Integrability and Universality in Random 2D Geometry - another look at the KPZ (Kardar-Parisi-Zhang) problem

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In this talk we will introduce the phenomenon of the KPZ (Kardar-Parisi-Zhang) universality. KPZ problem was a very active research area in the last 20 years. In the most general form the problem can be formulated in the following way. Consider random geometry on the two-dimensional plane. We shall think about it as a random landscape of hills, mountains, and valleys. The main aim is to understand the asymptotic statistical properties of the length of the geodesic connecting two points in the limit as distance between the endpoints tends to infinity. One also wants to understand the geometry of random geodesics, in particular how much they deviate from a straight line. It turns out that the limiting statistics for both the length and the deviation is universal, that is it does not depend on the probability distribution of the random landscape. Moreover, many limiting probability distributions can be found explicitly. One can say that in the KPZ problem integrability meets universality.

At present there are many results describing limiting laws based on a number of integrable models. At the same time, the problem of universality remains largely open. We also plan to introduce an alternative geometrical approach to the problem of the KPZ universality which provides an even broader point of view on the problem of universal statistical behavior.

No previous knowledge of the subject will be assumed.