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Atle Hahn* (hahn@math.lsu.edu), Louisiana State University, 266 Lockett Hall, Baton Rouge, LA 70803. *Chern-Simons theory in the (complexified) axial gauge and the Kontsevich integral.*

The study of the heuristic Chern-Simons path integral by E. Witten inspired several new approaches for the definition of knot (resp. Vassiliev) invariants in general 3-manifolds M . Firstly, the perturbative approach based on the CS path integral in the Landau gauge, secondly, the approach based on the Kontsevich integral, and finally, the “quantum group approach” by Reshetikhin/Turaev. While for the first approach the relation to the CS path integral is obvious, it is not yet fully understood how the last two approaches are related to the CS path integral. It is generally assumed that in the special case $M = R^3$ the last two approaches arise from the CS path integral after applying an axial gauge fixing (followed, in the case of the Kontsevich integral, by a complexification of the space coordinates). However, in order to obtain the correct expressions certain correction terms have to be inserted “by hand”. In my talk I will demonstrate that the aforementioned correction terms appear automatically when replacing the non-compact product manifold $M = R^3 \cong R \times R \times R$ by compact product manifolds of the form $M = \Sigma \times S^1$ and then using the so-called “torus gauge”, which can be considered to be the $\Sigma \times S^1$ -analogue of axial gauge. (Received February 14, 2006)