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Singularities of the Minimal Model Program



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[Reviewed by Felipe Zaldivar, on 08/8/2013]

One fundamental problem of birational algebraic geometry is to define and characterize a minimal model in each birational equivalence class of algebraic varieties. This is trivial for algebraic curves. For algebraic surfaces, it is the work of the Italian school of algebraic geometry. Castelnuovo, Enriques and many more were able to define and characterize minimal models for each birational class of algebraic surfaces.

For higher dimensional varieties, the existence of these minimal models, however defined, it is a much more complicated business. Perhaps this is due to the fact that the minimal model of a smooth algebraic surface is also a smooth algebraic surface, while for higher dimensional smooth algebraic varieties the minimal models usually have singularities. The understanding and characterization of these singularities is part of Mori's minimal model program, formulated in the late 1970s and early 1980s. For threefolds, Mori and Reid obtained rather complete characterizations of the corresponding singularities. Moreover, in a beautiful turn of events, Kollár and Shepherd-Barron also observed, in the 1980s, that the classes of singularities that appear in the minimal model program are the same as the singularities that appear in the compactification of the moduli space of algebraic surfaces. Thereupon, the study of these singularities followed these intertwined paths.

The book under review has as its main goal to define and give detailed characterizations of the singularities that appear in the minimal models for higher dimensional algebraic varieties. Most of these results were obtained in the last three decades. Before the publication of this monograph, many of the definitions and theorems were dispersed in several papers. In addition, some of them were obtained by researchers working on compactification of moduli spaces. A contribution of the book under review is to provide a self-contained exposition of these results, a sort of Ariadne's thread to find our way in the

intertwined paths that led to the classification of these singularities. Given the nature and level of the subject, the book is rather technical, written for the specialist, but the author has made an effort to provide specific references when needed.

By collecting many of the important results in this area, adding some unpublished results (Kollár is one of the most active researchers in this area, so that many of the included results in this monograph are due to him), the author, with contributions by S. Kovács, has produced a timely monograph, one that every worker in this area would like to have in her/his bookshelf.

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