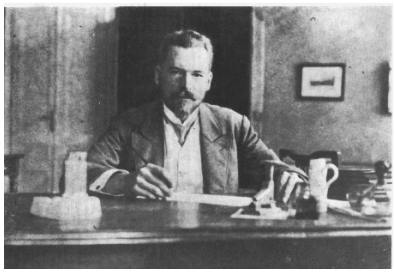

Contribution ID: **12** Type: **Contributed talk**

Paradigm shift in diffusion-mediated surface phenomena

Tuesday, 28 September 2021 12:30 (20 minutes)

Diffusion-mediated surface phenomena are crucial for human life and industry, with examples ranging from oxygen capture by lung alveolar surface to heterogeneous catalysis, gene regulation, membrane permeation and filtration processes. Their current description via diffusion equations with mixed boundary conditions is limited to simple surface reactions with infinite or constant reactivity. In this talk, we present a probabilistic approach based on the concept of boundary local time [1] to investigate the intricate dynamics of diffusing particles near a reactive surface [2]. Reformulating surface-particle interactions in terms of stopping conditions, we obtain in a unified way major diffusion-reaction characteristics such as the propagator, the survival probability, the first-passage time distribution, and the reaction rate [3-5]. This general formalism allows us to describe new surface reaction mechanisms such as for instance surface reactivity depending on the number of encounters with the diffusing particle that can model the effects of catalyst fooling or membrane degradation. The disentanglement of the geometric structure of the medium from surface reactivity opens far-reaching perspectives for modeling, optimization and control of diffusion-mediated surface phenomena.
References:
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Session Classification: S5