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Vector fields and RG flows in 4 dimensions

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The 1-loop RG flows in the most general local, renormalizable, Euclidean, classically scale invariant and globally SU(N) invariant theory of vector fields is computed. The total number of dimensionless couplings is 7 and several asymptotically free RG flows are found which are not gauge theories but nonetheless perfectly well-defined Euclidean QFT's. The set of couplings is extended to 9 with the most general globally SU(N) invariant ghost couplings and Yang-Mills theory is shown to emerge on a particular RG flow. Several marginal gauge symmetry breaking deformations of Yang-Mills theory are also found.

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