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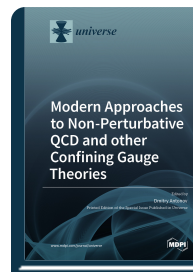
Modern Approaches to Non-Perturbative QCD and other Confining Gauge Theories

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This book contains seven reviews and four research articles on the various modern approaches to the problem of quark confinement in quantum chromodynamics (QCD). These approaches include microscopic models of the Yang–Mills vacuum, which are based on the condensation of magnetic monopoles and center vortices, as well as the models of the confining quark-antiquark string. Possible applications of these models to the analysis of the novel superinsulating state, which emerges in such condensed-matter systems as Josephson junction arrays, are further discussed in one of the reviews. Two reviews from this collection discuss the approaches towards the analytic construction of effective confining theories, at the classical level and within the center-vortex model of the Yang–Mills vacuum. Other aspects of non-perturbative physics addressed by this collection include a possible connection between the localization of low-lying Dirac eigenmodes with the deconfinement and the chiral QCD phase transitions, as well as the role of topology in baryon-rich matter. Last but not least, a novel model of dark matter, based on ultralight axion particles, whose masses are arising due to distinct $SU(2)$ Yang–Mills scales and the Planck mass, is suggested and developed in one of the contributed articles.

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