

The bizarre one-dimensional quantum world

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The effect of interactions on quantum particles is a long-standing question, with important consequences for most realistic systems. In one dimension interactions lead to a radically new type of physics, very different from the one we know for higher dimensional systems. Once a pure theoretical game, such one-dimensional physics has forcefully entered reality with the progress in miniaturization of electronic devices, and the appearance of novel physical system such as cold atoms in optical lattices.

I will present the main concepts underlying this physics, known as Tomonaga-Luttinger liquid, and show the various realizations of such systems that recent progress in material science, nanotechnology and cold atomic physics have provided. I will discuss where the field is standing now, and what today's challenges are.