

during the year, and the Control Mechanisms and Electronics Division is continuing with the development of the full-scale ACE, which is estimated to be at least four times faster than DEUCE or the pilot model. The electronic simulator of the Division continues to be used for the study of automatic control and other problems involving the solution of differential equations, and the work of the Electronics Section has included the development of a stable power-supply unit for the Electricity Division, the provision of acoustic equipment in the lecture hall and the construction of part of a special, highly accurate, camera-shutter system for the Admiralty. In the Electricity Division the caesium atomic beam standard of frequency and time interval has been completed, and an experiment similar to the Michelson-Morley 'ether-drift' experiment, but using short radio-waves within a cavity resonator instead of light waves, has been carried out. The result obtained supports the principle that there is no drift effect.

The diverse activities of the Light Division have had many industrial applications. The Merton-N.P.L. processes for the preparation of diffraction gratings are gradually being taken over by commercial organizations. New methods of producing plastic replica gratings have made it possible to prepare accurate gratings up to several feet in length, and work on the application of diffraction gratings to linear measurements included a thorough theoretical investigation into the theory of moiré fringe formation, which has now been published. The Division has also developed ultrasonic equipment for cutting slots in thick glass plate and for drilling tungsten carbide, and two new types of thin-film bolometers are being developed to meet the industrial need for sensitive non-selective detectors of infra-red radiation.

The tracer laboratory in the Metallurgy Division came into full operation during the year, and useful results were obtained from the application of a variety of experimental techniques to the problem of fatigue in metals. On behalf of the Fire Research and Building Research Stations, an investigation was made of the loss of stress, under the action of fire, in steel reinforcing bars used in pre-stressed concrete. Good progress is reported by the Metrology Division in the development of two impersonal methods of measuring line standards of length. Improved light sources for optical interference measurements of length have been explored, and interferometry is being applied to a re-determination of the velocity of microwaves to one part in a million. A new determination of the absolute value of gravity is being undertaken in order to improve the accuracy with which the pressure exerted by a barometric column is known in absolute units and also to improve the realization of the ampere. The experiment will consist of throwing a ball up vertically and timing its motion as it first rises and then falls over a measured distance. The new primary barometer is reported to be almost complete.

In the Physics Division significant progress has been made on the extension of measurements of thermal conductivity to low temperatures, on greater accuracy in mercury thermometry, on the international comparisons of the standard apparatus for determining the röntgen for X-rays up to 300 kV., and on a new method for the precise measurement of high pressures with the piston balance. The film dosage service which has been operated by the Radiology Section of the Division for many years is

to be transferred to the Radiological Protection Service, operated jointly by the Ministry of Health and the Medical Research Council. A scheme for the provision of liquid helium, prepared in the Laboratory's Collins liquefier, to various universities and laboratories was started during the year, but the demand so far has been rather limited. The Mathematics Division has been able to devote more time to research problems and less to the demands of outside organizations. DEUCE was used for the solution of hyperbolic and parabolic differential equations, nuclear scattering problems and the calculation of molecular integrals, and a new method employing Chebyshev series was developed. The Ship Division was mainly responsible for organizing the symposium on cavitation, and its research work has largely been concerned with ship/model comparison and the study of frictional resistance. A very useful method of controlling manoeuvrable models by radio in the Division's tank was developed.

The report concludes with details of the various tests carried out by the Test House of the Laboratory.

## THE 'GREEN POOL' AND HORTICULTURAL MARKETING

THE growing interest in the possibility of European agricultural integration reveals more and more clearly the lack of comparative information needed to answer many of the fundamental questions raised by the cases for and against this 'Green Pool'. In no part of European agriculture and its associated industries is that statement more true than in the marketing of fruit and vegetables. Not only are there extremely few studies of horticultural marketing in individual countries, but comparative data for the non-Communist European countries have until now been virtually non-existent in a readily accessible form.

The situation has been greatly improved by the publication of "The Marketing of Fruit and Vegetables in Europe" by the Organization for European Economic Co-operation\*. This report contains much descriptive and statistical information relating to the economic organization of horticultural marketing in thirteen countries. Subject to any subsequent revisions, it will remain a standard reference for many years. Some of the information is superficial, but there is much that will help satisfy the needs of administrators and research workers concerned either with technical or economic aspects of the industry in countries other than their own, especially if inter-country studies are planned. The degree of detail is of necessity often restricted, but a wealth of pointers and introduction to topics of considerable interest is provided. For example, there are useful references to the French Government's powers to plan the development of the main wholesale markets and of its Fonds de garantie et d'orientation de la production agricole, an agency aiming in time to reduce price fluctuations of fruits and vegetables. A more sophisticated arrangement already operating to achieve the same objective is the Dutch price insurance scheme, and the report contains one of the few existing descriptions of it in English.

\* Marketing of Fruit and Vegetables in Europe. (Project No. 249 C.) Pp. 328. (Paris: European Productivity Agency of the Organization for European Economic Co-operation; London: H.M. Stationery Office, 1956.) 600 francs; 12s.; 2 dollars.

The completeness of the statistical information varies considerably for different countries and crops; it covers production, the timing of harvest periods, levels of consumption, imports, exports and distribution costs. For the economist this last set of information is the most interesting, but it is tantalizingly deficient. The Italian data seem the most detailed and accurate, whereas for most other countries the evidence shows the inadequacy of our present knowledge. Yet the intra-European comparison of marketing costs is a most fruitful point of departure for any study of the relative efficiencies of the various systems described.

A real deficiency of the report is its tendency to reflect excessively official thinking. For example, the Dutch price insurance scheme has one serious defect, namely, that prices to growers are maintained by restricting total sales in the fresh fruit and vegetable markets and by destroying surplus supplies in some instances. This is not made clear. Similarly, the discussion on grading programmes in the British section contains no reference to the extremely successful private grading schemes that have been introduced by individuals or by groups of growers, particularly in apple and pear production. Yet the private development of fruit and vegetable grading has achieved more than has the public sponsoring of it, and there are good theoretical reasons for expecting such a result in Britain. Another important omission is the lack of reference to the 1950 Census of Distribution in the discussion of British costs of marketing. Therefore, the high value of the present survey must not hide the fact that it is not a complete guide to the many and diversified facets of horticultural marketing in various parts of Europe.

GEORGE ALLEN

## THE FUSED SILICA INDUSTRY IN BRITAIN

THE fascinating story of the birth and progress during the past fifty years of the fused silica industry in Great Britain is told in an illustrated volume produced by the Thermal Syndicate, Ltd., in commemoration of the jubilee of incorporation of the company\*. The three parts into which the volume is divided deal respectively with the history of the Thermal Syndicate, Ltd., during 1906-17; the Silica Syndicate, Ltd., a parallel organization, during the same period; and the post-1917 company, the Thermal Syndicate, Ltd., formed from the amalgamation of the two earlier syndicates.

In 1902, Mr. (later Sir) Richard Paget, a London barrister, when on a visit to the home of the first Lord Rayleigh, was shown a small quartz tube which Lord Rayleigh's son was building-up by fusing together little pieces of quartz crystal, a process evolved by Mr. W. A. Shenstone, a master at Clifton College. His interest thus aroused in fused silica, Paget together with Lord Armstrong, and C. Merz and W. McLennan who were on the look-out at the time for new uses for electric power, formed a private syndicate in order to carry out research, with Dr. F. Bottomley in charge, on the electric fusion of silica (sand). Bottomley, in 1903, successfully produced his remarkable 'Ostrich Egg', and the manufacture

of fused silica tubes and ware for sale was begun. Finally, on August 3, 1906, the Thermal Syndicate, Ltd., was incorporated as a private company with an authorized capital of £10,000.

The Syndicate's factory consisted of a small wooden building and office space was provided by Merz and McLennan in their Wallsend Laboratories. A quite separate but parallel organization, the Silica Syndicate, Ltd., was formed also in 1906. This had the backing of Johnson, Matthey and Co., Ltd., and was to exploit the manufacture of the 'transparent' form of fused silica made from quartz (rock crystal) as distinct from silica material made from sand. The growth and development of this syndicate were particularly associated with the mercury vapour lamp and the silica radio transmitting valve. In 1917 the two syndicates were merged into the Thermal Syndicate, Ltd., and with the transfer of the Silica Syndicate's plant and key workpeople to Wallsend in 1920 the whole of the fused silica industry of Britain became concentrated in one place.

The basic Thermal Syndicate patents expired in 1921 and several factories for manufacturing fused silica were established in Europe, but, in general, the British processes were copied. 'Optical quality' transparent fused quartz for use as lenses and prisms was first developed during the 1930's, and in addition at this time the company decided to enter the field of high-temperature refractories in materials other than silica, alumina and magnesia being chosen as the first to be developed. The demand for both the new products and fused silica equipment in the chemical and electrical industries and other projects during the Second World War rose to new heights, and since the War new output records have been achieved.

New agencies have been created, notably in Australia and Belgium, and the Thermal Syndicate, Ltd., has now many accredited agents in all parts of the world, including the subsidiary Thermal American Fused Quartz Company in the United States of America. It is interesting to note that the connexion with Johnson, Matthey and Co. is still maintained, with G. C. H. Matthey as the present chairman of directors of the Thermal Syndicate, Ltd.

## MESOANALYSIS IN METEOROLOGY

RESEARCH Paper No. 39 of the United States Weather Bureau, entitled "Mesoanalysis: an Important Scale in the Analysis of Weather" (pp. 84. Washington, D.C.: Government Printing Office, 1956; 50 cents), by Tetsuya Fujita, H. Newstein and M. Tepper, describes an investigation into the detailed structure of a depression in the Middle West of the United States using observations at stations spaced at distances of the order of 25-30 miles. This is termed analysis on the meso-scale as distinct from the macro-scale of the ordinary weather map, on which the spacing of stations is at distances of hundreds of miles, and the micro-scale, on which the spacing is less than ten miles. This work, carried out by the Severe Local Storms Research Unit of the Weather Bureau, is stated to have shown that local weather is more closely connected with features on the meso-scale than those of the macro-scale. 195 stations in ten States centred on Kansas were used, 67 of them regular reporting stations and 128 subsidiary stations, partly voluntary observing ones.

\* The Story of the Thermal Syndicate, Limited. Pp. xiv+48+13 plates. (Wallsend: The Thermal Syndicate, Limited, 1956.)