

## Mathematical Publications.

*Achievement 1.* My paper “On the Vassiliev Knot Invariants” (Topology **34** (1995) 423–472) was for many years (until books appeared) the “standard reference” on finite-type (Vassiliev) knot invariants. Google Scholar thinks it was cited 1,219 times.

*Achievement 2.* My paper with S. Garoufalidis, “On the Melvin-Morton-Rozansky Conjecture” (Inventiones Mathematicae **125** (1996) 103–133, 201 citations) resolved a conjecture by Melvin and Morton (further elucidated by Rozansky) and showed that the Alexander polynomial of a knot can be read from the coloured Jones polynomial of the same knot. This conjecture was since re-proven a number of times and it serves as the basis for much further study.

*Achievement 3.* My paper “Lie Algebras and the Four Color Theorem” (Combinatorica **17-1** (1997) 43–52) is a gem and nothing more. It shows that the famed four colour theorem is equivalent to an appealing statement about Lie algebras.

*Achievement 4.* My paper “On Associators and the Grothendieck-Teichmüller Group I” (Selecta Mathematica, New Series **4** (1998) 183–212, 129 citations) established that the Grothendieck-Teichmüller group is a group of automorphisms of a certain algebraic structure related to braid theory, thus explaining many of its properties.

*Achievement 5.* My series of papers with S. Garoufalidis, D. Thurston, and L. Rozansky, “The Århus integral of rational homology 3-sphere” (Selecta Mathematica, New Series **8** (2002) 315–339, **8** (2002) 341–371, and **10** (2004) 305–324, 175 citations) introduced used diagrammatic Gaussian integration to construct a universal finite type invariant of rational homology spheres.

*Achievement 6.* My paper “On Khovanov’s Categorification of the Jones Polynomial” (Algebraic and Geometric Topology **2-16** (2002) 337–370, 529 citation) was and perhaps still is the standard introduction to Khovanov homology of knots and links. It was also the first place where Khovanov homology was shown to be stronger than the Jones polynomial.

*Achievement 7.* My papers “Khovanov’s Homology for Tangles and Cobordisms” (Geometry and Topology **9** (2005) 1443–1499, 464 citations) and “Fast Khovanov Homology Computations” (Journal of Knot Theory and its Ramifications, **16-3** (2007) 243–255, 142 citations) use a highly abstract category theory construction to generalize Khovanov homology to tangles (“halves of knots”). Abstract as it may be it is very efficiently computable and the programs derived from it (written by me and/or under my supervision) remain the key to the application of Khovanov homology to 3- and 4-dimensional topology.

*Achievement 8.* My paper with S. Selmani, “Meta-Monoids, Meta-Bicrossed Products, and the Alexander Polynomial” (Journal of Knot Theory and its Ramifications **22-10** (2013)

15 pages) introduces an extension of the Alexander polynomial to tangles and along with it the fastest known algorithm to compute the Alexander polynomial.

*Achievement 9.* My series of papers on w-knots, some joint with Z. Dancso (Acta Mathematica Vietnamica **40-2** (2015) 271–329, Algebraic and Geometric Topology **16-2** (2016) 1063–1133, Mathematische Annalen **367** (2017) 1517–1586, [arXiv:1511.05624](https://arxiv.org/abs/1511.05624), and in preparation) establish that “w-knots”, a certain class of 2-dimensional knots in 4-dimensional space, are closely related to the “Kashiwara-Vergne Conjecture” (proven by Alekseev and Meinrenken), a fundamental structural result about general finite dimensional Lie algebras.

*Achievement 10.* My series of papers with R. van der Veen (Proc. Amer. Math. Soc. **147** (2019) 377–397, [arXiv:2109.02057](https://arxiv.org/abs/2109.02057), and in preparation) represent the achievement **I’m the most proud of**, though it is not yet fully written and hence not yet fully recognized by others. By using “solvable approximations of Lie algebras” and a fully algebraic version of Gaussian perturbation theory we construct a strong (in a measurable sense) poly-time computable (and hence real-life computable) invariant of knots that has good algebraic properties (in a quantifiable sense, leading to topological applications).

## Other Achievements.

*Achievement 11.* I maintain a very rich mathematical web site consisting of several tens of thousands of pages, programs, documents, and images.

*Achievement 12.* With S. Morrison I maintain the “Knot Atlas”, a wikipedia-style resource for information about knots and knot theory.

*Achievement 13.* Over the years I’ve given several hundred invited lectures! I am especially proud of my [Handout Portfolio](#).

*Achievement 14.* I have supervised around 35 student projects at all levels.

*Achievement 15.* Along with M. Bar-Hillel, G. Kalai, B. McKay (e.g. Statistical Science **14-2** (1999) 150–173), I played a role in debunking “the Bible code”, a misuse of statistics to “prove” a religious agenda which managed to get published in a mainstream statistics journal.