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Recent progress in Asymptotic safety

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Free and interacting fixed points of the renormalisation group play an important role in particle and statistical physics. High energy fixed points such as in asymptotic freedom or asymptotic safety are crucial for a fundamental definition of quantum field theory. Low energy fixed points relate to (quantum) phase transitions and critical phenomena.

In this talk, I explain how and why weakly interacting fixed points arise in general 4d QFTs. This covers general theorems, necessary and sufficient conditions for existence, and explicit examples. In addition, I also review the last progress in calculation of beta functions, anomalous dimensions up to four loop in the gauge and three loop in the Yukawa and scalar couplings, and some implications of our results for conformal field theory and particle physics.

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