

# DEVELOPING AN ALGEBRAIC THEORY OF INTEGRAL EQUATIONS

**Richard Gustavson**

Manhattan College, United States of America

rgustavson01@manhattan.edu

In this talk we will study the algebraic structure underlying Volterra integral operators and their corresponding equations. While the operator satisfies the Rota-Baxter identity when the kernel of the operator only depends on the variable of integration, we show that when the kernel is more generally separable, a twisted Rota-Baxter identity is satisfied. We will then discuss the development of an algebraic theory of general integral equations that allows for both arbitrary kernels and limits of integration using bracketed words and decorated rooted trees. As an application, we will show how any separable Volterra integral equation is equivalent to one that is operator linear, that is, contains only iterated integrals.

*Joint work with Li Guo (Rutgers University - Newark) and Yunnan Li (Guangzhou University).*