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The solution is in the vacuum

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The artificial separation between loop and tree-level contributions is at the origin of many technical difficulties in quantum field theory at high perturbative orders. The original motivation for the loop-tree duality (LTD), as explained in the seminal paper by Stefano Catani, was to circumvent this separation by opening the loops to tree-level objects in such a way that both contributions would be treated on the same footing. One of the unexpected properties of LTD is that the integrand of scattering amplitudes becomes manifestly causal. By exploiting this physically motivated property, we propose vacuum amplitudes in LTD as the optimal building blocks to assemble theoretical predictions at colliders.

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