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## **Talk: Analytical solutions of Dirac-Bogoliubov-de Gennes equations for inhomogeneous quantum many-body systems**

*Friday 10 February 2023 14:45 (55 minutes)*

I will discuss a pair of coupled partial differential equations identified as Bogoliubov-de Gennes equations with Dirac operators and show that they appear naturally in the effective dynamics of inhomogeneous quantum many-body systems in one dimension. The equations feature an effective local gap that opens up due to inhomogeneities, coupling right- and left-moving degrees of freedom, leading to scattering, and so far were not solved in general. I will show that one can obtain analytical solutions using ordered exponentials and algebraic properties of the equations, which yield detailed and even explicit information about the dynamics. The main physical motivation comes from so-called inhomogeneous Tomonaga-Luttinger liquids, but the equations also arise in descriptions of superconductor-normal-metal interfaces, polymer chains, and a toy model for coupled fractional quantum Hall edges.

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