From Kramer & Boyer (1905)

Figure 5.1 The location of primary tissues in an elongating root and relative amounts of absorption at various distances behind the apex. The distance from the apex at which various stages of maturation occur depends on the species and the rate of root elongation. According to McCully and Canny (1988) the metaxylem of maize and soybean roots becomes capable of significant water conduction 15 to 30 cm behind the root apex. From Kramer (1983).

Figure 5.5 Rate of water uptake at various distances behind the apex of barley and pumpkin (Cucurbita pepo) roots with varying degrees of suberization of the endodermis. Note that there is measurable uptake even where suberization is complete. From Kramer (1983), after Agricultural Research Council Letcombe Laboratory Annual Report (1973, p. 10).
Figure 8.8. Patterns of water uptake indicated by contours of decreasing water potential approaching regions of uptake at individual roots for a perennial plant root system. Most of the root system is suberized. Uptake is considered to occur at widely spaced points where the suberization is disrupted, such as cracks, or at unsuberized root tips, which are shown as white roots. Water flow around cracks is in a spherical configuration. For the unsuberized root tips, the water-uptake pattern is ovoid, with increasing radius toward the basal region of the roots, because the roots are actively growing (from Caldwell 1976).

Figure 9. Water transport in the soil-plant-air continuum. Water can move through the cell walls (apoplast), or cross the plasma membrane and move through the cytoplasm and plasmodesmata (symplast). Water cannot move through the suberized Casparian bands in the wall of all endodermal and exodermal cells, including passage cells. Note that the exodermis is absent in some species, in which case water can move from the soil through the apoplast as far as the endodermis.

Figure 3. Fine root hydraulic conductivity (FRHC, top panels) and aquaporin contribution to FRHC (AQPC, lower panels) for deep roots of *Quercus falciformis* at Powell’s cave on three dates. The hatched portion of the bars in the top panels represents the mean FRHC after treatment with hydroxyl radicals. The difference between the native FRHC (entire bar top panels) and inhibited FRHC (hatched portion of bars in top panels) was used to calculate % AQPC (lower panels). This same format is used in all subsequent figures. Midday and midnight measurements are means (±SE) of replicates \((n = 8-12)\) collected from various tap roots and compiled across several days. Replication and sampling were similar for data in all subsequent figures unless noted otherwise. ANOVA results: time of day effect, FRHC \(P < 0.02\), AQPC \(P = 0.373\); season effect, FRHC \(P = 0.733\), AQPC \(P = 0.106\); time of day \(\times\) season, FRHC \(P = 0.725\), AQPC \(P = 0.801\).

Figure 4. Fine root hydraulic conductivity (FRHC, top panels) and aquaporin contribution to FRHC (AQPC, lower panels) for *Bumelia lanuginosa* deep roots measured at Powell’s cave in July 2005 and January 2006. The hatched portion of the bars in the top panels represents the mean FRHC after treatment with hydroxyl radicals (see Fig. 3 legend for details). ANOVA results: time of day effect, FRHC \(P = 0.383\), AQPC \(P = 0.578\); season effect, FRHC \(P < 0.002\), AQPC \(P < 0.002\); time of day \(\times\) season, FRHC \(P = 0.447\), AQPC \(P = 0.208\).
Fig. 3. Mean daily rate of root elongation for three cool semi-desert species during the course of 1973 growing season in 10-cm depth intervals in the soil. Rates are expressed as mm day$^{-1}$ for the visible root system in an observation window of 50 cm width. The period of active shoot elongation, denoted as vegetative growth, and the principal periods of flowering and fruit development are also indicated for each species.