

ploration of the deep-sea fauna. We can speak from personal experience of the efficacy of a modification of Dr. Hansen's methods which has been used with great success in the exploration of the deep water to the west of Ireland, where the use of fine silk tow-nets attached to the dredge and trawl has revealed a wealth of species undreamt of by earlier British marine biologists.

Dr. Hansen prefaces his reports by a critical account of the literature relative to the area surveyed by the *Ingolf*, and a valuable summary of the geographical and bathymetric distribution of the species in the collection.

Of special interest is his conclusion that the Wyville-Thomson ridge does not form an absolute line of separation between the deep-sea fauna of the cold and warm areas. Evidence is submitted of several species which have been found in both areas, and the author rejects the hitherto accepted explanation of this distribution, that these species were taken pelagically and not actually on the bottom.

Dr. Hansen has a valuable chapter on sexual differences among Tanaidæ, in which he comments on the rarity of adult males, and makes the interesting suggestion that the development of the marsupium and eggs in the female is accompanied by a reduction in size. His remarks on the nomenclature of segments and joints and on generic and specific characters in Tanaids will prove of the utmost service to students of this difficult order of Crustacea, which is marked by great uniformity of external form and the absence of tangible characters upon which species and genera may be distinguished.

The most important morphological feature brought forward in these reports is the evidence in favour of the author's theory, advanced some twenty-three years ago, that the sympod of all biramous appendages in Crustacea was primarily three-jointed. Hitherto no evidence in support of his case could be brought forward as regards the thoracic limbs of the Malacostraca (with the exception of *Nebalia*), but Dr. Hansen has now produced evidence of the existence of a præcoxal joint in the maxillipeds of two species of Isopoda.

The new species and genera are clearly described and illustrated by a series of beautifully drawn figures. The wealth of material at the disposal of the writer and his clear and critical insight into the true value of characters for systematic purposes have led him to suggest several modifications in the minor classification of the families and genera of Isopoda, which tend to a better understanding of the group and to a restoration of order out of the chaos into which it was rapidly falling.

Students of Arthropoda have been indebted to Dr. Hansen in the past for a series of illuminating papers elucidating the structure and classification of many obscure and difficult groups. Their obligations are considerably increased by the publication of these valuable papers, which workers on Isopoda will find indispensable to the successful prosecution of their studies.

W. M. T.

#### GROWTH FACTORS OF FOODS.

THE *Biochemical Journal* more than maintains its increasing and well-deserved reputation in the current number (vol. x., No. 3). The articles of most general interest are two on feeding experiments, which were carried out at the Cambridge Biochemical Laboratory under Prof. F. G. Hopkins's direction. These experiments are a continuation of the very careful and elaborate series which Prof. Hopkins has been making for several years past upon the growth factors of foods. In all of them young albino rats of uniform origin,

sex, and weight are employed. They are fed and treated in an exactly similar manner, except with regard to the essential factor with which the investigation is concerned. The food consists of starch, cane-sugar, fat, suitable salts, and various protein products, together with the alcoholic extract of 1.5 c.c. of milk per diem, as this extract contains an unknown "vitamine," which is absolutely essential for the normal growth of the rats. In the first series of experiments, carried out by G. Totani, it was found that rats fed on the hydrolysed products of caseinogen from which all but 0.2 per cent. of the tyrosine had been removed, and to which a small quantity of tryptophane had been added, grew just as rapidly as on a similar diet to which tyrosine was added in addition. Other experiments made with a diet of hydrolysed gelatin—which contains no tyrosine or tryptophane—showed that whilst the rats lost 18 per cent. in weight in a month, they lost little, if any, weight if tryptophane were added. The addition of tyrosine as well as without influence, and so it seems highly probable that the tissues of the mammal have the power of synthesising tyrosine. They form it from phenylalanine, but the small amount of this substance present in gelatin suggests the possibility that they can synthesise the benzene ring from non-aromatic substances.

The second series of experiments relates to the synthesis of tryptophane in the body. It is known that some of the tryptophane of the food is excreted in the urine in the form of a quinoline derivative, kynurenic acid, and C. Asayama investigated the capacity of the tissues to carry out the reverse change. He found that rats fed on the amino-acids formed by the prolonged acid hydrolysis of caseinogen—a treatment which destroys all the tryptophane originally present—rapidly lost weight and died in eight weeks, though they grew moderately if tryptophane were added. If kynurenic acid were substituted for the tryptophane they lost weight and died at almost exactly the same rate as when no kynurenic acid was added at all, so we must conclude that whatever the synthetic powers of the tissues for tryptophane may be, they do not extend to this substance.

#### EDUCATIONAL REFORM.

THE Education Reform Council, which was founded last April at a conference called by the Teachers' Guild, has issued a programme of education reform. The work of the council is as yet incomplete, and it is hoped to publish the full report early next year. Among other important recommendations enumerated in the programme the following deserve special mention. The Ministry of Education should hold a higher place in the hierarchy of the offices of the State, and the salary of the Minister should be equivalent to that of other principal Secretaries of State. Progressive organisation is hindered by certain statutory distinctions between higher and elementary education. Local authorities for higher education should be obliged to supply or aid the supply of higher education, and the limit of 2*d.* to the higher education rate in the county areas should be removed. For the purpose of co-ordinating the activities of local education authorities with those of the universities and institutions for higher education, the country should be divided into educational provinces, the areas of which should be larger than those of the existing local authorities.

The number of efficient secondary schools of varying types should be increased. The Consultative Committee has advised the strengthening of the higher work of secondary schools, and the Reform Council considers that schools taking the lower grant should receive grants for this purpose. Pupils at any school

recognised as efficient by the Board of Education should be eligible for State scholarships for prolonging secondary education, or tenable at the universities. Many capable students will continue to be debarred from the universities, with consequent loss of national efficiency, if these scholarships are limited to "aided" schools. In secondary schools pupils should remain as a rule until the end of the term in which the seventeenth birthday occurs. Financial provision should be made to enable suitable pupils to continue at school until they enter the university. The Reform Council expresses complete agreement with the view advanced by the Consultative Committee that large additional funds should be provided by the State for scholarships for higher education. The amount suggested—329,500*l.* per annum—is not too large. The selection of students for scholarships to the universities and institutions for higher education should be based upon an expert review of the relevant qualifications rather than upon a central competitive examination. Such relevant qualifications are the school record, examination record, probable career, and general personal fitness. The amount of assistance given should be such as to enable the scholar to live in a manner befitting a university student during the normal course required for graduation, and for the necessary post-graduate preparation for professional practice.

The opinion is expressed that for most professions, and for research in pure science, at least one year of post-graduate preparation is necessary. In determining the number and incidence of the awards, the main consideration should be the national need to strengthen the learned professions (including teaching), and to further industry, commerce, and agriculture. The Board of Education should allocate grants for higher scholarship purposes to the provincial boards; the provincial boards should make the awards, their action being co-ordinated by the Board of Education or by a special national board.

#### THE WORLD'S SUPPLY OF PHOSPHATES.

PROF. J. W. GREGORY, in his presidential address to the Geological Society of Glasgow, gave an account of the chief sources of the world's supply of phosphates, in the course of which he pointed out that an instructive lesson in the conservation of mineral resources was to be learnt from this subject. He showed that Britain has but limited supplies of natural phosphates, and these were being left unworked owing to the introduction of cheaper and richer products from foreign deposits. Prof. Gregory dealt only with the natural phosphates, but he could well have strengthened his argument by reference to the artificial phosphates; that is to say, to basic slag, which has been such a very important source of phosphorus supply to the agriculturist during recent years.

The world's production of natural phosphates in 1913 was approximately six million tons (of which the United States produced one-half), whilst that of basic slag was approximately three million tons. Great Britain is now producing considerable quantities of low-grade basic slag, a by-product from the basic open-hearth steel process, and is likely to produce much more in the near future, but much of this valuable material is being wasted to-day owing to the insistence of the authorities upon the citric acid solubility test, a test devised in Germany, and adopted without proper investigation in this country; its real object was, of course, to favour the slag produced by the Basic Bessemer, or Gilchrist-Thomas, process, a process to which German iron ores are well adapted, to the prejudice of slag produced in the basic open-

hearth process, which latter suits British iron ores better. Many of our best agricultural authorities hold that, in spite of the above empirical test, our slags are quite as efficient as manurial agents as are the Basic Bessemer slags, and if we had in this country a department charged with the care of the proper utilisation of our own mineral resources, this subject would no doubt have received the attention that its importance merits.

Prof. Gregory has done valuable service in again directing attention to our supply of phosphates, and it is clear that, from the point of view both of the natural and of the artificial phosphate supply, the question is one of vital importance to our great agricultural interests.

#### AGRICULTURE AT THE BRITISH ASSOCIATION.

WITH the continuance of the state of war it is inevitable that where agriculturists forgather for discussion the central theme should be the problem of the more efficient utilisation of British soil. The task of British agriculture is the dual one of securing on one hand a more efficient, and on the other a more economical, utilisation of our resources in land and labour. The prolongation of the war renders more and more difficult the task of extending cultivation, and it becomes all the more necessary to devote attention to the consideration of economy.

It was thus timely and desirable that such considerations should bulk largely in the proceedings of Section M at the recent meetings. The topics discussed may be roughly grouped under the three heads of "Economy in Crop Production," "Economy in Meat Production," and "Economy and Reform in Timber Production."

The first group of problems received a fitting introduction in the presidential address, in which the possibilities of securing increased output of crops and the directions in which economies can be effected in existing practice were aptly summarised. In subsequent discussions more detailed consideration was given to the possibilities of motor cultivation and of the practice of ensilage.

Mr. C. B. Fisher introduced the former subject with a critical consideration of the possibilities of the extended application of steam and other mechanical tractors in the cultivation of the soil. His own experience led him to advocate warmly the extended use of motor tractors, although conscious that existing models left much room for improvement, and that more extensive and precise tests under experimental conditions are urgently needed. The general trend of the discussion substantially confirmed these views, although a disappointing experience in Scotland related by Mr. Alex. McCallum served to emphasise the need for caution under existing conditions.

In introducing the subject of ensilage for discussion, Mr. A. Amos gave the results of experience on Norfolk farms with this method of preserving green crops, which led him to advocate warmly its merits, not the least of which was the possibility of reducing or eliminating the costly root crop. Further testimony to the valuable results obtained in East Anglia was given by Messrs. Oldershaw and Wilson.

The importance of climate as a limiting factor in crop production was discussed by Mr. T. Wiberley, who once more urged the advantages of a rational system of continuous cropping as a means of securing increased output and greater economy.

A further contribution to the subject of economy in crop production was made by Mr. E. H. Richards in his summary of studies made at Rothamsted of the economy of the manure-heap, which demonstra-