marred by the fact that the *Besm* computer used can only accept numerical forms of information so that all the symbolism has to be recoded. It is true that the programming programme *P.P.* ('compiler' would be better understood) removes from the programmer the necessity for detailed coding of loops, operators, minimization of working space and so on, but I cannot believe that the automatic nature of the coding "practically rules out the chance of error".

The value of this book is greatly reduced by its shoddy presentation. Why must we have the translator's typewritten notes ? Smudges and smears make a number of tables and diagrams ambiguous.

Part 1 of the book describes the symbolism which the programmer must use. I feel a less fearsome notation could have been chosen. (See example on p. 21.) The numerical coding of this symbolism is inadequately described. Part 2 describes techniques for programming such things as loops, operators, and working-space economy. This is marred by the quality of some of the flow diagrams. The notation of these diagrams is not described until Part 3. This Part describes the *P.P.* itself and is the most detailed part of the book. There is undoubtedly some very useful information here.

After some rather optimistic conclusions follows a brief review of the *Besm* programming system. This part would have better been at the beginning, for implicit references are made to it earlier in the book. The ideas would have been easier to digest if more examples had been given. When these are given they are often incomplete or contain errors. The illustration of a *Besm* word on pp. 141–143 contains three errors. In spite of being, by computer standards, a rather old account and having the shortcomings described above, this is a book to be studied by those interested in the mechanism of automatic programming.

R. J. Ord Smith

CONFLUENT HYPERGEOMETRIC FUNCTIONS

Confluent Hypergeometric Functions

By Dr. L. J. Slater. Pp. ix+247. (Cambridge: At the University Press, 1960.) 65*s*. net.

THIS is the first book in English to be devoted entirely to confluent hypergeometric functions. There are two predecessors in other languages, "Die konfluente hypergeometrische Funktion" by H. Buchholz, and "Funzioni Ipergeometriche Confluenti" by F. G. Tricomi, but this book is no mere copy of its predecessors.

The general plan of the work is reminiscent of G. N. Watson's well-known "Treatise on the Theory of Bessel Functions". The first part gives the main properties of the confluent hypergeometric functions and the Whittaker functions, and the second part consists of tables—the most complete so far published—which were computed by the author on the electronic calculator *Edsac* 1 in the University Mathematical Laboratory, Cambridge.

The first three chapters are concerned with differential equations and differential and integral properties of the functions. Chapter 4 is devoted to asymptotic expansions ; this is a long chapter as the theme "has been treated in great detail because it seems to cause most difficulty to students of the subject". To me this is a most impressive chapter, and I imagine that it will contain enough to meet the needs of most mathematical physicists.

Chapter 5 is given over to related differential equations and particular cases, while Chapter 6 gives the descriptive properties of the functions, such as the distribution of the zeros, expansions for the zeros, and notes on the tabulation of the zeros. There are also notes on the numerical evaluation of Kummer's function.

The second part of the work consists of tables, running to about 120 pages, giving the smallest positive zeros of Kummer's function, ${}_1F_1(a\,;\ b\,;\ x)$, and the values of this function over those ranges most useful to the computer. Since confluent functions contain one parameter more than Bessel functions, it is natural that the properties of the functions should be correspondingly less in number, and it is also natural for the tables of the functions to be much longer and more complicated in form.

This is an impressive work which contains many important contributions by the author herself, and the printing is of the high standard that one expects from the Cambridge University Press. The book should certainly be the standard book on the subject in English for many years to come, and it will be indispensable to those mathematical physicists who meet these functions in the course of their researches.

W. N. Bailey

DENDRITIC GROWTH OF CRYSTALS

Dendritic Crystallization

By D. D. Saratovkin. Translated from the Russian by Dr. J. E. S. Bradley. Second edition, revised and enlarged. Pp. iv+126. (New York: Consultants Bureau, Inc.; London: Chapman and Hall, Ltd., 1959.) 6 dollars ; 50*s*. net.

THE growth of crystals is a subject of great theoretical interest and practical importance. The process is the building of a periodic three-dimensional pattern of atoms which in crystals, such as diamond or quartz, is simply a giant molecule the size of which is limited only by that of the crystal. Internally, a perfect crystal would have a regular arrangement of atoms, and its external form would be a convex polyhedron with plane faces. In fact, real crystals not only show departures from regular internal structure but also often develop shapes far removed from simple, compact, polyhedral ones. Departures from regular internal structure are known to have considerable effects on the physical and chemical properties of crystals, and the external form developed by a growing crystal is also of great importance. The repeated branching leading to fern-like growths, of which the snowflake is a well-known example, can take place not only if a crystal is growing from a solvent or vapour but also when a melt is cooled. A dendritic structure may first form and the spaces between the branches are then filled in when the remainder of the melt solidifies. Dendritic crystallization is often encountered in metallic systems.

After briefly classifying the various types of crystal growth, the author describes observations on dendrites made some ninety years ago by D. K. Chernov, described as "the famous Russian metallurgist, founder of the modern theory of metal crystallization". This section is followed by a review of existing (Russian) theories of dendritic crystallization, by