

the cost of which would not be more than that of a single professorship.

Anthropometric instruments have now been perfected, and because of the simple mendelian inheritance of the human blood groups, these give valuable indications of human relationships and migrations. It should be possible to find two reliable unemployed science graduates, one man and one woman residing in each of five or six centres scattered over the district to be surveyed. These ten or twelve people should meet at the nearest university for an intensive course of training of perhaps eight weeks, similar to an American University Summer Session. Here they would take courses in genetics and gross anatomy, and be trained in the use of the instruments, in blood testing methods and in anthropological photography by an expert with sound biological training. Then they could return to their homes and gather data from the community within reach for ten or twelve months. The data would be returned to the expert for statistical treatment and analysis, and

would provide an invaluable record of human traits in different communities and geographic groups. They would be valuable to the sociologists and public health authorities as well as to the geneticist and anthropologist. There are indications that blood group types are correlated with susceptibility and resistance to certain diseases. The effects of balanced and deficient diets are revealed in the proportions of the bones of the face and pelvis. Thus the anthropological data would be of use to research workers in nutrition.

The proposed scheme would also provide, at least temporary occupation for some unemployed graduates of both sexes. The experience they would acquire would be of help to them in finding permanent positions afterwards.

Such an undertaking would reflect credit on any institution or individual who sponsored it, and should appeal to wealthy laymen of different communities who might be induced to contribute towards the cost of the survey.

Nutrition, International and National.

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DURING the last year the subject of nutrition has received considerable attention from the League of Nations and the related organisation, the International Labour Office. As a result of international discussions, comprehensive schemes for the study and attack of the problem have been formulated, which are likely to have a considerable influence in the spheres of economics, agriculture, and public health.

In the Report of the Director of the I.L.O. to the Nineteenth Session of the International Labour Conference (June 1935), we find the following passage:—

“ Though there is still considerable controversy among physiologists as to the minimum needs for healthy subsistence and as to the rations of calories, proteins, mineral salts and vitamins required in different climatic conditions, it is not open to dispute that large masses of people are at present underfed or wrongly fed. . . . Every country is faced by a problem of this kind, but its exploration is only just beginning. It may be compared with the problem of medical treatment and maternity care, for which

much has already been done wherever a sound system of health insurance has been established. . . . If the cure and prevention of disease is a communal affair, housing and feeding, which are the primary requisites of healthy living, are hardly less so. They were certainly not excluded from the purview of the International Labour Organisation by the Preamble to the Constitution, which lays down the ‘ provision of an adequate living wage ’ as one of its objectives and declares it urgent to improve conditions of labour involving hardship and privation”.

“ Looked at from another angle, it is evident that a higher and more variegated standard of food consumption would go far to solve the problem of agricultural over-production. . . . ”

“ This question of consumption is not only national but international in its scope. If it is agreed that the only real solution of the problem of economic balance is not through scaling down production but in levelling up consumption, then it follows that the best hope of finding a way out of the present troubles is to raise the standards of the

millions who are now underfed, under-clothed and under-equipped. The cares of the American, Argentine, Australian, Canadian or Eastern European farmer would be conjured away if the urban population of Europe and America could eat even a little more bread, butter and meat per head. . . . When all other remedies have been clearly seen to fail, it is in this direction that thought will eventually be directed, unless a general regression towards lower standards of living is accepted as the ironical but inevitable outcome of a civilisation condemned to decline through the excess of its own creative ingenuity and technical perfection."¹

An interesting discussion of the questions raised in these paragraphs ensued at the Conference, in the course of which various delegates stressed the importance of nutrition in relation to agriculture, economic policy, and the purchasing power and health of industrial workers. The Conference adopted a resolution instructing the Labour Office "to continue its investigation of the problem, particularly in its rural aspects, in collaboration with the health and economic organisations of the League of Nations, the International Institute of Agriculture and other bodies capable of contributing to its solution, with a view to presenting a report to the 1936 Session of the Conference."

During the Sixteenth Session of the Assembly of the League of Nations (Sept. 1935), delegates of 12 countries, including the United Kingdom, Australia, the Argentine, Chile, Italy, and Sweden, addressed a letter to the President proposing that "the question of the relationship of nutrition to the health of the population, which has become a social and economic problem of widely accepted significance, and is recognised as having an important bearing on world agricultural problems, should be placed on the agenda of the current Session of the Assembly."

This was accordingly done, and the discussion raised lasted three days in the Second Committee—a somewhat remarkable fact when one remembers that the 1935 Assembly was perturbed by the tragedy of the Italo-Abyssinian war. A few months previously a report had been published in the *Quarterly Bulletin of the Health Organisation of the League of Nations* entitled "Nutrition and Public Health,"² by Dr. Et. Burnet of Paris

and myself. This report, which marshals evidence to show that malnutrition is prevalent throughout the world and outlines the far-reaching implications involved, was to a large extent used as a basis for discussion. In opening the debate, Mr. Bruce, the Australian delegate, used the memorable phrase "marry health and agriculture", which served to crystallise ideas previously nebulous. Other delegates who spoke were in general agreement that the time has come for vigorous action on a national and international scale, and the bearing of the ideal of "improved nutrition" on the economic life of the world was re-emphasised. Increase consumption of agricultural products and the purchasing power of the agriculturist must rise, to the benefit of industry and world trade in general. As a result of its discussions, the Assembly set up a "Mixed Committee," including agricultural, economic, financial, and health experts, who are to submit a general report on the whole question, in its health and economic aspects, to the next Assembly, and further, it instructed the technical organisations of the League to "collect, summarise, and publish information on the measures taken in all countries for securing improved nutrition."

The next necessary step was to define "optimum nutrition" in the light of modern knowledge. This was done in November, 1935, by a Technical Commission, convened by the Health Organisation of the League, which included leading nutrition workers from U. S. A. and various European countries. Its report, entitled "The Physiological Bases of Nutrition,"³ defines in simple language a series of optimum dietary standards. Those interested should study the report in the original. Among the points emphasised by the Commission were the following:—the importance of a high milk intake, particularly for children and expectant and nursing mothers; the value of green and leafy vegetables, fruit, eggs and unmilled cereals; the undesirability of a high consumption of milled cereals and sugar. It was subsequently pointed out by various authorities that the general adoption of a diet of the type recommended by the Commission would mean, even in a comparatively well-fed country like England, a very great increase in the demand for dairy products, eggs, fruit, vegetables, etc., and that such a demand would enormously

¹ International Labour Conference. Nineteenth Session, Geneva, 1935, Report of the Director, pp. 83-84.

² June, 1935, Vol. IV, No. 2,

³ C. H., 1197, Geneva, Dec. 1935,

stimulate the agricultural industry. The ideas of our 'over-production' in agriculture, and of restricted production as a way out of the economic depression, seem to be finally defunct. It has become ludicrous to talk of the 'over-production' of food-stuffs in a world, a great proportion of whose inhabitants are living on a diet far below optimum standards.

The fundamental problem (as far as the countries of Western civilisation are concerned) is therefore to stimulate food consumption in the right direction, and this clearly is a problem with many aspects each requiring intensive study. First, there is the question of educating the mass of the people in rational dietetics. There is great scope for advance here, but difficulties should not be underestimated. The average human being is not very teachable about his diet, being convinced that he knows all there is to know about the subject already. Untiring effort is required to make scientific knowledge, even in a rudimentary form, the property of the man in the street. Then there are difficulties inherent in the commercial organisation of the world; vested interests are quick to turn to their own advantage any new movement of this kind, and ingenious advertising of expensive and unnecessary food products might tend to drown the less sensational propaganda of the hygienist.

At best, however, the possibility of improving nutrition by purely educational means is limited. Poverty is a more basic cause of malnutrition than ignorance. To a large extent, as far as the poorest classes in many countries are concerned, diet is determined by income, and without increase in purchasing power no great improvement is possible. Obviously, purchasing power cannot be raised by a wave of the hand. But at least it is possible to investigate on a wide scale the relation between income, the "cost of living" and food consumption, and correlate the conception of a minimum wage with that of a minimum adequate diet. These are questions of special interest to those concerned with labour problems, and they are at present being actively studied by the International Labour Office.

In countries like England, the subsidising of certain branches of the agricultural industry (*e.g.*, dairy products, eggs, fruit and vegetables) would stimulate production, and lower prices to the benefit of the consumer. Again, an increased national

expenditure on unemployment benefit, the supply of milk and nutritious meals to school children, pregnant and nursing mothers, etc., an improvement in the feeding of residential institutions under governmental control, would ultimately have a beneficial effect on the health of a large section of the population, and at the same time put more money in the farmer's pocket.

The "Mixed Committee" of the League, which met in February, 1936, under the presidency of Viscount Astor, included representatives of the International Institute of Agriculture, the International Labour Office, and a number of distinguished nutrition, economic, and agricultural experts. In an interesting opening speech Viscount Astor outlined the enormous range and implications of its proposed activities. On the whole he was optimistic:—

"I believe that our final recommendations can and will make an overwhelming appeal to the common sense of the world..... If starting from the aspect of public health and continuing our enquiries through the fields of national agriculture, of world trade, of industrial employment we come to the conclusion that welfare, using this word in its widest meaning, can be immeasurably raised through the application of the results of science, we shall open up a new era of progress to a suffering world."

It is clear that this promising international activity closely concerns India and the East. Before long India will be drawn into the orbit of the investigation, and will be able to benefit from the results of enquiries carried out elsewhere. As a preliminary there is a great deal of work to be done in India to clarify the general situation as regards nutrition. It is first of all necessary to correlate and compare agricultural production, etc., with the food requirements of the population, and incidentally to throw light on the so-called population problem. This, in my opinion, is infinitely the most urgent and important task to be undertaken in connection with nutrition in India; in the absence of this basic information, the possibility of improving the diet of the people on a wide scale cannot be assessed.

On the economic side, investigations among both urban and rural groups are called for; any study of the economic condition of population groups indirectly throws light on diet. In the sphere of public health, more active educational and propaganda work is needed, and a great

deal of further research, involving many areas of the country, into the effects of malnutrition on the individual, should be set on foot.

Present League activities centre round the ideas that the diet of the mass of the population in almost all countries falls below "optimum" standards, that increased demand for nutritious food will result in increased production, and that the world as a whole is capable of a very much greater production of foodstuffs, and in particular of the physiologically most valuable foodstuffs. It is proposed that national and international "food policies" should be boldly constructed on the principles implied in Mr. Bruce's phrase—"marry health and agriculture". If India is considered as a self-supporting unit, the problem takes on

a somewhat different complexion; many consider that there is little possibility of the country producing an improved diet for its rapidly increasing population. We need, however, much more information on this point. If, on the other hand, we regard India, not as an isolated unit, but simply as part of the world, the ideas formulated at Geneva seem to become more applicable. It is conceivable, for example, that increase of wealth and purchasing power would enable the country to benefit, by importation of the kind of foodstuffs she most needs, from a world-wide boom in agriculture. At all events, there is no reason why an attempt should not be made, when the fundamentals of the situation have been more fully investigated, to formulate a "food policy" on a national or provincial basis.

An Interferometric Method of Measuring Temperatures and Temperature Gradients Very Close to a Hot Surface.

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A STUDY of the variation of air temperature with distance above and below a hot surface is a problem of importance in Physics and Meteorology. When the surface is an infinite horizontal plane and the air temperatures are required only at distances of the order of feet or centimetres, the problem of measuring the temperature is not difficult and may be solved in a variety of ways, *e.g.*, by using ventilated radiation-proof instruments like the Assmann Psychrometer or thermo-couples or resistance thermometers. Such measurements above the bare soil surface and above and below heated plates have been discussed by Ramdas and Malurkar¹ and others. When the investigation has to be extended to within a few millimetres or a fraction of a millimetre, as for example in the dust-free Aitken's layer referred to by Ramdas and Malurkar, the measurement of temperature becomes difficult. This is easily understood because the moment we place any measuring device or element so near to the surface, the isothermal surfaces get disturbed, radiation effects become pronounced and difficult to avoid, and we cannot hope to get accurate measurements of temperature. The method of

interferometry, however, provides a simple and elegant solution of the problem. About 2 years ago Mr. Paranjpe undertook an investigation of temperature variations in the air "above" and "below" hot solid surfaces, above evaporating water surfaces, as well as in the interspace between two plates as in conductivity measurements, by using the interferometric method.

Fig. 1 shows the experimental arrangement. Light from a monochromatic source S (a Zeiss sodium vapour lamp) stopped down by a diaphragm DD and rendered parallel by a lens L falls on a plane parallel glass plate P_1 and is partly reflected on to the mirror M_2 and transmitted through a second plate P_2 . The beam transmitted by P_1 is reflected at the mirror M_1 and the plate P_2 and then interferes with the other beam. The two beams are seen through a telescope T which can be focussed on the interference pattern. The above arrangement of the interferometer provides necessary facilities for localising the fringes at any point in the path of either of the interfering beams without change of fringe width.

The hot surface above or below which the temperature gradient is to be measured is provided by a brass plate about 13 cms. long, 5 cms. broad and 6 mm. thick with

¹ *Indian Journal of Physics*, 1932, 3, Part I.