Bose-Einstein condensation and infinite loops

Speaker: Quirin Vogel (NYUShanghai)

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Abstract: Elementary particles are either Bosons or Fermions. A gas of Bosons can be represented mathematically by a collection of interacting random loops. At very low temperatures, a gas of Bosons undergoes a phase transitions: the Bose-Einstein Condensate (BEC) appears. Despite the fundamental nature of the problem, a complete understanding of BEC is still at large. It had been conjectured by Richard Feynman that the BEC is represented by "infinite" loops. The recently developed theory of random interlacements provides a framework for a rigorous understanding of a canonical candidate of such paths. We will present the result of a recent preprint, showing this for the free and the mean-field gas. In the last part of the talk, we will examine the discontinuous phase transition for the Bose gas with Huang-Yang-Luttinger hard-core interaction. No knowledge of Bosons or random interlacements is required.