

attention is focused on high lysine (opaque-2) maize, but consideration is also given to other cereals: wheat, triticale, oats, rice, sorghum, and barley.

The improved amino acid balance of opaque-2 maize was first reported in 1962. Since that time abundant evidence of a corresponding improvement in nutritive value has accumulated. Studies conducted in Colombia and Guatemala indicate that the protein of opaque-2 maize has a biological value about 90 percent of that of skim milk in the feeding of protein-deprived children. Rat and swine feeding trials also attest to the improved nutritional value of opaque-2 maize.

The book includes reports on the development of opaque-2 maize types from various areas of the world: Brazil, Colombia, Hungary, India, Mexico, Peru, the Philippines, the United States, and the Soviet Union. In spite of the tremendous effort that has been expended on it and its proven nutritional superiority, opaque-2 maize occupies a very limited percentage of world acreage. Strategies for increasing utilization receive some attention.

The current situation with respect to improvements in protein quality or quantity in other cereals is also reviewed; subjects covered include the new high-protein wheats and oats and naturally occurring or induced mutations in both sorghum and barley that improve in protein quality through a reduction in the alcohol-soluble fraction. Consideration is also given to the economic and technical feasibility of improving dietary protein quality through fortification and supplementation as alternatives to genetic improvement. A series of workshops on chemical and biological evaluation techniques for protein, problems involved in the introduction of improved varieties, and social and economic factors involved in public acceptance of these varieties complete the book.

A large number of legume species, which are the subject of *Nutritional Improvement of Food Legumes by Breeding*, are used as human food in various areas of the world. It is possible that the wealth of species available has been a deterrent to progress, as few have received concentrated attention. The six most important types are cowpeas (*Vigna unguiculata*), dry beans (*Phaseolus vulgaris*), chick peas (*Cicer arietinum*), pigeon peas (*Cajanus cajan*), groundnuts (*Arachis hypogaea*), and soybeans (*Glycine max*). The last two are grown primarily for industrial processing though both are also used directly as human food.

Yields of food legumes have not been increased by the Green Revolution. In fact, the increases achieved in the cereals have often been accompanied by decreases in

both acreage devoted to and total production of the food legumes. In addition to relatively low yields, the legumes pose other specific problems that limit expanded use, and these are discussed in the book. The six objectives of food legume improvement programs are higher protein levels and better amino acid profiles; reduction of toxic constituents; reduction of flatulence; improvement of processing and consumer acceptance; development of screening methodology useful to plant breeders for measuring relevant chemical, nutritional, and toxicological factors; and expansion of research related to crop yields and productivity.

Within each of the six main types of food legumes, survey data indicate rather striking differences in protein percentages. As in other seed crops, percentage of protein in legumes is markedly influenced by environment, which complicates selection and evaluation. The lack of a simple screening technique has precluded extensive work on methionine and cystine, the amino acids of greatest interest.

Little information is available on the genetic control of various toxic or otherwise undesirable substances present in some or all of the food legumes. The effects of some of these (trypsin inhibitors, phytohemagglutinins, and antivitamin factors) can be minimized through cooking; apparently the digestibility of all legumes is improved by heat treatment. Other undesirable substances, such as goiterogens, cyanogenetic glycosides, flatulents, and possible heat-resistant growth depressants, are relatively unaffected by normal cooking procedures. Species and varietal variation of some of these characteristics has been established, but the extent and complexity of genetic control remains largely unknown.

On the basis of the general history of success in plant breeding it appears safe to assume that further increases in productivity in these two classes of food crops can and will be achieved. Improvements in other desirable characteristics (such as an increase in kernel hardness in opaque-2 maize or a reduction in toxic substances in legumes) are less predictable and will take longer. A prerequisite for the desired progress in any plant breeding program is the availability of a simple, rapid, and efficient screening technique for each of the factors of major interest.

These two volumes contain information of interest to specialists in agriculture and human nutrition and to all others who are interested in the adequacy and the protein quality of the world food supply.

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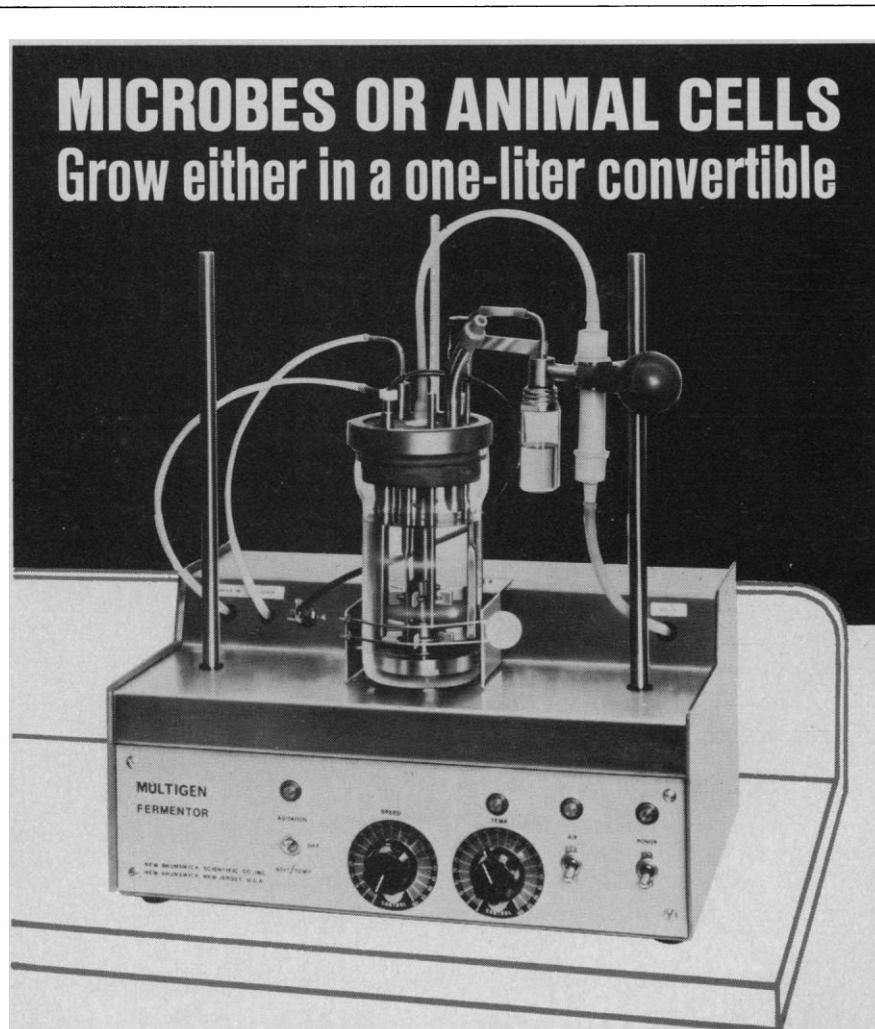
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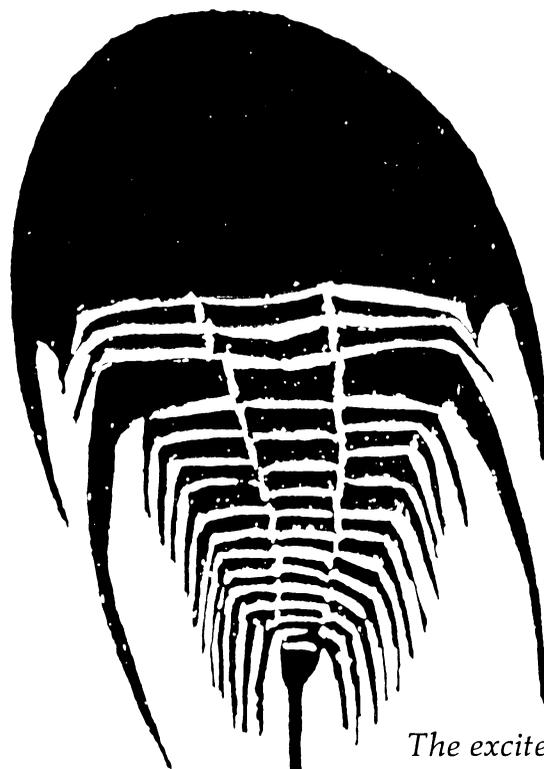
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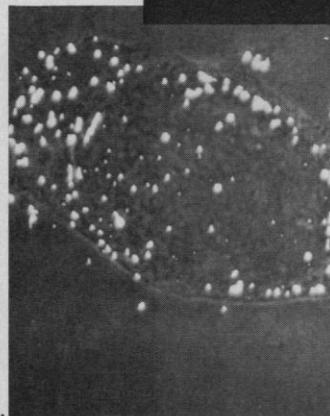
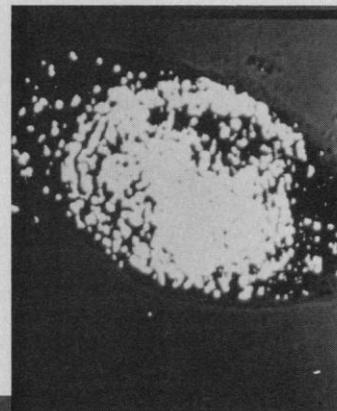
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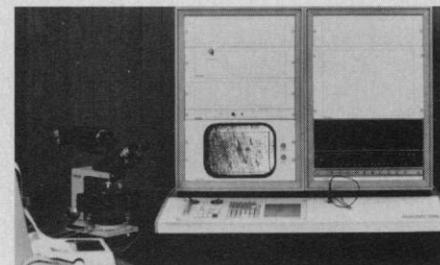
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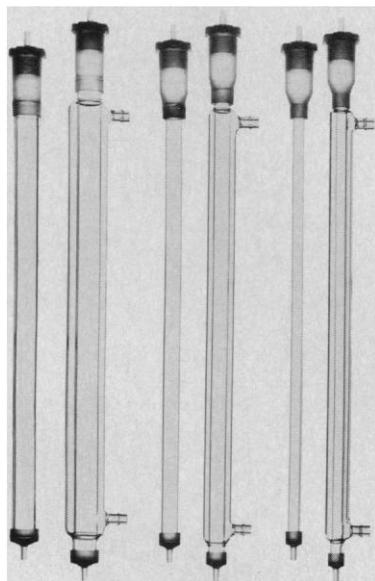
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