



The Galileo Galilei Institute for Theoretical Physics  
Arcetri, Florence

# Topological properties of gauge theories and their applications to high-energy and condensed-matter physics

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Many remarkable properties of gauge theories rely on the topology of field configurations and/or ambient spacetime and are connected with quantum anomalies and nonperturbative excitations. These properties, often exact, have many implications in the physics of fundamental interactions, condensed matter systems and statistical mechanics models. They also account for a large part of the investigations in string theory, and combined with supersymmetry have led to exact solutions of low-energy theories and the discovery of duality relations between supersymmetric gauge theories. Meanwhile, a renewed interest in topological aspects has emerged from condensed matter physics, through the study of topological phases of quantum matter. The effective field theories for these systems are not of the usual Landau-Ginzburg-Higgs type, rather, they are described by topological gauge theories. The goal of this GGI activity is to bring together theoreticians of different backgrounds, in condensed matter, high energy and mathematical physics, with the belief that interdisciplinary approaches can lead to substantial progress in many directions.

## Topics:

- Anomalies of quantum field theories
- Generalized symmetries
- Topological aspects of quantum states in condensed matter
- (Supersymmetric) dualities in  $(2+1)$ -dimensions
- Time-reversal symmetry and 4d theta-terms

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