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★**Uhlenbeck compactness.**

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This book is intended to be a self-contained textbook on Uhlenbeck's theorems on the (local) existence of a Coulomb gauge for connections in (noncommutative) gauge theories and (as a consequence) on the compactness modulo gauging of sequences of such connections with uniform $L^p$-bounds on their curvature, for some $p$ sufficiently large [see K. K. Uhlenbeck, Comm. Math. Phys. **83** (1982), no. 1, 31–42; MR0648356; Comm. Math. Phys. **83** (1982), no. 1, 11–29; MR0648355]. The author provides all necessary information from the analysis of PDE's (Neumann problem) of Sobolev spaces as well as some functional analysis, and from the geometry of vector bundles and gauge theories. The proofs are worked out in detail and the author sometimes uses alternative approaches, most notably by using the implicit function theorem for solving the Coulomb gauge problem (with boundary conditions) as suggested by Uhlenbeck. Some generalizations of the theorems are given which prove to be useful in the author's study of anti-selfdual connections with Lagrangian boundary conditions in ["Anti-self-dual instantons with Lagrangian boundary conditions. I. Elliptic theory", preprint, arxiv.org/abs/math.AP/0204150]. *Klaus Mohnke*