



Contribution ID: 38

Type: **Invited talk**

Heterogeneous Diffusion and Its Connection to the Noisy Voter Model

Friday, 25 September 2026 09:30 (30 minutes)

The noisy voter model is a widely used framework for stochastic opinion dynamics in finite populations, where changes in individual opinions are driven by two competing mechanisms: spontaneous opinion changes and social imitation. Although the model is originally formulated in terms of discrete states and transition rates, its continuum approximation can be related to Fokker-Planck-type transport equations with state-dependent drift and diffusion terms. In this talk, I discuss how the noisy voter model can be formally connected to heterogeneous diffusion with a position-dependent diffusion coefficient. The main focus is on the limitations of the standard Fokker-Planck description. Since this equation is parabolic, it implies infinite propagation speed, which would correspond, in the voter-model interpretation, to a nonzero probability of instantaneous opinion changes over arbitrarily large distances in the state space. To address this limitation, I present a heterogeneous Cattaneo–Vernotte-type formulation, in which memory is introduced into the probability flux through a finite time lag. This leads to a physically motivated continuum model with finite propagation speed.

Reference:

K. Górka, A. Horzela, D. Jankov Maširević, T. Pietrzak, T. K. Pogány, T. Sandev Heterogeneous Cattaneo–Vernotte equation connection to the noisy voter model, *Chaos* 36, 043108 (2026)

Primary authors: HORZELA, Andrzej (Institute of Nuclear Physics, PAS, Kraków, Poland); JANKOV MASIREVIC, Dragana (University of Osijek); GÓRSKA, Katarzyna (Institute of Nuclear Physics, PAS, Kraków, Poland); POGANY, Tibor (Obuda University); PIETRZAK, Tobiasz (Institute of Nuclear Physics, PAS, Kraków, Poland); SANDEV, Trifce (Macedonian Academy of Sciences and Arts)

Presenter: PIETRZAK, Tobiasz (Institute of Nuclear Physics, PAS, Kraków, Poland)

Session Classification: Session 7