

**AGRY 515: Plant Mineral Nutrition**  
**Short Distance Transport**  
**PowerPoint File: ShortDistTrans\_Slides\_2008.ppt**

*What do you know?*

1. For the table 1 (slide 1) in handout, examine the data and derive 3 general observations about the nature of short distance transport.
2. How far can  $K^+$  travel by passive processes alone? (Fig. 1)

**Short Distance Transport - Outline of Topics**

**Radial Transport Across the Root**

Apoplastic Movement (Fig. 2)

Cell wall properties

Micro and macropores

CEC

Free Space

Water free space

Apparent free space

Donnan free space

Exchange Adsorption (Fig. 3)

CEC and uptake selectivity

By-pass flow

Casparian Strip (Fig. 2, Fig. 4)

Symplastic Movement

Cell to cell transport

Plasmodesmata: bridge / gateway (Fig. 5)

**Fluxes Across Membranes (Fig. 6, Fig. 7)**

Enzyme substrate model: Carrier concept (Fig. 8, Fig. 9)

Michaelis-Menten Kinetics

$I_{max}$ : capacity

$K_m$ : affinity / efficiency

$C_{min}$

Electrical Potential Differences

Active Vs Passive Transport (Fig. 10, Fig. 11)

Nernst Equation (Fig. 12, Table 2, Fig. 13)

ATPase activity; electrogenic coupling (Fig. 14, Fig. 15,  
Fig. 16)

Models of Transporters (Fig. 17 – Fig. 24 )

Proton motive force

Carriers and channels

Uniport

Symport or cotransport

Antiport or countertransport

Biological features of transporters (Fig. 25)