

ability of using resistance strain-gauges for measuring the vibrations of turbine blades under service conditions. There is a vibration testing laboratory in which, at present, static vibration tests are being carried out on models of steam turbine-blading in order to determine their resonant modes.

Photo-elastic analysis is applied to the investigation of stresses in pressure vessels, steam headers and fuel element cans.

Measurements of particle size and other studies related to powders and dusts are carried out on materials such as fly ash and pulverized coal.

The work of the Division of Chemistry and Biology ranges from a group of researches on fuel cells to studies in marine and fresh-water ecology. The effects of power station operation on the ecology of marine and fresh-water organisms is a matter of increasing importance.

The analysis of flue gases, an important and traditional chemical measurement in thermal power stations, is now carried out by gas chromatography. Research is in progress on apparatus for effecting remote control of combustion by means of a computer handling automatically data provided by a gas chromatograph. The efficiency of different absorbent materials in extracting sulphur dioxide from flue gases is a related topic.

Internal corrosion in boilers is studied with the help of an experimental boiler, and work is also in progress on the fouling and corrosive effects of combustion products on the fire-side of boilers.

Although the scope of the Materials Division is in no way restricted to metals, the main effort is at present directed to metallurgical research, especially to performance at elevated temperatures in particular applications. Mechanical testing, involving high-temperature tensile, creep and fatigue tests, thus plays an important part. The effects of welding, stress relieving and other fabricating procedures are also studied. Much attention is devoted to austenitic steels used at temperatures above 550° C. Materials which may be of importance in high-temperature equipment for the direct generation of electricity are

also the subject of investigation. Magneto-hydrodynamic generation, for example, will require insulating duct materials and conducting electrode material capable of withstanding temperatures in excess of 2,000° C for long periods. Silicon carbide has potential importance in high-temperature rectification, and apparatus has been designed to grow single crystals of this material epitaxially.

The supporting technical services of the Laboratories were illustrated by an interesting series of exhibits in the central workshops and drawing offices. Machine and assembly work, profile cutting, welding, chassis wiring, armature rewinding and cable jointing were in progress.

Design and workshop drawings for mechanical and electrical equipment were shown in the drawing offices together with illustrative work.

In the photographic section examples included high-speed still and ciné photography, photomicrography and colour photography.

The opening of these new Laboratories serves further to demonstrate the will of the supply industry to maintain and to improve its position by its ability to absorb and to apply new scientific knowledge and, in addition, to make its own contribution to fundamental advances. It is important to realize that the Central Electricity Research Laboratories constitute only one of a group of major research projects operated by the Central Electricity Generating Board. The Berkley Nuclear Laboratories are exclusively concerned with the special problems of nuclear power stations. A further research station, designed to undertake large-scale experiments in the field of generation and transmission, is being established at Marchwood on Southampton Water. In addition, each of the five regions of the Generating Board has a regional research organization devoted primarily to the solution of problems in the operation of power stations and of the Grid System in its own area. All these organizations, with a research staff totalling some 1,300, contribute to the research effort devoted to improving electricity supply.

J. GREIG

ROTHAMSTED EXPERIMENTAL STATION

REPORT FOR 1961

THE diversity of modern agricultural research is well exemplified in the annual report of the Rothamsted Experimental Station for 1961*. It covers the activities of the twelve research departments at Rothamsted, the farms there and at Woburn, the experimental stations at Woburn and at Dunholme and the work of the Soil Survey of England and Wales. Of the 296 pages in the report, more than 200 describe investigations actually in progress or just completed and a short review can scarcely do justice to the year's work of this, Britain's premier, agricultural research station.

Of topical interest and importance are the results of a ley-arable rotation experiment designed to assess the effect of the ley on soil fertility and the performance of subsequent crops. Since Stapledon so forcefully and successfully advocated the use of the ley before

and during the Second World War, it has been widely assumed that the benefits were automatic. Farm practice has often seemed to confirm this, but in fact critical experimental data, either for or against, are singularly few. For several years the Rothamsted experiment has been running in two parts, one on a field ploughed from old pasture and the other on land long under an arable rotation. The test crops were wheat, potatoes and barley, and the results, apart from a few interesting but minor variations, show that no definite improvement in yield has followed the ley that cannot, just as easily, be secured by the use of fertilizer in a purely arable rotation. Ley-arable rotations do not lend themselves very readily to really critical experimental control, and the danger of generalization from one set of experiments is obvious, but the work is valuable just because of this. We may well have overstated the case of the ley as a universal panacea and a well-based re-appraisal will certainly do no harm.

* Lawes Agricultural Trust. Rothamsted Experimental Station, Harpenden. Report for 1961. Pp. 296. (Harpenden, Herts: Rothamsted Experimental Station, 1962.) 15s.

Another classical concept in agriculture is the role of farm-yard manure in maintaining and increasing soil fertility. Again, farm experience would leave little doubt as to its value, but the reasons for this may not be those we have always assumed. The Chemistry Department has continued its experiments to show just how farm-yard manure affects crops, and an interesting and essential development is a study of liquid manures resulting from the intensive methods of stock management now being practised. Liquids from piggeries were analysed and shown to be rich sources of N.P.K., for example 1,000 gal. of one sample supplied 90 lb. nitrogen, 70 lb. phosphorus pentoxide and 70 lb. potassium monoxide. The disposal of large volumes of such material is a major practical problem on farms to-day, but its value is such that new methods of conservation and disposal must be devised so that this potentially rich source of plant nutrients may be used to full advantage.

The work being carried out by the Botany Department is concerned with matters ultimately related to crop yields. The physiology and distribution of weed seeds and the competitive activities of the resultant plants have been studied, while the long-term investigations on the physiology of growth and yield continue to provide useful information. One of the major advances in post-war agriculture has been the development of spring varieties of wheat almost the equal in performance to their winter counterparts. An analysis of the photosynthetic processes in varieties of wheat suggested that the greater efficiency of grain production in Capelle and Jufy I was attributable to increased photosynthesis in the ears of these varieties

as compared with Squareheads Master or Atle. Studies such as these provide the plant breeder with vital information that may well open up new lines of cereal development. Two new records are reported from the Plant Pathology Department. For the first time blight lesions have been found on a potato tuber without any sign of the disease appearing above ground on the parent or neighbouring plants. This adds to our scanty knowledge of what actually happens in the earliest stages in the development of this well-known disease. For the first time, too, *Pithomyces chartarum*, the mould responsible for facial eczema in sheep in New Zealand, has been found in several areas in the Home Counties. In New Zealand the disease is a serious one, the organism being produced in enormous quantities, especially on mown grass. The discovery of the fungus in Britain is a direct, if unwelcome, consequence of the utilization of aerial spore-trapping procedures developed at Rothamsted.

Rothamsted does not restrict its services to agriculture in Great Britain. Overseas problems are studied: the report lists the advisory visits, and secondments abroad, of members of staff. Of interest in this connexion is the work of the Biochemistry Department in devising and establishing leaf protein production units for use overseas. At home the Dunholme Field Station is now closed, and the sugar beet work will be carried on from a new base, Broom's Barn. It is to be hoped that Dr. R. Hull and his staff will there find increased scope to continue the excellent and valuable work that has meant so much to the beet industry in Britain.

J. H. WESTERN

CALCIUM REQUIREMENTS BY HUMAN BEINGS

MORE people fail to receive the amounts of calcium normally recommended as necessary than of any other nutrient; yet there is little convincing evidence of any disabilities specifically attributable to deficiency of calcium. In many parts of the world only limited opportunities exist for the intake of the recommended amounts, and this has led to suggestions for the widespread fortification of foods with calcium. This can be both expensive and technically difficult, and in the long run—according to a joint Food and Agriculture Organization/World Health Organization Expert Group on Calcium Requirements—nutritional improvements ought to be met through a better basic diet and not only by supplementation of this kind (*WHO Chronicle*, 16, No. 7, July, 1962).

No supplementary calcium should be given without first obtaining reliable information about the calcium needs of different population groups. Contrary to what has sometimes been believed, the development of rickets and dental caries is largely independent of the intake of calcium. In adult life no clear signs of calcium deficiency in men have ever been described in any part of the world. In women, among populations where the intake of calcium is habitually low, repeated pregnancies and long lactations may be associated in some regions with the development of osteomalacia, though this is not solely due to the low intake of calcium. In some parts of northern India, for example, osteomalacia is frequent with higher intakes of calcium, whereas it is rare in southern India, where the intake is lower. It would seem that

if the intake of vitamin D is satisfactory, osteomalacia is not a problem even for women whose intake of calcium is low—though a low intake of calcium may be an exacerbating factor. The common osteoporosis of old age is thought by some investigators to be associated with calcium deficiency but by others to be more related to endocrine disturbances. Nor does present knowledge support the view that a low intake of calcium is necessarily prejudicial to normal physiological function, although certain pathological conditions, mostly rare, do exist in which increased intake of calcium may be advisable. Among conditions in which calcium deficiency may play a part are the osteopathy of premature infants; various syndromes involving subnormal calcium absorption, such as steatorrhœa and certain forms of chronic renal damage with or without calciuria, and senile osteoporosis.

In making recommendations on calcium needs, the Expert Group defined the minimum requirement of calcium for adults as the smallest amount that will maintain health and keep the body in calcium balance when the diet is otherwise adequate and the vitamin D status is satisfactory. The available evidence, however, does not permit the specification of any particular figures for minimum adult requirements; for disorders often attributed to calcium deficiency have not been observed in large populations habitually subsisting on intakes of only 300–400 mg a day, and it has been shown that adults can successfully adapt themselves to intakes of 400–500 mg and even less.