Complex ground states of disordered systems (Universität Göttingen)

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In the field of statistical physics of random systems, many basic problems are still unsolved. Due to the development of new numerical algorithms and the increasing computer power, considerable progress can be expected during the next decade. In the research group the low-temperature behavior of several random systems is investigated, using recently developed fast optimization algorithms. The exact ground (i.e. T = 0) states of large random-field Ising magnets and diluted antiferromagnets in a field are studied. The order-disorder phase transition is characterized by critical exponents. Also the T = 0 behavior of Ising spin glasses and related random-bond models will be investigated. To answer the main underlying question, what makes a problem computationally hard, the vertex-cover problem, a graph theoretical problem, and other problems are studied with exact algorithms and by means of analytical methods from statistical physics.
It is furthermore planned to extend the work towards biophysics. The low-temperature behavior of RNA secondary structures will be considered. Also the statistics of sequence alignments, which is the basic tool for accessing biological databases, will be studied.

Projektbeteiligte

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