

Magnus Expansion... Old and New

jeudi 27 novembre 2025 14:45 (50 minutes)

The Magnus expansion was introduced by Wilhelm Magnus in his 1954 paper “On the Exponential Solution of Differential Equations for a Linear Operator”(CPAM 7 (1954) 649), where he addressed a central problem in applied mathematics: computing the logarithm of the operator- or matrix-valued solution of a linear initial value problem. Since then, the Magnus expansion has evolved into a versatile and widely used tool with applications in physics, chemistry, engineering, and beyond. Over the past 25 years, significant mathematical developments have revealed deep connections between algebra, combinatorics, and geometry in the study of the Magnus expansion. A key driver of these modern advances has been the work of Dominique Manchon, whose contributions have been essential in uncovering the pre- and post-Lie algebraic structures that underpin today’s understanding of the subject. These structural insights have substantially broadened the scope of the Magnus expansion and opened the door to a variety of extensions and applications. In this presentation, we will first review these developments, with a particular emphasis on the roles of pre-Lie and post-Lie algebras. We will then discuss an application of the pre-Lie Magnus expansion to the derivation of a Chen–Strichartz formula for stochastic differential equations driven by Lévy processes. The results presented are based on joint works with D. Manchon, and with F. Patras and A. Wiese.

Orateur: EBRAHIMI-FARD, Kurusch (Norwegian University of Science and Technology)