The Mysteries of BF

Thanks for inviting me to Banff!

ωεβ:=http://drorbn.net/b19/

Abstract. The BF quantum field theory on one hand, and prior art regarding finite type invariants of w-knots on the other hand, suggest that there should be a "Kontsevich Integral" for general 2-knots in 4-space (of not necessarily the "simple" or "welded" or "w" type). Where is it? Why don't we know about it? Why aren't we studying it?
This will be a "large structures" talk. I will explain how several large structures fit together nicely in 3D and several other large structures show potential in 4D. Personally I prefer "every detail shown" talks. Sorry.

Confession. I haven't touched this material for a few years, and I barely know what I'm talking about.

Recent Abstracts. • *Everything around sl_{2+}^{ϵ} is DoPeGDO. So what?* UCLA, Nov 2019, ωεβ/ucla: I'll explain what "everything around" means: classical and quantum m, Δ, S, tr, R, C, and θ, as well as P, Φ, J, $\mathbb{D}$, and more, and all of their compositions. What DoPeGDO means: the category of Docile Perturbed Gaussian Differential Operators. And what sl_{2+}^{ϵ} means: a solvable approximation of the semi-simple Lie algebra sl_2.

Knot theorists should rejoice because all this leads to very powerful and well-behaved poly-time-computable knot invariants. Quantum algebraists should rejoice because it's a realistic playground for testing complicated equations and theories.

• *Some Feynman Diagrams in Algebra.* Sydney, Oct 2019, ωεβ/syd2: I will explain how the computation of compositions of maps of a certain natural class, from one polynomial ring into another, naturally leads to a certain composition operation of quadratics and to Feynman diagrams.

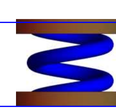
• *Algebraic Knot Theory.* Sydney, Sep 2019, ωεβ/syd1: This will be a very "light" talk: I will explain why about 13 years ago, in order to have a say on some problems in knot theory, I've set out to find tangle invariants with some nice compositional properties. In later talks in different seminars here in Sydney I will explain how such invariants were found — though they are yet to be explored and utilized.

• *The Dogma is Wrong.* Les Diablerets, Aug 2017, ωεβ/ld: It has long been known that there are knot invariants associated to semi-simple Lie algebras, and there has long been a dogma as for how to extract them: "quantize and use representation theory". We present an alternative and better procedure: "centrally extend, approximate by solvable, and learn how to re-order exponentials in a universal enveloping algebra". While equivalent to the old invariants via a complicated process, our invariants are in practice stronger, faster to compute (poly-time vs. exp-time), and clearly carry topological information.

• *On Elves and Invariants,* Knots in Washington, Dec 2016, ωεβ/kiw: Whether or not you like the formulas on this page, they describe the strongest truly computable knot invariant we know.

References.

[Za] D. Zagier, *The Dilogarithm Function,* in Cartier, Moussa, Julia, and Vanhove (eds) *Frontiers in Number Theory, Physics, and Geometry II.* Springer, Berlin, Heidelberg, and ωεβ/Za.



"God created the knots, all else in topology is the work of mortals."

Leopold Kronecker (modified)

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