THE ORNSTEIN-ZERNIKE EQUATION FOR THE PAIR-CONNECTEDNESS FUNCTION OF STATIONARY CLUSTER PROCESSES

by *Guenter Last*

In a seminal paper Ornstein and Zernike proposed in 1914 to split the interaction between molecules in a liquid into a direct and an indirect part. While the resulting spatial convolution equation is of great important in physics, it seems to be hardly known among mathematicians. In the first part of this talk we consider the pair-connectedness function (PCD) of a rather general stationary cluster model. Combining point process methods with analytic tools for solving integral equations we show that the associated Ornstein-Zernike equation (OZE) admits a unique solution in the whole subcritical regime. In the second part of the talk we consider the special case of a Poisson Boolean model with deterministic grains and show that the solution of the OZE is an analytic function of the intensity. Moreover, for small intensities there is a simple combinatorial way (based on the concept of pivotal diagrams) to express the coefficients of the power series in terms of the corresponding coefficients of the PCD. In the final part of the talk we shall briefly discuss the random connection model and propose some directions for future research.

This talk is based on joint work with Sebastian Ziesche (Karlsruhe).