

Hübsch, Tristan

Calabi-Yau manifolds. A bestiary for physicists. (English) Zbl 0771.53002
Singapore: World Scientific. xv, 362 p. (1992).

This monograph offers a tour of the methods of analyzing and constructing various Calabi-Yau 3-folds, i.e. complex compact 3-dimensional manifolds, inspired by their application to superstring models in physics. As such it is exciting and fascinating mathematics regardless of its ultimate applicability to theoretical physics. Contents include sixteen chapters entitled respectively: Spiritus movens (an overview of the physical applications); Complex kindergarten (Calabi-Yau 3-folds as intersections of hypersurfaces in a complex projective space); Complete intersections in products in projective spaces; Some more general embeddings; Group actions, quotients and singularities; Embeddings in weighted projective spaces; Fibred products; (Co)homology basics; Topological triple couplings; (Co)homological algebra; Tangent bundle valued cohomology; Other tangent bundle related cohomology; The (2,1) triple couplings and generalizations; Parameter spaces – from afar; Parameter spaces – a closer look; and finally, A prelude to quantum geometry. It concludes with a 28 page Lexicon (a collection of definitions and brief explanations of terms used in the text) and a 16 page Bibliography of over 200 items.

Although written in a highly individualistic and somewhat unusual style, the monograph is a valuable compendium of results – few proofs! – which should appeal to a broad class of readers, viz. physicists and mathematicians. The latter should be warned that it is by no means an introduction to superstring theory, but rather an exposé of some algebraic/differential – geometric methodology involved in this theory. However, in this context it contains a wealth of interesting examples, and occasional hints of things requiring further mathematical scrutiny. Needless to say, as the author does, a prospective reader is expected to have “at least nodding acquaintance with the basics of differential and algebraic geometry which are by now fairly standard in theoretical physics”.

Reviewer: [J.D.Zund \(Las Cruces\)](#)

MSC:

- 53-02** Research exposition (monographs, survey articles) pertaining to differential geometry
- 81-02** Research exposition (monographs, survey articles) pertaining to quantum theory
- 53C80** Applications of global differential geometry to the sciences
- 53C56** Other complex differential geometry
- 81T30** String and superstring theories; other extended objects (e.g., branes) in quantum field theory

Cited in **2** Reviews
Cited in **59** Documents

Keywords:

[superstring models](#); [complex projective space](#); [weighted projective spaces](#); [triple couplings](#)