The Board has also conducted an inquiry in twelve European countries as to the feasibility of a comprehensive Russian-to-English translating service in physics, and as an outcome of this inquiry the American Institute of Physics has announced the initiation, in November 1955, of a complete English translation of the Russian *Journal of Theoretical and Experimental Physics*.

Together with the Publication Committee of the International Union of Pure and Applied Physics, the Board has also promoted the publication of articles reviewing the work of the principal schools of research in physics in the U.S.S.R. and other Slavonic countries, and it is co-operating with the same body in the revision of the Universal Decimal Classification in physics. Steps have also been taken to facilitate the abstracting of non-periodical publications in physics.

As early as 1950 the Executive Committee of the International Council of Scientific Unions had expressed the opinion that the joint commission should be concerned with the abstracting of both chemical and physical literature, and this view was endorsed by the Council in October 1951, though later a proviso was added that work on chemical documentation should not be attempted before sufficient progress had been made in the field of physics. It was only in 1954, accordingly, that the Abstracting Board was ready to extend its activities into chemical literature, and this extension was authorized by the Council in October of that year. When notified of this decision, the International Union of Pure and Applied Chemistry, now represented on the Board by Dr. L. H. Lampitt, recommended *Chemical Abstracts* and the *Bulletin Analytique* as member-journals for chemical abstracting in English and French, respectively. These journals were unanimously elected to the Board and remain the only member-journals for chemistry. The editors of a number of important chemical periodicals have already been approached with the view of organizing the exchange of page-proofs. The International Union of Mechanics and the International Union of Biology have also expressed interest in the work of the Board, and Prof. Boutry concludes his paper with a warning that the time may be due when full-time salaried officials will be required for the work of the Board in place of honorary officials.

CONNECTIVE TISSUE AND ITS CHANGES WITH AGE

THE British Society for Research on Ageing held a meeting in the Littlewood Hall of the General Infirmary, Leeds, on January 20, under the chairmanship of Prof. R. E. Tunbridge, at which four papers were read and discussed. The first, by Dr. M. K. Keech, Dr. R. Reed and Miss M. J. Wood, dealt with the characterization of elastic tissue by means of the electron microscope. They presented evidence that the variable morphology shown by normal elastic tissue fibres from various sites indicates that elastin, the fibrous protein entity assumed to be present in all forms of elastic tissue, is a complex system, consisting of fibres coated with a dense, amorphous material. They also produced evidence that dermal collagen fibrils, either fresh or prepared substantially free from ground substance, when treated at 37° C. with alkaline buffer solutions of *p*H 8·8, or with periodate solution, *p*H 5·0, transform into structures closely resembling those in naturally occurring elastic tissue (see *Nature*, **176**, 966 ; 1955 ; and *J. Gerontol.*, **10**, 388 ; 1955). These structures stain like elastica and also are attacked by the enzyme elastase.

The so-called dense, moth-eaten fibres (*Ann. Rheumat. Dis.*, **14**, 19 ; 1955), which result from the action of bacterial collagenase on collagen fibrils, also transform, when heated in water, to similar elastin-like structures (*J. Path. and Bact.*, in the press). The importance of these findings lies in the fact that the moth-eaten fibres are an index to the age of the collagen from which they arise. In the age range 0–20 years, collagen, when treated with collagenase, forms many such fibres. From collagen of ages 20–50 years, however, their number gradually decreases, while above the age of 50 none is produced. It is concluded, therefore, that the products of collagen breakdown become coated with a dense amorphous material to form the elastin-like structures. Apparently the coating material is present in young collagen, but gradually decreases in amount with age. Elastic fibres from ox ligamentum nuchæ, when treated with boiling 1 per cent acetic acid solution for 1 hr., are apparently devoid of collagen fibrils as judged by the electron microscope. Collagenase action, however, reveals that they still contain many short fibrils of degenerate collagen. In general, therefore, there are strong morphological grounds for believing that material resembling elastic tissue can originate from the breakdown of collagen.

In the second paper, Dr. P. F. Lloyd discussed some problems relating to the polysaccharide components of connective tissue, and dealt with these under three headings : the type of polysaccharide(s) present ; the nature of the linkages binding polysaccharides to other components ; and the function of the polysaccharides or polysaccharide-containing complexes. Knowledge of the first two is essential for a full understanding of the third, and all three need to be studied before the wider problems concerning the nature of the changes which occur in connective tissue on ageing can be seen in true perspective.

To facilitate work on connective tissue in general, and on elastic tissue in particular, paper ionophoretic and infra-red analytical methods have been developed. Paper ionophoresis on an apparatus fitted with 'Perspex' condensers above and below the paper appears to give excellent separations of mucopolysaccharides (potential gradient 18 V./cm.). It has been found that chondroitin sulphuric acid-A moves at a faster rate than chondroitin sulphuric acids-C and -B. The mobility of the latter polysaccharide is increased after treatment with testicular hyaluronidase. Extraction of ligamentum nuchæ with 5 per cent saline followed by fractionation leads to the isolation of chondroitin sulphuric acid-B and a hyaluronic acid, the nature of which has been demonstrated by chemical and physical methods. In addition, this elastic tissue contains probably chondroitin and also a new type of connective tissue polysaccharide which is either a sulphated hyaluronic acid or a sulphated polysaccharide containing both glucosamine and chondrosamine in approximately equal amounts.

Extraction with 10 per cent calcium chloride has led to the separation of an insoluble mucoprotein containing about 8 per cent polysaccharide. In its behaviour on treatment with elastase, it resembles elastin (0·5 per cent polysaccharide) ; and Dr. Lloyd expressed the opinion that it would serve as a con-

venient model for further enzymatic studies. The results of an examination of the action of pancreatic elastase on crude polysaccharide suggest that elastase is an oxidizing enzyme.

Dr. H. Saxl and Dr. G. N. Graham, in the third paper, gave details of an interesting histochemical and biochemical study of the Ehlers Danlos syndrome. The work has been carried out during the past five years on biopsy specimens from two patients suffering from this condition. One biopsy from each of these patients afforded the material for electron-microscope studies previously reported. Histological examination of a lesion from one of the patients (a boy aged 3½ years) showed an increased amount of elastic-staining material, paralleled by a decrease of collagen. The lesion was highly metachromatic and the periodic-acid – Schiff reaction was very positive. The elastic tissue from the lesion and that of the "apparently healthy skin" surrounding it was found to be resistant to elastase. Drs. Saxl and Graham directed attention to the fact that elastase can be inhibited by a component of normal serum. The elastase-inhibiting effect of the serum of Ehlers Danlos patients was found to be quantitatively increased over that of normal serum.

Although attempts to isolate the component or components of serum responsible for such inhibition of elastase by means of chromatography on an ion-exchange resin column have been made, the results so far obtained have been rather equivocal. However, there are indications that the inhibitory agent is a high-molecular-weight component associated with the globular serum proteins. Drs. Saxl and Graham have also made a study of the effect of the inhibitor using fresh ox ligamentum nuchæ as the elastic substrate and have found a loss of metachromasia if the enzyme, the substrate and the inhibitor are incubated together. There is, however, no loss of metachromasia if each of these components is permitted to act in turn on the ligamentum nuchæ. There is an increased susceptibility of elastic tissue to elastase in senile elastosis, and the elastic fibres of the human carotid artery and of the aorta are dissolved by elastase at a greater speed with advancing age. In the serum of patients belonging to the age-group in which there is a high incidence of arteriosclerosis, there is a reduced concentration of serum inhibitor for elastase which is related to a low concentration of the enzyme in the pancreas.

In vitro experiments have indicated that the inhibitor has a twofold biological action: first, the control of the enzyme elastase in the formation of degradation products; and secondly, the absorption of metachromatic mucoid and elastic-staining substances. From the work of Karczmar and S. M. Rose, who have shown that, in *vivo*, differential development can be correlated with inhibition, it would not seem too unlikely to suggest that the elastase inhibitor can be an essential factor in the formation of elastic fibre.

The final paper, by Dr. David Hall, dealt with the dependence of equilibria between connective tissue components on age. He said that the structural components of connective tissue are particularly resistant to metabolic reactions, but must be maintained at their normal concentration by the simultaneous presence of anabolic and catabolic enzyme systems and their appropriate inhibitors. Age changes in the susceptibility of the various structures to attack by their specific enzymes can be coupled with variations in concentration of those few enzyme systems which have as yet been identified. A full assessment of the equilibria between the various components can only be made when studies of tissue, enzyme and inhibitor from the same animal and from the same age-group are made. As a preliminary to these studies, it has been necessary to examine the chemical reactivity of the tissue components.

Alkali treatment of collagen results in the extraction of small quantities of protein under conditions which give marked production of elastin-like material when examined under the electron microscope. The protein is, in certain circumstances, rich in hydroxyproline and arginine, two amino-acids which one would expect to be extracted, if collagen were to change to elastin. In the case of young collagen, this hydroxyproline-rich material is extracted during the early period of treatment, whereas the extract from old collagen does not contain a high hydroxyproline content until longer periods of extraction have occurred.

Based on these results, and those stemming from the observations of the other workers in the group, it is possible to devise a hypothesis for a similar *in vivo* synthesis of elastin via collagen. If this is done, many of the hitherto unexplained questions concerning connective tissue can be solved: for example, the absence of an elastoblast, the variations in chemical composition of elastins of various age-groups, and the appearance of elastic staining materials which are really dissimilar, in senile elastosis and the Ehlers Danlos syndrome. It was stressed by Dr. Hall that this is only a hypothesis, but that it would act as a starting-point for the discussion of age relationships of collagen and elastin, by permitting them to be considered as a single unit rather than as two diverse structures which merely share a common site.

G. H. Bourne

NON-DESTRUCTIVE TESTING OF MATERIALS AND STRUCTURES

THE French and English editions of the report* on the symposium on "Non-Destructive Testing of Materials and Structures", held in Paris in January 1954 by the Réunion Internationale des Laboratoires d'Essais et de Recherches sur les Matériaux et les Constructions, include thirty-nine papers from fourteen countries, some of the discussion and a bibliography containing references to fifty-five papers on non-destructive testing. The symposium was very largely concerned with the testing of concrete, and the scope of the report is not therefore as extensive as the title suggests. There are, however, four papers in the report, by M. Mamillan, G. Dawance, A. Moles and J. Jacquesson, of France, which deal in particular with the testing of materials other than concrete, namely, stones, rock and soils.

The three sections of the report cover vibration methods (*A*), hardness methods (*B*) and radiographic methods of test (*C*), respectively. The numbers of papers dealing with these methods vary considerably: there are twenty-six papers in section *A*, nine in section *B* and four in section *C*. The papers are prefaced by short summaries introducing the sections

* International Union of Testing and Research Laboratories for Materials and Structures (RILEM). Proceedings of the International Symposium on Non-Destructive Testing of Materials and Structures. Vol. 1, pp. x+1–208; Vol. 2, pp. ii+209–404. (Paris: RILEM, 12 rue Brancion.) 2,000 fr.