

**ADVENTURES OF KNOT THEORIST:
FROM FOX 3-COLORINGS TO YANG-BAXTER
HOMOLOGY– 5 YEARS AFTER POZNAŃ TALKS**

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Five years ago I was invited by Krzysztof to give a series of talk on Knot Theory at the University of Poznań. I gave 10 double talks starting from:

Lecture 1: Short historical introduction,

Lecture 2: 3-coloring of Fox,

and ending with:

Lectures 9 and 10: Distributive homology and homology of Yang-Baxter operators.

My lectures were an introduction to ambitious goal which can be summarize as follows:

We propose to develop connections between Yang–Baxter homology, which is a generalization of the distributive homology, including the rack or quandle homology, and Khovanov homology. We envision the connection via the cocycle invariants of links obtained from quandle or biquandle homology, motivating it via Knot Theory.

For a non-specialist we would describe the project as follows: Mathematics that we study in school is usually associative and up till now most of the modern mathematics assumed associativity.

Khovanov homology has an associative and co-associative underlying algebraic structure. Khovanov homology was constructed for and motivated by theory of knots and links.

Another algebraic structures discovered recently, quandles and racks, are distributive but not associative. Just like Khovanov homology, quandles and their homology were motivated by knot theory. No direct link between Khovanov homology and quandle homology is currently known. We propose a program which may link these two modern concepts. The tools we envision are Yang-Baxter operators, powerful tools used in statistical physics, related to at least three Nobel prizes (Yang 1957, Bethe 1967, Onsager 1968).