NEW SOURCES OF FOOD

by CHARLES CAMPBELL

The production of cheap proteins will relieve chronic malnutrition

IT is many years since H. G. Wells wrote of 'a race between education and catastrophe'. In the uneasy world of today the warning has a wider application than ever before, in relation to the many thorny problems that confront us all, as human beings. If for 'education' we substitute 'birth control' and for 'catastrophe' 'mass starvation', one of our two most acute problems stands out at once in almost terrifying clarity.

The United Nations Report, *Future Growth of World Population,* arrived at this startling estimate:

1950 — 2,497 millions
1975 — 3,838 millions
2000 — 6,267 millions.

The explosion of population is occurring, not in the wealthy West but in countries where life is already at a bare subsistence level. Medical science is reducing the death rate more and more by anti-malarial and other life-saving measures. But what can be done about *birth control* in the short time left us before starvation or near-starvation hits perhaps 2,500 millions of the human race before the end of this century, less than forty years ahead? 'Education' is too hopelessly slow a process. We must as a matter of urgency look for new ways of supplementing man's essential food supplies.

Protein deficiency is the crux of the problem of chronic malnutrition today in India and Eastern Asia and over large areas of Africa and Central and South America. A diet consisting mainly of starch, in the form of cereal foods, without concentrated sources of supplementary protein, provides less than half the minimum protein intake essential for human growth, development, and reproduction. Its deficiency can cause infantile mortality, stunting of growth and mental development in childhood, and reduced resistance to infection and disease in child and adult alike.

Under the ægis of the Food and Agriculture Organization of the United Nations, the World Health Organisation, and the United Nations International Children's Emergency Fund, much research has been done in recent years. It is established that proteins found in peanuts, soya beans, cottonseed, legumes and leaf, suitably blended with staple cereals, are capable of providing adequately for the protein requirements of the human organism, either alone or by extending limited supplies of animal proteins.

It is strange that the countries which suffer most from protein malnutrition are the chief sources of high protein oilseeds, now exported largely or processed for their oil content, leaving a high-protein cake used only for cattle-feeding and fertilizers.

Breaking the Cell Wall

The main world sources of seed protein, peanut, cottonseed and soya bean, have oil and indigestible carbohydrate contents which make it well-nigh impossible for enough of them to be eaten to provide an adequate supplementary protein intake. Nor can the green leaf materials that maintain cattle and other animal life be digested and their protein utilized by the human stomach.

A recent development known as the Impulse Protein Process is coping with the problem of utilizing the sources of vegetable protein for human consumption. All living matter exists in cellular form, with the nutrients, such as protein, fat, carbohydrate and sugars, enclosed in a tough skin. Once this cell wall is broken, the contents can be sorted and recovered separately. The Impulse technique was first used in 1949 for breaking the animal cell structure of bone by applying shock waves (impulses) to a stream of cold water carrying the bone through a machine designed for the purpose. The impulses transmitted by the water burst the cells in approximately two-thirds of a second, liberating continuously fat and other constituents.

A similar process is now being applied to vegetable and plant material of all kinds, and not only is protein being recovered in concentrated and palatable form, free of the indigestible

Mr I. H. Chayen (centre), inventor of the process
(International Protein Products Ltd)

cellulose and fibre, but high-grade oil and carbohydrate by-products are being won.

The Impulse Protein Process was first demonstrated in September 1959 on a pilot plant in the Development Department of British Glues and Chemicals Ltd, in Bermondsey, London. Of the oilseeds, peanuts, for example, yielded food protein as a milk-like lipoprotein, consisting of approximately two-thirds protein and one-third oil, from which an 'isolate' of 96% protein could also be produced. High-quality edible oil and meal of good animal feeding value were important by-products.

Of the leaf material, lucerne gave a protein concentrate of 70%, together with fibre for paper-making, hardboard manufacture, or animal feeding, and an oil containing chlorophyll, waxes, and other valuable constituents.

Other vegetable raw materials successfully processed in the pilot plant include cottonseed, soya beans, grass, manioc, sugar-beet tops, and cereals.

Animal feeding tests have confirmed that the proteins were digestible with their natural nutritive values unimpaired. From the angle of human consumption, the bland flavour and textural property of peanut lipoprotein enable it to be widely used in food industries as an incorporated food supplement in meat products, sausages, ice-cream, soups, sauces, and bread and bakery goods; it can also be made into a highly concentrated milk-like drink with cocoa, coffee, or other flavouring.

Peanut protein 'isolate', being 96% protein, can be used where highly concentrated supplementation is essential, e.g., with infant and geriatric foods, survival rations, and hospital and convalescent diets.

Peanut lipoprotein is now being marketed under the trade-name 'Lypro'. The Plymouth plant of the operating company, International Protein Products Ltd, has a current capacity of 1,000 tons per annum, to be increased to 2,000, which it is claimed will provide for the protein supplementation of a city of 120,000 people at a cost of about 1s per person per week. The optimum unit of economic working will produce 8,300 tons of 'Lypro' per annum, to provide for a population of half-a-million people at a cost of about 8d per person per week.

If, as is hoped, larger factories come to be put up in Europe, North America, and other industrial countries, and later in some of the less developed areas of the world, this new form of food supply may well prove to have a significant contribution to make to the solution of a problem of immediate and world-wide importance—chronic malnutrition. The process described above is not the production of a synthetic foodstuff; it involves the separation by aqueous extraction of the natural components of the peanut. But those of us who recall the London chophouse of a more leisurely and spacious day will continue to look back nostalgically on those juicy rump steaks we used to get our teeth into, with never a thought of proteins or vitamins. We must reflect, however, that the majority of human beings in this world have no such memories.)

In other directions, the manufacture of edible carbohydrates from straw or even waste paper is a possibility yet to be investigated. The consumption of paper in the United States alone is some 35 million tons, or 400 lb per person per year. If half of this were to be recovered and converted, it has been estimated by American scientists that it would produce about 180 lb of edible carbohydrate, or about ½ lb per person per day. This amount of carbohydrate would provide

about 900 calories, or a little less than one third of the daily requirement.

Again, the harvest of the sea is yet uncropped; its boundless stores of protein are yet to be gathered and processed. Man is still at the hunting stage in the fishing industry, which is centuries behind agriculture.

Science marches on; but so does the menace of over-population. Optimism for the future must be qualified, and tempered with caution, when we look again at the brutal facts. Even today half the world is underfed. In the next fifty years we may well have succeeded in making twice as much food available as today. Yet even if we achieve this the economic and political obstacles to a more even distribution of world food supplies are, and will probably remain, formidable. And if in the same period the world population has doubled, human beings will still be going hungry — twice as many millions as today.

THE ONLY MIRACLE IN HISTORY

by PAUL CUNNINGHAM

Modern psychology throws new light on the genesis of scientific ideas

THE emergence of science and philosophy in Ionia and the Greek mainland was described by Renan as 'the only miracle in history'. Prof Benjamin Farrington called it, with more accuracy, perhaps, a mutation of the human mind. Certainly this extraordinary event was a major turning-point in the world's history. Whether it could have happened anyhow later on we do not know. We can only marvel and be thankful that mankind started on the path of rational inquiry.

Freudian Approach

Instead of taking their beliefs about the universe from religious tradition, a handful of remarkable men began to ask searching questions and to provide their own answers. What was the world made of? How had it come into existence? Where was it all going?

There are many different ways of following this adventure in ideas from Thales to Einstein. We can suppose that Ionians were dissatisfied with magical explanations and tried the experiment of rational thinking, but this is only part of the truth.

The concepts they formed bore traces of their magical-religious origin. The late Professor Cornford suggested that what prompted the search for an invisible substratum beneath the material world was the primitive belief in *mana* and its equivalents. Magical forces, like spirits and demons, were gradually transmuted into impersonal agencies, independent of man's wishes.

In *The Origins of Science* (Allen & Unwin, 28s) Dr E. H. Hutten carries the investigation further. He approaches the subject from a psychoanalytical point of view. Freud, as is well-known, held that the mental world of an infant is governed by the pleasure principle. This leads him to weave fantasies in order to enjoy his wishes and silence his fears. Gradually, as he becomes more aware of an external world indifferent to his wishes, he learns to think more realistically. In so far as he gains maturity he turns from the pleasure principle to the reality principle.

Omnipotence of Thought

The early infantile phase is sometimes called the Omnipotence of Thought. It is felt that the external world can be changed by thought alone, without material intervention. This is the source of magic. The sorcerer can kill his enemy by thought waves. The paranoiac has similar delusions. On a more exalted plane the idealist philosopher holds that the material world is made of 'mind-stuff'.

The Indian philosophers continued to speculate on these lines and therefore failed to develop science, apart from certain practical discoveries. We owe science to the Greeks who turned their attention to the outside world and sought genuine knowledge. They invented such important concepts as 'element' and 'atom'.

Moral Feelings

But they inherited the primitive idea that natural laws must be moral. If we forget this background, it seems puzzling that they should speak of Justice as though it were a physical force, of Love and Strife as moving the elements, and so on. Dr Hutten regards Plato and Aristotle, despite their great achievements, as retrograde influences because they did not detach their moral feelings from their account of the world.

Science progresses by emancipating thought from these religious feelings. There is a progressive differentiation and secularization from the fantasies of infancy, dominated by wishful thinking, to the idea of an external world which cannot be influenced by our desires though it can be controlled to