# 数学与系统科学研究院

# 计算数学所学术报告

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报告题目：

**An algebraic theory of symmetric Zassenhaus splittings**

邀请人： 唐贻发 研究员

报告时间：**2015** 年 **8** 月 **12** 日（周三）

上午 **9:00~10:00**

报告地点： 数学院南楼七层

**702** 会议室

# Abstract:

**The computation of the linear Schrödinger equation in the semiclassical regime presents major challenges because of the presence of a small parameter. Our analysis commences with the investigation of the free Lie algebra generated by the Laplacian and the interaction potential. It turns out that this algebra possesses structure that renders the exponential of the Hamiltonian amenable to a very effective form of asymptotic splitting: exponential splitting where consecutive terms are scaled by increasing powers of the small parameter. The cost of these higher order splitting schemes, called the symmetric Zassenhaus splittings, grows cubically in the order desired in contrast to the exponential growth of traditional schemes based on the Yosida composition.**

**The advantage of the symmetric Zassenhaus splittings becomes more pronounced in the case of time-varying potentials. Here we need to split the exponential of a Magnus expansion which features terms beyond the Laplacian and the interaction potential. The structure of the free Lie algebra helps us simplify nested commutators encountered in the Magnus expansion and leads to generous convergence bounds. Postponing the evaluation of integrals appearing in the Magnus expansion until the very end allows us to handle potentials with varying degrees of regularity.**


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