Friday, May 9th (at 4.00pm, UK time)

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Title Tetrahedron equation, cluster algebra and quantum field theory.

ABSTRACT

The Zamolodchikov tetrahedron equation is a fundamental relation for integrability of quantum field theories in (2+1)-D and of statistical mechanical models on 3D lattices, much in the same way as its lower-dimensional analog, the Yang–Baxter equation, is a fundamental relation in integrable (1+1)-D quantum field theories and 2D lattice models. Compared to the Yang–Baxter equation, however, our understanding of the tetrahedron equation is still limited despite its obvious importance and relatively long history.

This talk will explore constructing solutions to the tetrahedron equation using cluster algebra, based on collaborations with Junya Yagi [arXiv: 2211.10702], and Rei Inoue, Atsuo Kuniba, Yuji Terashima, and Junya Yagi [arXiv:2403.08814]. Our cluster algebraic approach recovers most known solutions as special limits and links these solutions to some partition functions of 3D N=2 gauge theories on a 3D ellipsoid, unveiling the first connection between 3D integrable systems and supersymmetric gauge theories.

If time permits, I will sketch the rough idea of an ongoing work collaborated with Myungbo Shim, Hao Wang and Junya Yagi. In this ongoing work, we use a topological field theory-based method to construct new solutions of the modified tetrahedron equation.
