

BOOK REVIEWS

CASSELS, J. W. S. and FLYNN, E. V. *Prolegomena to a middlebrow arithmetic of curves of genus 2* (London Mathematical Society Lecture Note Series Vol. 230, Cambridge University Press, Cambridge, 1996), xiv+219pp., 0 521 48370 0 (paperback) £22.95.

The study of the arithmetic geometry of algebraic curves has a long and distinguished history. Texts which have come down from the turn of this century are largely seen as “middlebrow” in modern terms, although they were not seen as such at the time. The value of these texts has not diminished (as can be seen from the popularity of the recent reprint of Hudson’s text *Kummer’s Quartic Surface* (Cambridge University Press, 1990)) and there will always be a place for the type of book under review. While the term “prolegomena” is somewhat gratuitous, the use of “middlebrow” is important. The authors use it to mean that they only employ elementary, explicit methods as distinct from, say, cohomology theories. Such an approach to the study of curves of genus 2, even over the complex numbers, is not really to the reviewer’s taste as it can result in rather complicated and inefficient computations. Nevertheless, it does greatly improve accessibility and, in the reviewer’s opinion, the regular production of such *modern* treatments of middlebrow methods is an essential part of the development of any area of mathematics. The text under review is a virtually perfect example. The explicit computational aspects are covered in great depth and are facilitated by the use of the computer algebra package *Maple* and the authors provide sample Maple code and even an anonymous ftp site at <ftp://ftp.liv.ac.uk/pub/genus2>, should the reader wish to download various results. Notice that “middlebrow” should not be confused with “old-fashioned”.

The subject matter of the book is the arithmetic of curves of genus 2. This consists largely of a detailed study of the Jacobians and associated Kummer surfaces of genus 2 curves. The authors work over various ground fields and many examples are provided. Some background is provided, but in fact little is required. Indeed, this book, perhaps following on from Cassel’s *Lectures on Elliptic Curves* (Cambridge University Press, 1991), would make an excellent beginning graduate course in Algebraic Geometry or Arithmetic. Topics include the Mordell-Weil group of the Jacobian, formal groups, heights, rational points and the endomorphism ring of the Jacobian. The emphasis is on computing many of these objects: for example, providing equations for the Kummer surface, counting rational points on the curve and describing the addition law for the Jacobian. Useful parallels are drawn with the elliptic curve case and the text always has half an eye on generalizations to higher genus curves.

In summary, this textbook provides an excellent treatment of the subject of the basic algebraic geometry (and arithmetic) of genus 2 curves and would serve as a useful introductory text for graduate students who wish to understand the detailed computations needed for the study of such curves and their Jacobians.

A. MACIOCIA