to admit that, though in one sense a genus and a species are both sets of organisms, there is another sense in which a genus is a set of species. Personally, I think the difficulty is even better resolved by reference to intentional and extensional definition.

I have said that the results are meager. Indeed (5.6) and its exploration seem to be the high point of the book.

There are few errors, of which the most interesting is this. To illustrate the concept of incompatible relations, it is asserted that "if x is father of y then x is not cousin [of any order] of y, and vice versa." Actually, it is incestuous (nephew-aunt mating) for a man to beget a first cousin, but not impossible; moreover, I conjecture that most fathers and their sons are distant cousins.

To sum up, the book attacks a problem of minor interest with some success, success that would have been greater had the author been able to interest mathematicians in his project while it was under way.

LEONARD J. SAVAGE

Approximations for digital computers. By C. Hastings, Jr., assisted by J. T. Hayward and J. P. Wong, Jr. Princeton University Press, 1955. 8+201 pp. $4.00.

The theory of "best approximation," i.e. of minimizing the maximum of the absolute difference between a given function and its approximating function, has been studied extensively ever since it was initiated by Chebyshev, but practical approximations have in the past usually been based on other, analytically more manageable, methods. It appears from this book (implicitly, since no motivation is given explicitly) that Chebyshev approximation is just what is required in work with digital computing machines. Apparently one gives the machine a simple polynomial or rational approximation, which it can easily evaluate, in preference to an exact transcendental function. It also appears that almost none of the elaborate theory of Chebyshev approximation is of any practical use, and that the construction of useful approximations is still much more of an art than a science. Indeed, it is only rarely that the "best" approximation can be found explicitly, and the computer must usually be satisfied with some other approximation which is still uniformly close enough for his needs. The first part of the book consists of the reproduction of a strip film, with running commentary, describing the art of concocting approximations as practiced by an acknowledged expert. The second part presents 76 numerical approximations to 23 varied functions, each with a carefully drawn graph of the error. The book is evidently addressed to computer technicians rather than to mathematicians.

Mathematicians (by whom I mean people who produce, rather than consume, mathematics, whether pure or applied) may well be depressed by the realization of how ineffective even a well-developed theory can be in the face of practical requirements. On the other hand, a study of some of the forms which have been found useful might well suggest new lines of research. The level of the exposition is implicitly a disheartening commentary on the present level of mathematical education of computer personnel.

R. P. BOAS, JR.

BRIEF MENTION

Leitfaden der Nomographie. By W. Meyer zur Capellen. Berlin, Springer, 1953. 4+178 pp., 203 figs. 17.40 DM.

Nomographie. By M. W. Pentkowski. Trans. from the Russian by M. Peschel. Berlin, Akademie-Verlag, 1953. 16+268 pp., 140 figs. 15 DM.

These two books contain much useful information not elsewhere available and present it in stimulating manner. Both pay considerable attention, for example, to the question of errors. In the first, the discussion proceeds by numerous varied examples taken from engineering practice. The types are listed in an easily usable index. The sources form a bibliography of 68 titles. The theory is only lightly treated. With sharply contrasting method Pentkowski's book discusses few applications to specific equations from engineering. Most of the types considered are among those given in d'Ocagne's treatise. A mathematical classification of these types and their relations is not attempted. The object is rather to discuss how data should influence type, size and disposition if the nomogram is to have specified accuracy. This is done at great length and with a high degree of success.

J. M. THOMAS

An introduction to the theory of numbers. By G. H. Hardy and E. M. Wright. 3d ed. Oxford University Press, 1954. 16+420 pp. $6.75.

The first edition was reviewed in this Bulletin vol. 45 (1939) p. 507. A number of changes have been made, among them the inclusion of an elementary proof of the prime number theorem.

Mathematical foundations of quantum mechanics. By J. von Neumann. Trans. by R. T. Beyer. Princeton University Press, 1955. 12+445 pp. $6.00.