

<<规范场、纽结和引力>>

图书基本信息

书名：<<规范场、纽结和引力>>

13位ISBN编号：9787506291767

10位ISBN编号：7506291762

出版时间：2009-1

出版时间：世界图书出版公司

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页数：465

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前言

Two of the most exciting developments of 20th century physics were general relativity and quantum theory, the latter culminating in the 'standard model' of particle interactions. General relativity treats gravity, while the standard model treats the rest of the forces of nature. Unfortunately, the two theories have not yet been assembled into a single coherent picture of the world. In particular, we do not have a working theory of gravity that takes quantum theory into account. Attempting to 'quantize gravity' has led to many fascinating developments in mathematics and physics, but it remains a challenge for the 21st century. The early 1980s were a time of tremendous optimism concerning string theory. This theory was very ambitious, taking as its guiding philosophy the idea that gravity could be quantized only by unifying it with all the other forces. As the theory became immersed in ever more complicated technical issues without any sign of an immediate payoff in testable experimental predictions, some of this enthusiasm diminished among physicists. Ironically, at the same time, mathematicians found string theory an ever more fertile source of new ideas. A particularly appealing development to mathematicians was the discovery by Edward Witten in the late 1980s that Chern-Simons theory—a quantum field theory in 3 dimensions that arose as a spin-off of string theory—was intimately related to the invariants of knots and links that had recently been discovered by Vaughan Jones and others. Quantum field theory and 3-dimensional topology have become firmly bound together ever since, although there is much that remains mysterious about the relationship.

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内容概要

The Series on Knots and Everything: is a book series polarized around the theory of knots. Volume 1 in the series is Louis H Kanffman's Knots and Physics. One purpose of this series is to continue the exploration of many of the themes indicated in Volume 1. These themes reach out beyond knot theory into physics, mathematics, logic, linguistics, philosophy, biology and practical experience. All of these outreaches have relations with knot theory when knot theory is regarded as a pivot or meeting place for apparently separate ideas. Knots act as such a pivotal place. We do not fully understand why this is so. The series represents stages in the exploration of this nexus.

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