Observations were also made on a thyratron tube 884, which was stated by the manufacturers to contain argon at a pressure of about 0.3 mm. As in the noise experiments of Cobine and Gallagher⁵ with the same type of tube, the magnetic field was applied transversely to the current. The receiver was connected between the plate and cathode or, through condensers, between the plate and grid. With a current of 4.4 m.amp. the curves of noise-intensity are shown in Fig. 2. These reveal two separate noise-bands. This again demonstrates the characteristic feature of the theory, even though now the ionized medium is far from uniform, and the electron temperature and collision frequency are not negligible. Our curves agree with the published results of Cobine and Gallagher up to their limiting frequency of 7 Mc./s.

In the experiments with helium and a magnetic field of about 300 gauss, the available noise-power output measured between a long external metal sleeve and the cathode was found to vary between 3×10^{-11} and 10^{-16} watts (c./s.)⁻¹ as the frequency ranged from 0.6 to 15 Mc./s. These outputs correspond to power fluxes through the surface of the beam of between 3×10^{-13} and 10^{-18} watts (c./s.)⁻¹ cm.⁻². Equipment was not available for measuring the power outputs in the higher bands. It is of interest, however, to mention that in a private communication concerning observations at 100 Mc./s. made on noise from the great sunspot area which crossed the sun's meridian between April 5 and 7, 1947, Dr. J. L. Pawsey estimated that the mean power emitted normally was of the order of 10^{-17} watts (c./s.)⁻¹ cm.⁻².

Thus our experiments both demonstrate the value of the electro-magneto-ionic theory in predicting new phenomena and also supply a rough model of a sunspot emitter of enhanced solar noise⁶. The additional prediction that this noise is elliptically polarized remains to be tested. A detailed account of this work will be published in due course.

We owe thanks to Drs. E. G. Bowen and J. L. Pawsey for the loan of receivers, and to Messrs. J. Middlehurst and A. J. Mortlock for their assistance with the experiments.

¹ Bailey, V. A., *Nature*, **161**, 599 (1948).

² Bailey, V. A., *J. Roy. Soc. N.S.W.*, **82**, 107 (1948).

³ Bailey, V. A., *Aust. J. Sci. Res.*, (A), **1**, 351 (1948).

⁴ Roberts, J. A., thesis for the degree of M.Sc.; chapters 7 and 9 (University of Sydney, 1949).

⁵ Cobine and Gallagher, *J. App. Phys.*, **18**, 110 (1947).

⁶ Bailey, V. A., *Phys. Rev.*, May 15, 1950.

BRITISH CAST IRON RESEARCH ASSOCIATION

By DR. J. G. PEARCE, O.B.E.
Director of the Association

A BRIEF account was given early in 1947 (*Nature*, **159**, 49; 1947) of the origin and growth of the British Cast Iron Research Association. From mid-1948, as a result of arrangements made with the Joint Iron Council, the two thousand or so iron-foundries in the United Kingdom may become members of the Association simply by signing a form, and, as previously, other interested firms may also join. This arrangement has nearly doubled the annual income, now of the order of £80,000, and two recent extensions have been made.

On May 5, Lord Bilsland opened the new Scottish laboratories on the Blantyre Industrial Estate, Glasgow. The Association maintained a Scottish regional laboratory in Falkirk for more than twenty years, and this has been transferred to a building on the new site, where 5,000 sq. ft. of covered space has been provided. Scotland has roughly one-tenth of the population and a similar proportion of the number of iron-foundries of the United Kingdom, but it has about one-eighth of the tonnage output, the bulk of which is used outside Scotland. The new laboratory is regarded essentially as a part of the Development Department of the Association, concerned with industrial applications, and is equipped for chemical, metallographic and mechanical testing, and sand testing, with auxiliary accommodation and a machine shop. The place of regional laboratories in the Association's final scheme is a matter of considerable interest to the Council. The French counterpart of the Association, the Centre Technique des Industries de la Fonderie in Paris, which has evolved since the War, has established no less than nine regional laboratories, in addition to its central headquarters laboratories and experimental foundries.

On July 5, the president of the Association, Mr. P. H. Wilson, opened some extensions at the Association's headquarters at Alvechurch, Birmingham, consisting principally of new accommodation for the machine and instrument shop and mechanical testing laboratory. The total covered area at Alvechurch is now 20,000 sq. ft., with a total staff of about eighty, and the ultimate development of the Association may require a total staff of about double this figure. A brief account of the organisation and work was given in the reference previously quoted. The staffs of the Research and Development Departments, in addition to their own provisions, can call on the services of a group of laboratories and departments. In addition to the new extensions, these include laboratories for spectrographic work, gases, metallography, chemical analysis, and the testing of sands and refractories. Some new equipment has been added and the total assets of the Association now approach a value of £100,000.

The Physical Metallurgy Laboratory contains platinum-wound furnaces for cooling-curve determinations. It is equipped, as are many of the other laboratories, with Kent potentiometric recorders, and with the Tinsley vernier potentiometer and Tinsley high-speed recorder. In the Metallographic Laboratory, the Vickers projection microscope can be used for vertical illumination, dark-field illumination, the examination of structures under polarized light, and for macro-examination. A wide range of objectives includes a mono-bromo-naphthalene immersion objective, used for high resolution in conjunction with the mercury arc. The Chemical Research Section includes a Uvispek spectro-photometer, and apparatus for the electrolytic isolation of phases in cast iron, a polarograph and absorptiometers. Phase-change study has been facilitated by dilatometers arranged for operation in inert atmospheres and fitted with programme controllers. The Sand Testing Laboratories contain a complete set of equipment for milling, mechanical grading, mechanical testing, in addition to the Association's own apparatus for the determination of evolved gases in core sands and for determining stress-strain curves of sand specimens at normal and elevated temperatures. The Spectrographic Laboratory has a large quartz prism spectrograph, complete with microphotometer

and comparator. The Gases Laboratory is mainly concerned with the determination of oxygen, hydrogen and nitrogen in molten metal, and vacuum fusion apparatus is used, comprising a vacuum system attached to a 30-kVA. valve-oscillator type high-frequency furnace. Bone and Wheeler and Orsat apparatus for gas analysis are available. The Mechanical Testing Laboratory is equipped with a variety of machines for testing ordinary mechanical properties—tensile, transverse, compression, fatigue, impact, hardness, damping—including a 50-ton Avery single ram-type machine for determining mechanical properties at both high and low temperatures. Five types of extensometer are used, including one for elevated temperature tests. The experimental foundry is equipped to provide any of the molten metals within the Association's field and for their subsequent treatment, and immersion pyrometers and temperature recorders are used. The machine and instrument shop has a wide range of modern machine tools, such as are needed not only for the preparation of all forms of test samples, but also for the construction of apparatus made by the Association itself, including, for example, a machine for simulating cavitation erosion in propellers by a Venturi nozzle and a jet impact machine for measuring cavitation erosion; apparatus for annealing in controlled gaseous atmospheres; a 20-way static strain-gauge bridge with calibration beam, and apparatus for thermal conductivity, thermal shock and electrical resistivity. Considerable use is made of electronic control methods.

One of the most recent extensions of activity has been the setting up of a small operational research team to which two of three appointments have been made, for the examination of foundry efficiency. The Association is also considerably interested in problems arising from working conditions in foundries, a solution of which is required, for example, to implement the 1947 report of the Joint Advisory Committee on Conditions in Iron Foundries.

In addition to papers presented by the staff to scientific and technical institutions, reports are issued in the Association's *Journal of Research and Development*, which has now been made generally available. Thirty-three reports, running to 445 pages, have appeared in the six issues published since mid-1949.

MUSK AND THE MUSK DEER

THE musk deer (*Moschus moschus*) has been divided by modern systematists into five sub-species. The sub-species of the Himalaya region has perhaps not suffered so much at the hands of man as have the other sub-species, and is stated to be still fairly common in parts of Kashmir. But as Colin Matheson (*J. Soc. Pres. Fauna Emp.*, 41; March 1950) has recently stated, all are and have been subject to severe persecution. To-day the musk deer is found in many areas in China and also in forested parts of Manchuria, Korea and Sakhalin Island; thence its range extends into the Amur region through Siberia as far as the Altai and to the West Mongolian Border. It is also found in Tibet and southwards as far as the Himalayas in northern India.

Male and female are much alike; neither carries antlers; but the male is armed with two abnormally long teeth (the canines) in the upper jaw, which is used in fights with rivals. On the abdomen the male carries the so-called musk-pod, into which a gland

secretes the musk, generally described as of the colour and consistency of 'moist gingerbread' and which appears to serve for attracting the female.

This musk-pod has unfortunately proved to be a great incentive to the destruction of the animal, musk being in constant demand as raw material in the perfume industry. Like other animal perfume materials, musk is a powerful fixative for plant perfumes, and in addition its scent is so intense that in many finished perfumes it is not subordinate to other odours but is one of the predominant constituents.

The animals are caught by snaring or shooting, which results in the death of many young deer as well as females which have no musk-pods. As a result the musk deer now appears to be on the road to extinction over much of its range. In 1925 the quantity of musk exported from China and Eastern Tibet was stated to amount to about 27,000 Chinese ounces per annum, valued at £100,000. The number of animals killed annually in China and Tibet at that time was estimated to be between 10,000 and 15,000.

So valuable was musk in the perfume industry that attempts were made to prepare artificial musk, the first commercial success being achieved by Albert Baur. The present-day musk xylon is widely used in shampoo powder perfumes but has its greatest application in soap perfumery, as it is stated to give a tablet of soap an indefinable sweetness unobtainable with other substances. Another artificial is musk ketone, stated to be the most widely used among continental perfumers. The third musk, ambrette, is the most frequently used in England. These artificial musks resemble natural musks in odour to a greater or lesser degree, but are quite different from it in their chemical composition. True musk owes its odour to a small amount of one of the ketones, known as muscone. In 1926 muscone was isolated from musk, and since then a number of synthetic products have been prepared which, although similar in chemical structure to natural musk, do not occur in Nature.

Although the use of artificial and synthetic musks has increased during the past twenty years, there is, however, still a big demand for natural musks, and the future of the musk deer is causing considerable disquiet to animal lovers. T. H. HAWKINS

MUSHROOM RESEARCH ASSOCIATION

REPORT FOR 1946-48

THE Mushroom Research Association, Ltd., represents a well-directed effort on the part of mushroom growers in Great Britain to obtain new knowledge for their own particular industry. A research laboratory was established at Yaxley, Peterborough, in 1946¹, and the first report, covering the years 1946-48, is now available, following the provision of financial assistance from the Ministry of Agriculture in 1948.

Dr. R. L. Edwards, director of the Station, describes a wealth of detailed experiment leading to the specification for a successful 'synthetic' compost. This is, of course, necessary because very little horse manure is now available. The 'MRA' compost is made from 315 lb. wheat straw with the addition, at first stacking, of 42 lb. dried blood, 2 lb. of sulphate of potash, 7 lb. ground chalk and 5 lb. gypsum. At the fourth turn