

There is nothing startlingly new about the arrangement of the subject-matter. The introduction is followed by preliminary remarks on plant organs, tissues and tissue systems, after which we pass on to the cell and the bodies within the cell. A long section is devoted to meristems. We then start at the outside of the plant body and work inwards, covering in turn the primary protective tissue or epidermis including hairs, the secondary protective tissues or periderm, the ground tissue including secretory cavities and laticifers together with mechanical tissues, such as collenchyma and sclerenchyma, and finally the conducting tissues of the xylem and phloem. Having discussed the various tissue systems the author goes on to show how they are organized in the plant body, dealing in turn with the vegetative organs of stem, leaf and root and the reproductive organs exemplified by flowers, fruits and seeds.

As is only to be expected in a modern text-book, the author summarizes what is known of the submicroscopical structure of the cell-wall and discusses the chemical nature of the material of which plant cells and their inclusions are composed. The book is copiously illustrated with excellent line-drawings, many of them original and others taken from recent publications. Other illustrations are from photographs. There is a well-balanced, selected bibliography at the end of each section of the book, but the author was forced by circumstances to cite no further literature after June 1961. There are separate indexes to subjects and authors.

It is difficult for any author who has to deal with a long-established branch of botany such as plant anatomy to decide just what to include in a text-book. In the face of so much accumulated factual information selection is unavoidable. To me it seems that one urgent task is to make this very fundamental aspect of botany more palatable to students and to make them realize that the subject-matter refers to living organisms rather than to corpses. Furthermore, in these utilitarian days it would undoubtedly stimulate the interest of students to make them appreciate more fully that the detection of substitutes and adulterants among economic plant products is often impossible without a knowledge of plant histology. Finally, one seldom finds any attempt at relating plant structure to plant pathology in spite of the fact that this all-important aspect of applied botany cannot be fully understood without some knowledge of pathological anatomy. These comments are presented purely as constructive suggestions for future editions of Prof. Kaussmann's excellent book. The basic information which he has brought together is so well presented that it would be a pity not to make his book still more useful by incorporating some of the suggestions made here.

C. R. METCALFE

ERRORS IN CHILDREN'S THINKING

A Study of Children's Thinking

By Margaret Donaldson, in collaboration with Donald Withrington. With an appendix by John Duthie. Pp. viii+263. (London: Tavistock Publications (1959), Ltd., 1963.) 35s. net.

AS the title indicates, the book reports a particular rather than a general study of children's thinking. This study concerns the behaviour of children, aged between eight and fifteen years, who are attempting to solve certain formal, reasoning-type problems. Individual children are given these problems to solve, they are questioned in ways designed to reveal how they deal with the presented evidence and proceed to a conclusion, and they may be asked to attempt modified versions of the problems. The sort of data obtained may be briefly illustrated. An eight-year-old boy is given this problem. "Betty is ten. Betty is three years older than May.

Betty is five years older than Jean. How old are May and Jean?" His commentary runs as follows. "Betty is ten. Betty is three years older than May, so May is thirteen. Betty is ten. Betty is five years older than Jean, so Jean is eighteen." Such a clinical approach is essential in the study of human functioning but, as is well known, it presents a challenge to the drawing of general conclusions. The authors respond to this challenge by concentrating on errors of thinking, that is, on the ways in which the child fails to do what might be expected of a successful adult reasoner. So the children's answers and comments are examined for the errors they indicate, and the bulk of the book is devoted to classifying and considering these errors.

Three introductory chapters make clear that the enquiry was conceived as a possible contribution to educational goals of assessing, predicting and guiding children's abilities. This introduction considers issues involved in predicting the future development of children's abilities, stresses the limits of intelligence tests for such prediction, and, in fine, argues the long-term advantages of exploring the detailed ways in which children fail on intelligence test items. It is for these reasons that the problems used are of the kind faced by eleven-year-olds taking verbal group tests of intelligence. The problems fall into five, logically distinguishable, classes, and a chapter is devoted to each class. First, the logical structure of the problem is surveyed, and then the children's errors are discussed in relation to this structure. These errors arise from various sources and are grouped under three broad headings, namely, structural, arbitrary and executive. Structural errors involve "failure to grasp some principle essential to solution". Arbitrary errors involve various forms of "guessing", ignoring parts of the presented data, and importing additional evidence from "real life". Executive errors involve "failure in the actual carrying out of the manipulations required: some defect of concentration, of attention, or of immediate memory seems to lie at their origin". These detailed discussions and illustrations of error cannot easily be summarized. But they are excellent and contain the chief interest of the study. As the book unfolds, the relative frequencies of this or that error are considered in relation to the type of problem given. More ambitiously and less conclusively, ingenious attempts are made to work inductively from the errors observed, reconcile clinical with statistical methods of study, and discover developmental trends. A concluding chapter makes some very tentative suggestions about the developmental routes through which children attain error-free handling of the problems studied.

This investigation is important for a number of reasons. First, as a follow-up and extension of the pioneering, but strangely neglected, work of Burt (1919) on the development of formal reasoning. Secondly, for its close attention to the qualitative intricacy of children's attempts to deal with formal problems. Thirdly, its methodological concern to use its data inductively rather than as superficially amusing illustrations of preconceived theories. Since this study has been published in book form, it is perhaps a pity that the authors did not widen its appeal by permitting themselves to consider some general issues. For example, a long tradition surrounds the study of cognitive error, ranging from the idols of Francis Bacon, through the fallacies of logic, the experimental work of Burt and Piaget, into present-day notions about so-called cognitive dissonance. It would have been of interest had the authors compared their treatment of error against this tradition. It would also have been of interest had there been more explicit consideration of prescriptive models for the children's problem-solving procedures. As it is, the authors have confined their discussion to matters arising very directly from their own investigations. But even within this limited frame of reference, the study will be of value to psychologists concerned, from whatever point of view, with human intellectual functioning.

I. M. L. HUNTER