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## DK Seminar

May 31, 2017, 14:15 - 15:45  
Vienna University of Technology,  
Freihaus, green area, 4th floor, 101C

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### **Analysis of a degenerate parabolic cross-diffusion system for ion transport**

A cross-diffusion system describing ion transport through biological membranes or nano-pores in a bounded domain with mixed Dirichlet-Neumann boundary conditions is analyzed. The ion concentrations solve strongly coupled diffusion equations with a drift term involving the electric potential, which is coupled to the concentrations through a Poisson equation.

The global-in-time existence of bounded weak solutions and the uniqueness of weak solutions under moderate regularity assumptions are shown. The main difficulties of the analysis are the cross-diffusion terms and the degeneracy of the diffusion matrix, preventing the use of standard tools. The proofs are based on the boundedness-by-entropy method, extended to nonhomogeneous boundary conditions, and the uniqueness technique of Gajweski.

As an example for an application of the model, a finite volume discretization of the equations is employed to simulate a calcium-selective ion channel. Furthermore, the large-time behavior of the solutions is illustrated numerically.