BRITISH BOOT, SHOE AND ALLIED TRADES RESEARCH ASSOCIATION

OPENING OF NEW LABORATORIES

THE British Boot, Shoe and Allied Trades Research Association was one of the first to be incorporated. It started in the town of Northampton in a very small way in 1919. At that time, when the research association movement was quite new, the principle obtained that anything was better than nothing in the way of science in industry, and this Association began with a trade contribution income of only £500 a year. During the first four years it remained small and its staff was only part-time. In 1922 steps were taken to put the Association on to a more national basis, and it was towards the end of that year that a full-time director was appointed, the headquarters were moved to London, a small staff duly appointed, and a beginning made with full-time work in somewhat incommodious premises in City Road, E.C. In 1927 a move was made to better accommodation in Bedford Square, W.C. These premises were damaged early in the air raids of 1940 and the Association went to temporary accommodation in the Boot and Shoe Technical School, Kettering, where the work was carried on through the War. When the War ended, search was made for suitable premises in the Midland area for the Association's permanent home, it being almost impossible to find suitable accommodation in London. A house in Kettering with reasonable area of land was acquired and at the beginning of 1947 the Association took it over. In due course the erection of extensions was begun, culminating in the opening of the new laboratories at Satra House by the Duke of Gloucester on October 28.

To-day, the whole of the shoe industry of Great Britain is connected with the Research Association either in full membership or affiliation. All the shoe manufacturers through their trade associations are members *en bloc*. Wholesale and retail distributors, as organised bodies, are in full membership or affiliated; the Shoe Operatives Union is affiliated, and in addition there is a considerable body of membership from the ancillary supply trades. So, as it should be, the scientific body is unique in linking together all sections of the industry; no matter on which side of the table they may be in business, economic and other such negotiations, all sections are united under the banner of science for the improvement of the industry and its service to the community. It has taken thirty years to achieve this from the small beginnings in Northampton.

Thirty years is not an unduly long time for such an accomplishment. The shoe industry is a craft industry based on the handicraft which is as old as civilized man. It is a traditional industry; but in the form that we know it to-day it is young. The mechanization was beginning only two generations ago. The mental disciplines of craft and science are quite different and the problem of grafting science on to this industry is in large measure the psychological one of unifying two different mental disciplines. It is a long time since this was recognized by the Research Association and allowed for in its plans. Thirty years—a generation—was the period anticipated as necessary for a reasonable measure of accomplishment.

The shoe industry is very close to the public; it is a secondary industry producing a commodity of direct personal significance to each individual in the community. It is sometimes thought that the industry's science must begin where its supply industries leave off; we prefer to say that it begins with civilized man's need for footwear. The fundamental work is research into the human need, to measure and tabulate it in all its aspects in order to build up the knowledge necessary to decide how best to satisfy the need. Accordingly, the research programme starts with foot surveys, to accumulate statistical knowledge of foot dimensions and shapes for all sections of the community—children, adolescents, adults—in various geographical areas and social strata. There is also work on orthopædic aspects of footwear to throw light upon the influences which the shoes may exercise upon poise and gait, with their consequent subtle reactions on bodily well-being. There are physiological questions relating to foot comfort in regard to warmth or coolness, moisture dispersal and so forth. At the next stage of a logical sequence an understanding is required of all potential shoe materials so that their physical and chemical properties may be assessed in relation to the requirements in shoes for physiological comfort, weatherproofness and serviceability.

Next comes the manufacture of shoes, where again the properties of the materials are important in relation to factory processing. Development of processing methods rests very largely upon improving knowledge of the physics of the materials. The manufacture of shoes consists to-day in a sequence of machine operations, the different machines along the line having different production capacities, so that problems arise in the balancing of the chain. There are doubtless general propositions to be worked out in this connexion which may be valid for such other industries as are similar in the sense that batches of articles in work flow down a chain of operations. The ultimate object is, of course, the improvement of manufacturing efficiency and productivity, and the money value of the product to the public. Finally, there are problems of distribution, in particular, stock-keeping. The ideal is naturally that a stock of shoes should be so constituted as to provide a maximum probability of being able to suit the random foot. This is complicated enough for a simple type of shoe because of the variety of fit criteria, but it is additionally complicated by the variety of types and styles.

The brief outline just given shows how shoe science and the Research Association's programme are broadly based on a policy of service to the community—undoubtedly a sound principle for any industry's research programme and in the long run the surest foundation for an industry's prosperity.

The Association's laboratories at Satra House provide accommodation for all the various types of work in the programme: mathematics and statistics, last modelling, shoe making, shoe fitting, orthopædics, biophysics, physics and chemistry, methods and production engineering. In the staff are brought together the many various talents and scientific accomplishments necessary to bring all the best techniques into the several parts of the programme. Three typical examples will illustrate: a team goes out into the field to survey feet; it is composed of the leader who is bringing to bear new ideas in electronic technique for the testing of shoe fitting, an individual experienced in foot measurement, a last

modeller and a physiotherapist. The results collected in the survey are investigated in the laboratories by mathematical statisticians, then last models are made to incorporate the statistical results, ranges of shoes made and then taken out into the field in a statistical fitting trial. A second illustration is afforded by a wear trial of shoe components. Physicists and chemists have collected the appropriate laboratory information about the materials to be tested, which are then built into shoes and put out for systematic wear trials in accordance with a proper plan designed by the statisticians for the necessary cross-linkages and tests of significance. This type of work is essential to the development of laboratory quality-appraisement methods. A third illustration may be taken from the productivity investigations; a team going into a shoe factory for this work is composed of a shoe factory technician who acts as leader, a production methods engineer, junior observers, and often a statistician–economist.

As a final word it may be said that in addition to the work at Satra House the Association finances a fellowship at University College, London, where a research fellow possessing medical qualifications works full time on problems of the foot, and the influence of shoes on its structure and function.

H. BRADLEY

ONTARIO RESEARCH FOUNDATION

ANNUAL REPORT

THE annual report for 1948 of the Director of Research of the Ontario Research Foundation*, after referring to the increased accommodation now available and to the strengthening of the staff by graduates of British universities who have recently gone to Canada, expresses concern at the absence of a floating supply of capable research workers in Canada and at the diminishing income from investments which, with rising costs over the past ten years, has limited both the number of senior staff capable of directing applied research and also the number of young graduates which the Foundation could engage, as well as the amount of basic research it could initiate and support. The greatest problem of the Foundation to-day is to restore to their earlier proportions these three aspects of its activity. Satisfactory progress has been made in the projects in parasitology, wood chemistry, physiography and climatology, wire-rope research and ferrous metallurgy undertaken with the co-operation of the Advisory Committees of the Research Council of Ontario; with the Industrial Advisory Committee of the same Council efforts have been made to stimulate group research in that Province, but without success, and the conclusion was reached that group research cannot be developed on the basis of the existing trade associations.

In the field of biochemistry, with a fellowship on linseed oil, partly supported by the National Research Council, research has further elucidated the structure of *iso*linoleic acid formed during the hydrogenation of linseed oil. Under other fellowships, careful studies have been made of the constitution of pharmaceuticals possessing antihistaminic properties, and of the effects of small concentrations of metals on the keeping qualities of vegetable oils. In the Department of Chemistry, attention was given to a single-stage process for the production of washable wall-paper, and the flow and printing characteristics of wall-paper coatings; and investigations on the commercial possibilities of sulphite liquor and the manufacture and applications of sodium carboxymethylcellulose continued. With the termination of investigations on the development of synthetic gum from Canadian raw materials, attention is being directed to the chemistry and utilization of white birch, the essential oils contained in the leaves, cones and twigs of twelve Ontario species, and the production of tannin from waste sulphite liquor. Two other projects supported by grants from the National Research Council have been concerned with plastic dentures from acrylic resins and with the polymerization of styrene–isoprene, butadiene–isoprene and butadiene–styrene systems; this second project has now been terminated.

In the Department of Engineering and Metallurgy, fellowships in operation relate to malleable electrolytic nickel, the theoretical and applied aspects of the use of lithium atmospheres in the carbonization of steel, the controllable factors affecting the resistance of steel balls to abrasion, the behaviour of binary alloys of titanium and other metals at high temperatures and a study of methods to relieve the existing shortage of steel scrap in Canada. The Mathematical Statistics Unit undertook studies on sequential sampling from finite batches, the confidence limits for hypergeometric distribution, and methods for estimating biological populations. Work in the Department of Parasitology has been concerned with the conditions of climate and weather which determine the total population of black flies in any season and their activity to man, bird and beast. Helminthological work has related to the maintenance of a host-parasite catalogue for the vertebrate animals of Ontario, collection of material for a study of the pathological lesions caused by worm parasites and experimental studies on the toxic and allergic manifestations caused by the body fluid of *Ascaris lumbricoides*, a worm parasite of the pig, and on the immunological relations between the ascarid worms of pigs, man, cattle, horses and skunks. In the Physiography Department, the evaporation experiment in Toronto was continued for a second season, and a co-operative irrigation experiment on young pine trees was started at the Ontario Reforestation Station.

There was no extension of the work of the Textiles Department, but the existing projects on quality control, on nylon and on wool problems were continued or enlarged. During the year the Industrial Research Services Department made 790 visits to plants or offices and has received requests for assistance from more than two thousand firms or individuals, and of these, seven hundred have used the service more than once. The success of this work—nine hundred inquiries have involved laboratory work—has had repercussions on the scientific laboratories, and the director has already recommended the provision of suitably equipped laboratories to handle inquiries from the food industries and in the field of applied physics. A list of papers published during the year is appended, together with the balance sheet and accounts and a list of professional and technical staff.

* Annual Report of Ontario Research Foundation, 1948. Pp. 26. (Toronto: Ontario Research Foundation, 1949.)