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Integrability and
Four-Dimensional Gauge Theory

Some years ago, Kevin Costello introduced a new approach to the Yang-Baxter equation and integrable systems based on an unusual gauge theory in four dimensions. The gauge theory in question is a close cousin of three-dimensional Chern-Simons theory, which almost thirty years ago was related to knot invariants and three-manifold invariants and has had a variety of physical applications. The Yang-Baxter equation has a conspicuous analogy with knot theory, but prior to Costello’s work, it was unclear how the gauge theory/knot theory connection could be extended to the Yang-Baxter equation and integrability. The talk will be an introduction to Costello’s approach, drawing also on recent work by Costello, Masahito Yamazaki, and the speaker. For background, one might consult arXiv:1611.00592.