Abstract. The a priori expectation of first year elementary school students who were just introduced to the natural numbers, if they would be ready to verbalize it, must be that soon, perhaps by second grade, they'd master the theory and know all there is to know about those numbers. But they would be wrong, for number theory remains a thriving subject, well-connected to practically anything there is out there in mathematics.

I was a bit more sophisticated when I first heard of knot theory. My first thought was that it was either trivial or intractable, and most definitely, I wasn’t going to learn it is interesting. But it is, and I was wrong, for the reader of knot theory is often lead to the most interesting and beautiful structures in topology, geometry, quantum field theory, and algebra.

Today I will talk about just one minor example, mostly having to do with the link to algebra: A straightforward proposal for a group-theoretic invariant of knots fails if one really means groups, but works once generalized to meta-groups (to be defined). We will construct one complicated but elementary meta-group as a meta-bicrossed-product (to be defined), and explain how the resulting invariant is a not-yet-understood yet potentially significant generalization of the Alexander polynomial, while at the same time being a specialization of a somewhat-understood "universal finite type invariant of w-knots" and of an elusive "universal finite type invariant of v-knots".
Meta-Groups, Meta-Bicrossed-Products, and the Alexander Polynomial, 2

Why Happy? Applications to w-knots.

- Everything that I know about the Alexander polynomial can be expressed neatly in this language (even if without proof), except 3H, but including genus, ribbonness, cabling, w-knots, knotted graphs, etc., and there’s potential for vast generalizations.
- The least wasteful “Alexander for tangles” I’m aware of.
- Every step along the computation is the invariant of something.
- Fits on one sheet, including implementation.

Some business!

• The key trick:

\[ B(w, A - \sum_j i_j h_j) \]

We’re done: Some true. The accidental answer is that it is a symbolic calculus for a natural reduction of the unique homomorphic expansion of w-tangles.

1. “Accidental” for it’s only now I came about it. There ought to be a better answer.
2. A “homomorphic expansion”, also as a homomorphic universal finite type invariant, is a completely canonical construct whose presence implies that the objects in question are susceptible to study using graded algebra.
3. “w-Tangles” are the groupoid generated by crossings, modulo Reidemeister moves. “w-Tangles” are a natural quotient of v-tangles. They are at least related and perhaps identical to a certain class of 1D/2D knots in 4D.
4. To “only what is visible in the 2D Lie algebra”.

A certain generalization will arise by not reducing as in 1. A exact generalization may be, when homomorphic expansions for v-tangles are understood, a task likely equivalent to the Etingof-Kazhdan quantization of Lie bialgebras.

A Partial To Do List.
1. Where does it move simply come from?
2. Remove all the denominators.
3. How to determinants arise in this context (x)?
4. Understand links.
5. Find the “readiness condition”.
6. Do some “Algebraic Knot Theory”.
7. Categorify.
8. Do the same in other natural quotients of the story.

A. Add boxes 1. The standard definition of Alexander.
2. The need for for an extension to tangles.
3. The existing Alexander for tangles, aside on Alexander homology, weaknesses of current
Alexander for tulips.