

knowledge so imparted is inter-linked and becomes an 'integrated' whole. On the training in nutrition now given to medical students, the views of those present at the symposium were unfavourable; it was noted that while students receive some instruction in the science of nutrition in its clinical aspects, this is not given in an 'integrated' way and is rarely related to the everyday problems of family life.

Emphasis was placed on the contribution to popular education which can be made by the public health nurse through her contacts with families in their homes. Home economists, a growing professional group in a number of European countries, can also influence families directly. As part of her work to improve family living conditions, the home economist is concerned with the planning of the family budget, the preparation of family meals, the domestic production, storage and preservation of food.

The training in nutrition of school teachers, so that they can teach its elements to their pupils, at an impressionable age, was discussed at some length. Ways of including nutrition in the teaching of subjects such as biology, health education and home economics were outlined, and it was agreed that it should not form a special and separate addition to school curricula. The need for simple and practical

instruction was stressed, and attention was directed to the educational value of school meals.

Since good nutrition depends on the supply of enough of the right sort of food, it was appropriate for the symposium to consider the training in nutrition of agronomists and agricultural extension workers and their role in national nutrition programmes. Students in agricultural colleges learn much about the feeding of animals, but practically nothing about the feeding of human beings, which is after all the *raison d'être* of their profession.

Finally, the educational specialists present insisted that their colleagues should glance at modern educational techniques and modern ideas about the learning process, pointing out how these can be applied in the nutritional field. They were heard respectfully by a group in general more familiar with old-fashioned methods of instruction.

The symposium was aware that some of its conclusions cannot be exactly applied to the different countries represented, but require adaptation to the circumstances and needs of each. In the animated discussions, however, a large measure of agreement was reached on major points. Throughout, the friendly atmosphere characteristic of international technical meetings prevailed. W. R. AYKROYD

ELECTRON-PHONON INTERACTIONS

A CONFERENCE on Electron-Phonon Interactions in Solids was held at the Clarendon Laboratory, Oxford, during December 17-18. The Conference was held under auspices of the Physical Society and the delegates were welcomed by Dr. K. A. G. Mendelsohn (Oxford) on behalf of the President of the Society. The subject-matter of the Conference was of a very specialized nature and the organizers had further restricted the field of discussion by excluding topics directly related to superconductivity. It was therefore most encouraging that more than one hundred delegates attended the Conference. Among these were visitors from the United States, Belgium, Canada, Holland, South Africa and Switzerland. These delegates were not all specialists in the subject-matter of the conference, but nevertheless the discussions which followed the formal papers were often lively and to the point.

The Conference devoted its attention to those aspects of electron-phonon interactions which are most closely concerned with the complicated processes usually classified as 'transport phenomena' in metals and semiconductors. Examples of such phenomena are the electrical and thermal conductivities or the thermo-electric effects. The classical kinetic theory of the 'free electron gas' gives a very simple and elegant explanation of most of these effects in a first approximation. However, this theory makes the very fundamental assumption that the electron gas is in thermal equilibrium at some particular temperature, but does not clearly describe a mechanism by which this equilibrium can be achieved. The approach to equilibrium is discussed in terms of 'collisions' which do not involve interactions. The difficulties of a more rigorous theoretical treatment were emphasized by Dr. G. V. Chester (Birmingham) and Dr. J. M. Ziman (Cambridge). Dr. Chester, in attempting a more rigorous approach using the 'adiabatic' approx-

imation, was rather surprised when experimentalists in his audience pressed him for some numerical orders of magnitude. Dr. Ziman reviewed the different methods at present used for estimating the electron-phonon interaction. He suggested that the strength of this interaction in metals was related to the Fermi energy; but the discussion which followed Dr. Ziman's paper showed that some delegates thought that he may have over-simplified the problem by laying such stress upon one parameter—the closeness of approach of the Fermi-surface to the Brillouin-zone boundary.

Prof. F. J. Blatt (Michigan State University), Dr. D. K. C. Macdonald (National Research Council, Ottawa), and Dr. J. R. Drabble (General Electric Co.) presented papers dealing with experimental investigations of thermo-electric effects in metals and semiconductors. Prof. Blatt described an interesting series of experiments which had been carried out using alloys of zinc, germanium, cadmium, indium, tin and antimony with copper. Of these alloys, 1 per cent zinc or germanium alloyed with copper gave a change in the thermo-electric power consistent with the expected phonon drag contribution estimated from pure copper. On the other hand, the addition of 1 per cent cadmium, indium, tin or antimony to copper reduced the phonon drag contribution almost to zero by virtue of phonon scattering arising from the solvent mass difference.

On the morning of the next day, Dr. A. B. Pippard (Cambridge) gave a simplified theoretical treatment of the anomalous absorption of ultrasonic waves by conduction electrons when the metal is situated in a magnetic field. Ultrasonic waves are essentially very long wave-length phonons, so that this technique provides in principle a direct approach to electron-phonon interaction processes. Unfortunately, this anomalous absorption is difficult to measure and is

often masked by other attenuating mechanisms such as may arise from the movement of dislocations. The effect sought for has apparently only been observed in copper and possibly in lead. Other papers during the morning were contributed by Dr. R. Furth (London) and Dr. L. Mackinnon (Leeds).

The session during the afternoon was opened by Dr. S. Raimes (London), who gave a careful account of the description of transport phenomena in metals using the techniques of plasma theory. This was followed by a paper in which Dr. R. J. Elliott (Oxford) directed attention to an alternative line of investigation which might provide useful information about electron-phonon interactions. He suggested that

further electron-spin resonance experiments should be undertaken with metals in order to measure the electron spin-lattice relaxation time in more detail. The final paper was given by Dr. D. M. S. Bagguley (Oxford). He described some experiments using cyclotron resonance techniques to investigate the different collision processes for carriers in germanium.

All the delegates who attended the conference were grateful to the organizers for their efforts in providing an opportunity for listening to the formal papers and for informal discussions between colleagues. Such informal discussions are themselves a sufficient and complete justification for a conference of this nature.

D. M. S. BAGGULEY

BRITISH GELATINE AND GLUE RESEARCH ASSOCIATION

THE eighteenth meeting of the Research Panel of the British Gelatine and Glue Research Association was held on November 12 with Mr. J. N. Blake (Richard Hodgson and Sons, Ltd.) in the chair. Mr. Blake introduced Dr. D. A. Sutton, who had recently succeeded Mr. A. G. Ward as director of research.

Dr. J. E. Eastoe (Department of Dental Science, Royal College of Surgeons of England) presented the first paper entitled "Bone—The Structure of a Biological Microcosm". After considering bone as one of the several mineralized biological tissues, note was taken of its occurrence in the vertebrate sub-phylum of the chordate phylum. Dr. Eastoe discussed bone at descending orders of size beginning with the skeleton, its function and the integration of its component parts, and continuing through the cellular level to electron microscope studies of bone mineral and collagen and thence on to the organization at the molecular level of these two main components. He concluded with a discussion of the hypotheses advanced to explain mineralization. Particular reference was made to the work of Glimcher, Hodge and Schmitt showing that mineralization is induced from metastable solutions containing calcium and phosphate only when the collagen fibrils present have the 640-Å. spacing, and that deposition can be prevented by traces of polysaccharide components. Chemical differences exist between bone and skin in that the former contains less polysaccharide and that its lysine and hydroxylysine have ϵ -amino groups more reactive towards fluorodinitrobenzene according to recent work by Solomons and Irving.

In the second paper, "Shrinkage of Cherries in Jelly", Miss M. J. Anthistle (Fruit and Vegetable Canning and Quick Freezing Research Association) demonstrated that the shrinkage which has been noted on storage can be virtually eliminated by adjustment of the surrounding gelatine gel (isoelectric pH, 4.7) to about pH 4.0; below this pH shrinkage occurred and above it a slight degree of swelling. The effect was not dependent on the sugar concentration. Miss Anthistle then considered the phenomenon in terms of the Donnan membrane equilibrium theory and deduced that shrinkage should be minimal at the isoelectric pH of the gelatine; in fact, it was minimal between pH 4.0 and 4.5. The pH of minimum shrinkage is thus somewhat lower than the isoelectric pH of the gel. In the discussion, it was suggested that the slight discrepancy might be due to an effect upon the equilibrium caused by the protein and pectin inside the fruit.

A short paper was then given by Mr. A. M. Kragh (British Gelatine and Glue Research Association) entitled "The Equilibrium Moisture Content of Plasticized Gelatine Gels". Glycerine and a sugar mixture (4 sucrose : 1 glucose) were used as plasticizers and relative humidities of between 35 and 93 per cent were studied. Temperature had a negligible effect upon the equilibrium moisture contents. Unless the relative humidity was very high, the equilibrium moisture content of the mixtures did not vary greatly over a wide range (0.5 : 1.4 : 1.0) of plasticizer : gelatine ratios.

D. A. SUTTON

INTERLINGUA

THE free circulation of ideas and information is not less important for science than the circulation of the blood is for the body. This circulation is impeded by the publication of the results of scientific research in a multiplicity of languages. At least 50 per cent of the scientific literature of the world is published in languages that more than 50 per cent of the scientists of the world are unable to read. The number of published articles is growing rapidly; chemical literature, for example, has doubled itself in the past eight and a half years. There is also an increasing number of international meetings. There is thus not only the difficulty of reading published

articles but also that of participating in discussions with research workers from other countries.

According to Forrest F. Cleveland, the scientist has two requirements. First, he has to scan the current literature to obtain ideas and information with respect to new developments in his field. Secondly, he must read in detail those articles that pertain to his own investigations. These requirements are largely frustrated by the language barrier (*American Scientist*, 47, No. 3, 1959). Scientific work would be facilitated if the results of scientific research were published in a single language that every scientist would be able to read at sight. Such