

writing style, Koosis' book contains 66 gorgeous diagrams and a sizable bibliography. If you want to learn about  $H_p$  spaces, here is an excellent place to start.

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*Number theory*, by Helmut Hasse, Grundlehren der Mathematischen Wissenschaften, Band 229, A Series of Comprehensive Studies in Mathematics, Springer-Verlag, Berlin and New York, 1980, xvii + 638 pp., \$49.00. A corrected and enlarged translation of the third edition of *Zahlentheorie*, Akademie-Verlag, Berlin, 1969, edited and prepared for publication by Horst Günter Zimmer.

The late Helmut Hasse wrote two treatises on number theory. Their first editions appeared in rapid succession in 1949 and 1950. The first, the "blue book", was entitled *Zahlentheorie* and was published by Akademie-Verlag (2nd ed. 1963, 3rd ed. 1969). It was a book on algebraic number theory. The second, the "yellow book", was *Vorlesungen über Zahlentheorie*, a book on elementary number theory published by Springer-Verlag (2nd ed. 1964).

Lovers of number theory will now have to be a little careful: both books are yellow. The volume under review is a translation into English of the third edition of the blue book; in moving from Akademie to Springer it changed color. Beyond that the major change is a recasting of Chapter 16 (on tamely ramified extensions) to remove an error detected by Leicht and Roquette; the rewriting was done by Leicht.

None of the earlier editions was reviewed in this Bulletin. I think a review is still timely, for it is a fine book. It treats algebraic number theory from the valuation-theoretic viewpoint. When it appeared in 1949 it was a pioneer. Now there are plenty of competing accounts. But Hasse has something extra to offer. This is not surprising, for it was he who inaugurated the local-global principle (universally called the Hasse principle). This doctrine asserts that one should first study a problem in algebraic number theory locally, that is, at the completion of a valuation. Then ask for a miracle: that global validity is equivalent to local validity. Hasse proved that miracles do happen in his five beautiful papers on quadratic forms of 1923–1924. But I cannot end this paragraph without calling attention to Hasse's eloquent attribution of the key idea to his teacher Hensel; see vol. 209 (1962) of *Crelle* and an amplification in his preface to volume I of his *Mathematische Abhandlungen*.

We can now read in English Hasse's disavowal of a "Satz-Beweis" format in favor of a discursive exposition. And indeed the exposition is discursive. The first 100 pages take the reader on a trip through elementary number theory that reaches quadratic reciprocity in the Hilbert product formula version. Then comes a 200-page book within a book on valuation theory. At last, halfway through the book, algebraic number theory begins. Examples