

# Rethinking Quantum Field Theory



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**Rethinking  
Quantum Field Theory**

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## Large-Charge Perturbation Theory

*Thursday, 29 September 2016 14:00 (15 minutes)*

I will introduce the basic concepts of Large-Charge Perturbation Theory (LCPT) in  $d+1$  space-time dimensions. Given a Quantum Field Theory with a globally conserved charge  $Q$ , LCPT aims at providing analytic insight to sectors, which remain inaccessible via ordinary perturbative methods, but where  $Q$  is assumed to be large. To this end, the scalar  $O(2)$  model with  $\phi^N$  self-interaction will be implemented as a toy-example. I will construct the large-charge vacuum of this theory as a generalized coherent state and derive its effective potential at fixed (and large) charge  $Q$ . Subsequently, we shall investigate the perturbative treatment of fluctuations around the large- $Q$  vacuum proving the existence of a consistent “ $1/Q$ -expansion”.

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