

In a section on gene action the evidence for the one cistron-one polypeptide hypothesis is concisely presented. This leads to a description of the characteristics of the genetic code. The genetic evidence that the codon is a triplet is well expounded. The biochemical work with *in vitro* protein synthesising systems receives rather scant treatment, the extent and significance of degeneracy is not properly dealt with and unfortunately the work on polypeptide chain termination is too recent to be included. Finally, there are chapters on gene regulation and episomes, both of these are very well done. These accounts however, leave the impression that the hypotheses based on the  $\beta$ -galactosidase system have a more universal validity than they deserve.

The only criticism to be made of the general presentation of the material in this book is that the references are not sufficient for the serious student. The type is unusually large and clear the book having strong covers and binding. This book is remarkably good value at 15s. and is recommended as probably the year's best buy in genetics textbooks. J. A. PATEMAN.

#### "A SWEET CANE FROM A FAR COUNTRY"

GENETICS AND BREEDING OF SUGAR CANE. G. C. Stevenson. Longmans, London, 1965. Pp. 284+xli, 70s.

Sugar cane breeding is one of the most striking success stories in the recent history of plant improvement. Indeed there is no doubt that the successes of cane breeding over the past sixty years have been a key element in—indeed they were probably essential for—the economic survival of the industry. Baver has shown that sugar yields in Hawaii have more than doubled in the past four decades and attributes 75 per cent. of this advance to the use of new varieties; figures of this order are no doubt quite general.

Sugar is big business, for production can only be economic on the basis of an efficient and vertically-integrated system of large scale cultivation backed by heavy engineering, milling and transport facilities. Just how big the business is will be evident from the fact that world cane sugar production is roughly 30 million tons, representing probably some 300 million tons of cane itself. The cane-producing lands are all tropical or subtropical and the great majority can fairly be described as "under-developed". Often, sugar is a very important, even the leading, export of a producing country, so the economic viability of the trade is a matter of acute social and political importance. The cane breeder therefore serves a technically competent industry, and one which recognises the crucial social and economic importance of good new varieties and can state plant breeding objectives in unusually clear quantitative terms. In this sense at least, the cane breeder has an easier time of it than, say, the potato breeder in Britain who may well despair of ever understanding what the public wants of a new variety.

There is no doubt that attachment to a large and progressive industry played an important part in determining the magnificent successes of sugar cane breeding. But if the cane breeder is fortunate in his economic associations, he is unfortunate in the botany and cytogenetics of his chosen plant. The sugar canes are highly polyploid (often aneuploid), the chromosomes are small and nasty, flowering and fertility are often erratic, the flowers are minute, controlled hybridisation is frequently impossible and the seed has very short (all too often zero) viability. The only compensation is

ease of vegetative propagation; sugar cane is one of the best examples of those plants, more numerous in tropical than in temperate agriculture, that combine vegetative propagation with deranged sexual reproduction.

The breeding behaviours and the ingenious means used to offset the natural disadvantages of the plant have now been very well described by G. C. Stevenson in what must surely become the standard book on the subject. The book starts with a brief but adequate account of the botany of the plant; goes on to a very good history of cane breeding and a description of the intricate and ingenious crossing techniques used and finishes with four chapters on cytology, breeding behaviour and breeding plans. The author has over thirty years experience of the crop as breeder and cytologist and this fact is apparent in every page. A very adequate bibliography accompanies each chapter and the illustrations range from good to excellent. The text is lucidly written but was, for me, somewhat marred by some schoolmasterish phrases (*e.g.* p. 3—"Hereditary characters which have come to be known as genes . . ."), by some unnecessary glimpses of the obvious or irrelevant (*e.g.* p. 213—references to Nilsson-Ehle and the Hardy-Weinberg equilibrium), by some non-genetical terminology (*e.g.* "blood", "blood-lines" and (p. 243) "prepotence" meaning dominance) and by a number of misspellings (*e.g.* frequently *rubustum* for *robustum*).

Two more considerable defects are, I think, the failure to give a critical discussion of varietal "degeneration" (does it happen?) and a somewhat confused approach to the question of systematics and nomenclature. As with most crop plants, the formal taxonomy of the group is a mess and the author more or less says so on pp. 12-13 where he shows that several of the so-called "species" are in fact simply poorly defined groups of natural hybrids; but at page 225 he treats these "species" as having some "real" existence and so makes the parentages of certain clones seem much more diverse than they really are. The best way out here, as always, would be to discard Latin nomenclature altogether in favour of some more informative coding which revealed the genetic facts; failing this, the Latin names should be treated for what they are—sometimes useful and significant, more often merely arbitrary and ill-defined tags applied at a time when our knowledge of the history of crop plants was poorer than it is now. This is not a mere quibble: inadequate Latin nomenclature does confuse all except those having a fairly intimate understanding of a group of plants. Furthermore, in cane, as in bananas and potatoes, recent studies have led to re-interpretation of Linnean names, so that common current usage does not even obey the rules of botanical nomenclature.

The reader should realise that the author deliberately excludes one large and important topic, namely selection procedures. He outlines the principles of selection but does not describe the very various schedules in practical use nor the rationales behind them. Since much of the effort in any cane-breeding programme goes into selection and since selection procedures are the subject of most of the cane breeding literature, the omission is a significant one. To this extent the title of the book is misleading: it deals only with one half of cane breeding. Perhaps someone will now write the complementary volume, the need for which the author of this book refers to at pp. 8-9.

This, then, is an essential work for anyone concerned with sugar cane improvement and it could be read with profit by all who are interested in

the history of crop plants. The author and the publishers (who maintain their usual high standards of production) are to be congratulated on another valuable addition to the literature of tropical agricultural science. Socially and politically, there is no more important science in the world today.

N. W. SIMMONDS.

### A TALE OF TWO CITIES: THE EFFECTS OF INBREEDING IN HIROSHIMA AND NAGASAKI

THE EFFECTS OF INBREEDING ON JAPANESE CHILDREN. William J. Schull and James V. Neel. Published by Harper & Row, New York. £5. 12s. 6d.

This book reports the results of a remarkably detailed and painstaking survey on consanguinity in Hiroshima and Nagasaki, the individuals studied being ascertained by the two authors when they were investigating the genetic effects of the atomic bombs.

Between 1948 and 1953 there were 76,626 pregnancies in the two cities and because in Japan the rate of consanguineous marriages is high, in 5346 of these the parents were related. This 1948-53 cohort was investigated from 1958-60 and in addition to the lack of bias in ascertainment, the examiners were unaware whether the child they were testing was the product of inbreeding or not, and (most important) adequate data with respect to socio-economic factors were available.

The effects investigated were mortality and morbidity, and after the elimination of all children whose parents had received a significant amount of radiation, the final number of offspring of consanguineous parents was 1789 in Hiroshima and 2686 in Nagasaki. The controls were selected by taking a 10 per cent. sample based on the terminal registration digit for the pregnancy. From these were eliminated those who happened to be of consanguineous origin and those born to irradiated parents, and since there were still too many, those whose subterminal digit was 3, 6 or 9. The control series then numbered 1970 in Hiroshima and 2847 in Nagasaki.

The high frequency of consanguineous marriage is not surprising since it accords well with the pattern of family life in Japan. Parents choose mates for their children who will fit peaceably into the common household, who are well-known to them and to their prospective partners and who are of the same economic status (this is very important owing to the heavy burden of present-giving in Japan).

The general statistical problem was, simply: "What is the statistical and biological significance, if any, of parental relationship with mortality and morbidity in the child?" The solution is complicated mainly by extraneous variation and by markedly disparate numbers of observations in the various consanguinity classes (principally first cousins, first cousins once removed and second cousins); moreover, corrections have to be made throughout for socio-economic factors. The coefficient of relationship, *i.e.* the probability of occurrence of an identical gene by descent at a given locus for the two individuals, has been calculated for unrelated individuals and for all the consanguinity classes, and by the application of complicated statistical and computer techniques a series of unspectacular but very interesting results were obtained, some of which follow:

1. There was a small but significant effect of inbreeding on mortality