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4-manifolds and Kirby calculus. (English) Zbl 0933.57020

Graduate Studies in Mathematics. 20. Providence, RI: American Mathematical Society (AMS). xv, 558 p. (1999).

The main goal of the book under review is to describe in detail topological techniques and ideas (especially, concerning the Kirby calculus) over the last twenty years in the theory of compact 4-manifolds. Since the advent of gauge theory (differential geometry plus nonlinear analysis), the use of the Kirby calculus for analyzing the structure of 4-manifolds has received a new attention by topologists in order to prove existence results, to construct new manifolds with gauge-theoretic properties, to show that certain differently constructed 4-manifolds are homeomorphic, and to decompose manifolds into simple pieces. The authors also discuss interactions of the Kirby calculus with other fields, as gauge theory, algebraic geometry, and symplectic topology. They present a lot of modern computational results and the most advanced applications of the Kirby calculus in 4-manifold topology. There are many books available on this subject (as the references show), but a peculiar feature of the present book is the description of the theory from the point of view of differential topology. Another appealing aspect of the book is the blend of modern computational results and topological constructions together with the theory. I greatly recommend this wonderful book to any researcher in 4-manifold topology for the novel ideas, techniques, constructions, and computations on the topic, presented in a very fascinating way. I think really that every student, mathematician, and researcher interested in 4-manifold topology, should own a copy of this beautiful book.

Reviewer: [A.Cavicchioli \(Modena\)](#)

MSC:

- 57N13 Topology of the Euclidean 4-space, 4-manifolds (MSC2010)
- 57-02 Research exposition (monographs, survey articles) pertaining to manifolds and cell complexes
- 57R65 Surgery and handlebodies
- 53C15 General geometric structures on manifolds (almost complex, almost product structures, etc.)

Cited in **15** Reviews
Cited in **325** Documents

Keywords:

[four-manifolds](#); [handlebody theory](#); [cobordism](#); [gauge theory](#); [surgery](#); [complex surfaces](#)