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Is soil physics based on the wrong experiment?

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Richards (1931) studied the unsaturated flow of water in a porous medium under equilibrium pressure gradients by applying an air pressure. Richards did not suggest that the resulting relationships would apply to dynamic flows in real soils but the same experiment is still used to determine the unsaturated soil moisture and conductivity characteristics today. These relationships are then used to predict infiltration and soil water flows in models based on the Darcy-Richards equation. But this experiment precludes the possibility of flow in pores that are emptied as a result of the air pressure and there is an increasing amount of evidence that under dynamic natural conditions film flows in larger pores play an important role in infiltration and wetting of the soil. Such non-equilibrium flows can be described within the laminar flow range by Stokes relationships, with some evidence that given a continued input such wetting can penetrate locally to considerable depths. This paper will set out some of the evidence and its consequences put together in preparation of a paper revisiting the WRR Macropores and Water Flow in Soils paper of 1982.