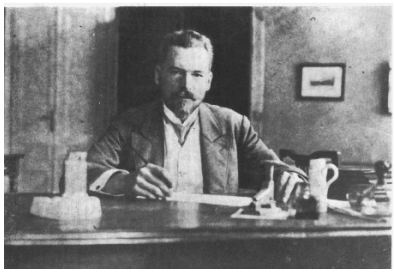

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Statistical physics of inhomogeneous transport equations: first passage to the space-dependent diffusion

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As the science and modern technologies are seizing the realm of nanoscale systems, characterization of composite materials with solid-fluid and fluid-fluid interfaces has become a problem of broad interdisciplinary interest. Properties of such complex systems, which vary in space over microscopic scales, shape important processes in engineering and biology. Estimation of the inhomogeneous—space-dependent—transport coefficients that characterize these processes, e.g. the diffusion coefficient or the heat conductivity, is however a challenging task. Moreover, two alternative formulations of the inhomogeneous transport equations exist in the literature. Using the theory of statistical physics, in my talk I will show that the two formulations, often regarded as distinct models, are in fact equivalent. In particular, one of them conveniently links the mass diffusion equation with statistics of molecules' first-passage events, which provide an efficient inference technique for the space-dependent diffusion coefficient.

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