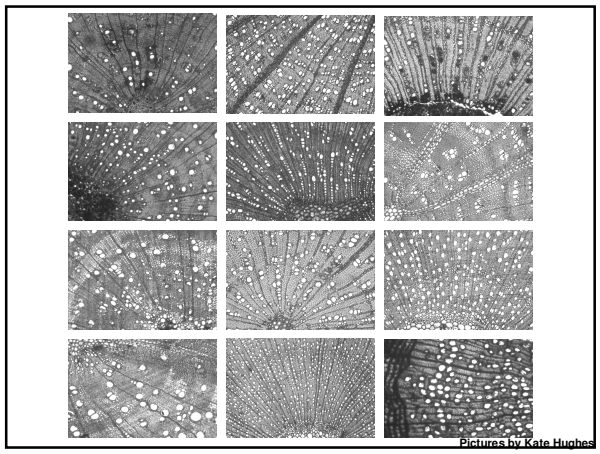
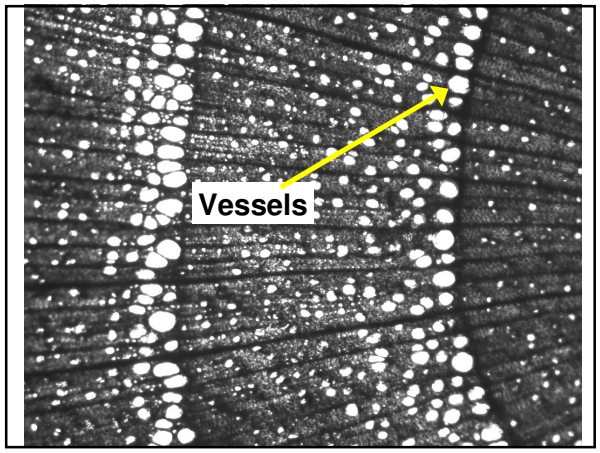
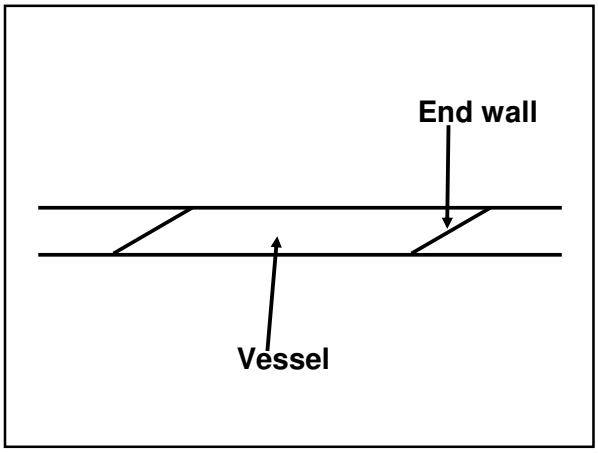


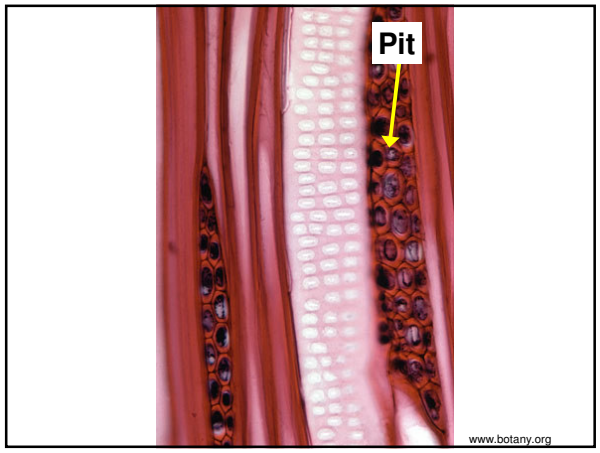



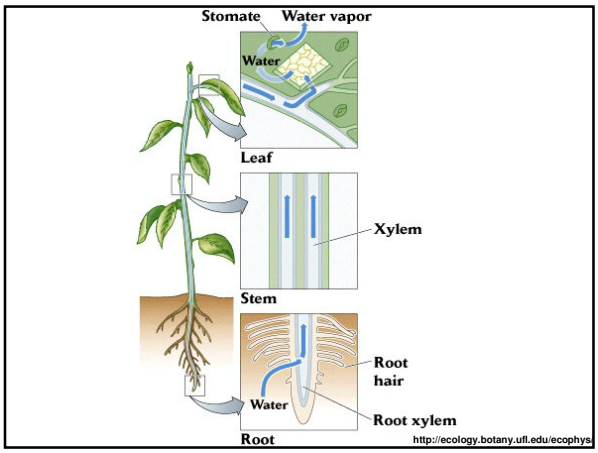

## Wheeler et al. 2005

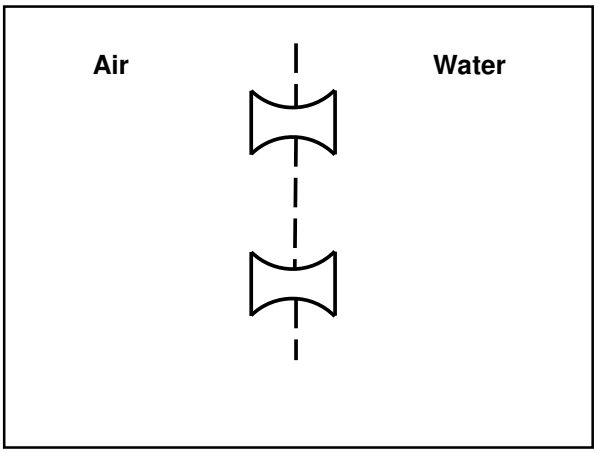
- Series of papers in 2005 out of Sperry lab in Utah, culminating in
  - Wheeler et al. 2005. Inter-vessel pitting and cavitation in woody Rosaceae and other vesselled plants: a basis for a safety versus efficiency trade-off in xylem transport. Plant, Cell and Environment. 28: 1-13.

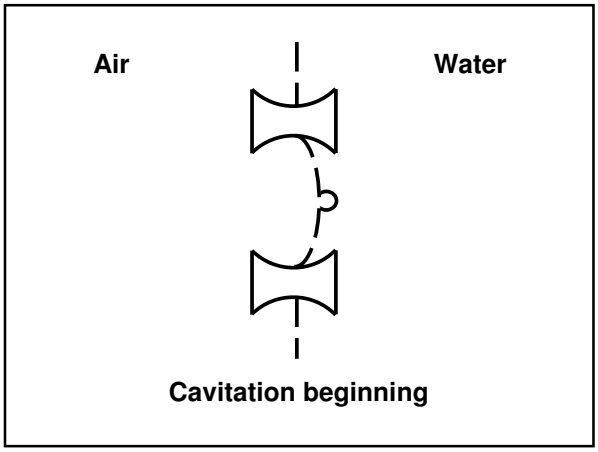


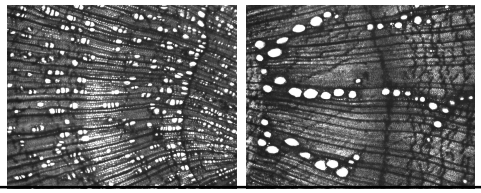


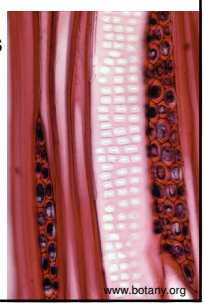

## Transport

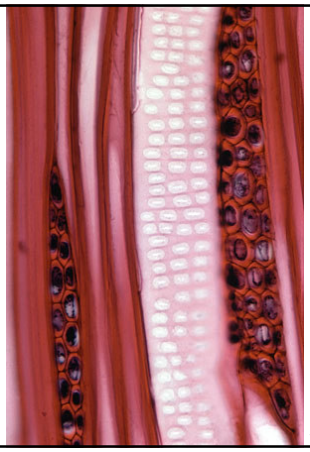
- Known to be related to
  - Vessel density (#/mm$^2$)
  - Vessel diameter
    - Lumen resistance = 8 η L / π $R^4$ ΔΨ



## Transport

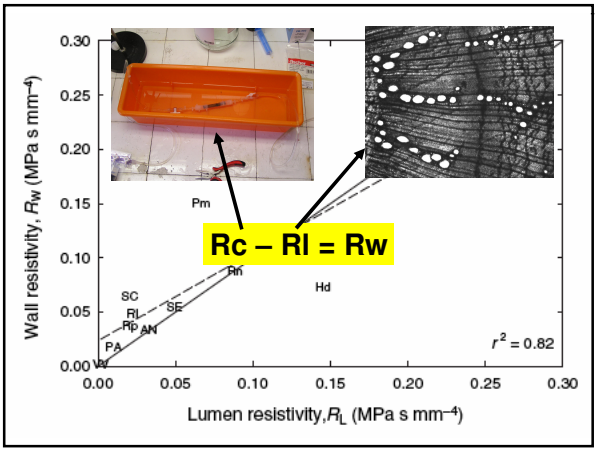
- Should also be related to
  - The frequency of end walls
  - Permeability of pits
    - # of pits
    - Porosity of pits

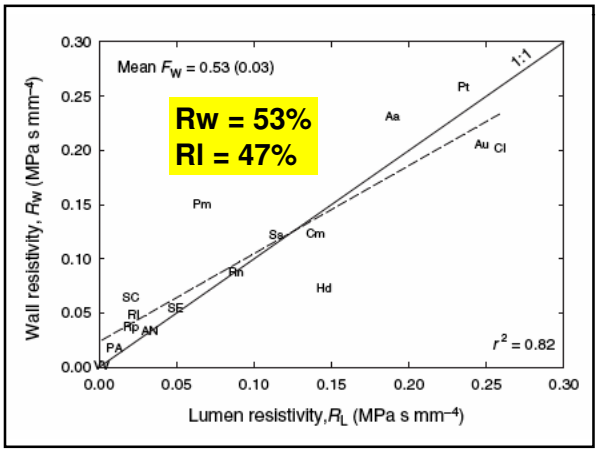


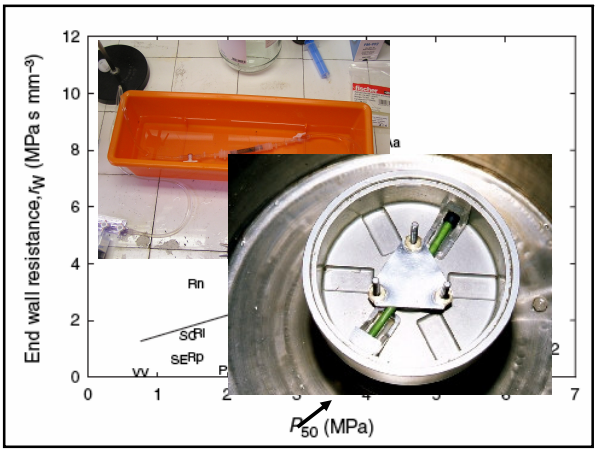




## Wheeler et al. 2005

- Across 16 species, examined role of end walls
  - Tradeoffs between cavitation risk and pit membrane resistance

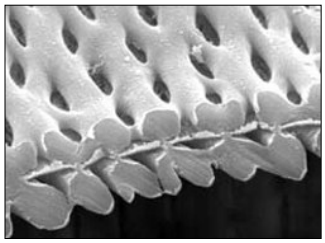


## Rw vs. P50

- Rw = Rp * Pit area

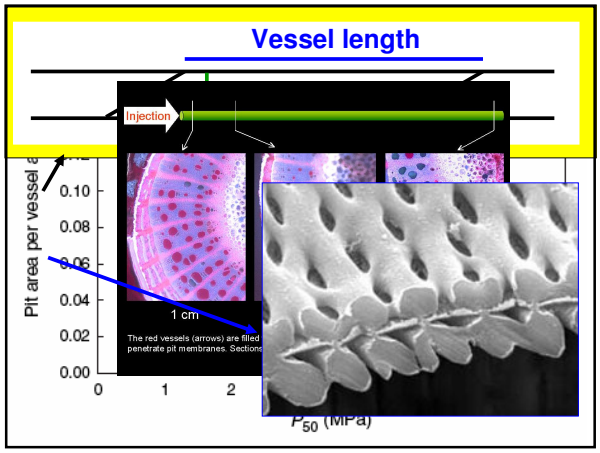


## Hypothesis

- Species with higher pit resistance (Rp) would be less vulnerable to cavitation (P50)

## Surprisingly

- No relationship between Rp and P50!




## Results

- Thus, rare large pit pore may lead to greater cavitation risk
- This relationship may limit total vessel size and therefore how fast water can flow through vessels

## Where next???

- These microscale measures increase our understanding of
  - Interspecific differences
  - Where species can grow
  - Potential evolutionary selection pressure