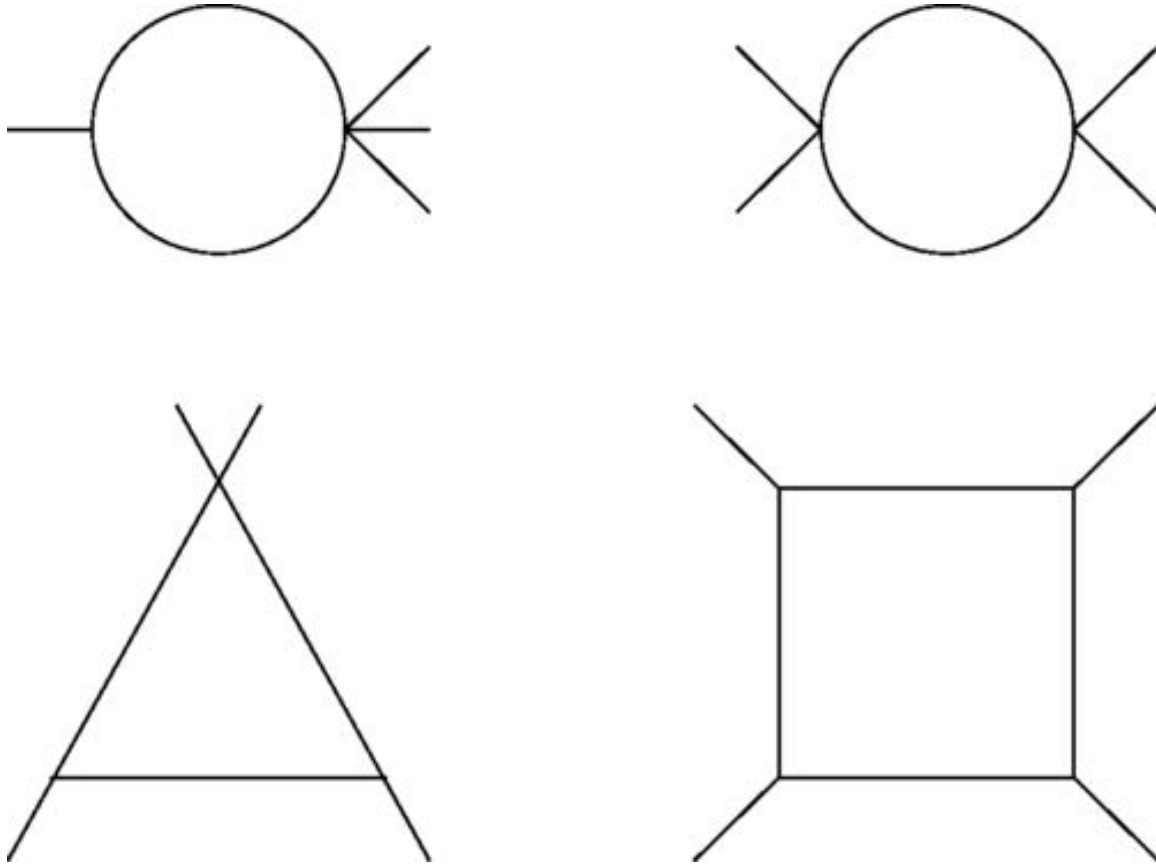## Off-shell gauge invariance

Master integrals for reduction of 4-point functions

Dirk Kreimer (IRIS member), John Gracey (U. Liverpool and DFG Mercator Fellow in Kreimer's group) and postdoc Henry Kissler could clarify the algebraic and combinatorical foundations of off-shell Slavnov Taylor identities, off-shell gauge invariance that is. The problem remained open in the litera- ture for many years and was now settled by modern algebra and confirmed computation- ally. Quantum chromodynamics served here as a concrete test case. Generalizations to other gauge theories are under study. Figure 1: Off-shell gauge invariance Using Hopf-algebraic structures as well and diagrammatic techniques for deter- mining the Slavnov-Taylor identities for QCD familiar from the study of graph complexes we construct relations for off-shell Green functions. The methods are sufficiently versatile to allow for applications even in the study of diffeomorphism invariance in quantum gravity in the future.

Self-consistency of off-shell Slavnov-Taylor identities in QCD
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