Book review for "Off-Diagonal Bethe Ansatz for Exactly Solvable Models"

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Reviewer and Review

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In 2013, the authors made a significant breakthrough in the field of quantum integrable systems. Indeed, recall that a key feature of the periodic Heisenberg quantum spin chain is that the spectrum (eigenvalues T of the transfer matrix) can be characterized by the zeros ("Bethe roots") of a polynomial ("Q-function") that satisfies a homogeneous second order finite difference equation ("Baxter TQ equation"). Similar relations hold for the other quantum integrable models that had been solved until that time. However, there remained a number of interesting integrable models (such as the open Heisenberg quantum spin chain with generic boundary fields) that had resisted solution. The obstacle was that three basic requirements (polynomial Q-function, asymptotic behavior of T, and T-Q equation) could not be simultaneously satisfied. The simple - yet far reaching - solution proposed by the authors was to introduce an inhomogeneous term in the T-Q equation. The authors then proceeded to demonstrate that this approach (which they dubbed "off diagonal Bethe Ansatz") had general applicability, by successfully tackling numerous previously-unsolved models. This volume provides an accessible exposition of this approach, which is likely to have an enduring impact.

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