in Europe, which is defined as 1 Kg./cm.^{2}; it is 73·555 cm. of mercury for the standard value of gravity. For physics, however, it is agreed that the standard atmosphere should be 76 cm. of mercury at 0° C. and with $g = 980{\cdot}665$ cm./sec.^{2}. It is proposed that only the last should be accepted as the meaning of 'atmosphere'.

(iii) For work on vibrations it is often convenient to use not the frequency itself, but this quantity multiplied by 2π. Various names have been proposed for this, but none has gained any very wide acceptance. It is proposed that the most suitable name is 'radian frequency', which brings out the contrast to 'cyclic frequency'.

(iv) There have been various words adopted from the German without translation, and this is a clumsy practice. One was 'Nullpunktsenergie', for which the translation 'zero-point energy' has gradually grown up. This is an ugly word; but it expresses the idea correctly and has already been widely accepted. Another is 'Bremsstrahlung', for which no translation has been found. The German name is bad itself, because the connexion with braking is very remote, and it is an awkward word for an English mouth. It is not easy to think of a name that would give a really significant description of the effect, and it is suggested that 'brake-radiation' would be no worse a misdescription than the German word.

(v) The English practice has hitherto tended to be to use the symbol 'log' for both natural and common logarithms, and when there is danger of confusion to put a subscript e or 10. The practice of denoting the Naperian logarithm by 'ln' has much to commend it, and then 'log' will signify only the common logarithm. The subscript would then be mainly used only when the base is neither e nor 10, though it is always possible in case of doubt to retain it for the common logarithm.

(vi) The word 'super-sonic' is sometimes used in two entirely different senses, one for motions faster than the speed of sound, and the other for acoustic vibrations of pitch too high to be audible. It is suggested that it should only be used in the first sense, and that the word 'ultra-sonic'—on the analogy of ultra-violet—should be always used for high-pitched vibrations.

3/6

RESEARCH LABORATORIES OF THE GENERAL ELECTRIC COMPANY

THE Research Laboratories of The General Electric Co., Ltd., entertained at Wembley more than three thousand guests, including men of science and members of other research organisations and industrial concerns, at a conversazione held on June 21–23.

These Laboratories, a pioneer industrial research organisation, were founded in 1916 when the late Sir Clifford Paterson (then a principal assistant at the National Physical Laboratory) undertook the formation of a research department for the lamp works of the Company. By 1923, when the Laboratories built at Wembley were formally opened by Lord Robert Cecil and Sir J. J. Thomson, so many requests for collaboration had been received from other sections of the Company that the original plans had already been extended and the scope of the work considerably increased. The Laboratories now cover a floor area of 200,000 square feet and employ nearly 1,400 personnel, of whom more than 500 are scientific and experimental staff. The scope of the organisation becomes apparent when it is realized that each works and technical department in The General Electric Co. requiring scientific advice is represented by a group of workers in the Laboratories.

There are some thirty-four such units in addition to service groups of analytical chemists, metallurgists, X-ray workers, spectroscopists and others, the services of which are generally available throughout the organisation. The predominant note in the work of all these groups is the giving of scientific service to industry, with two important departures—the fostering of fundamental research which may give new knowledge of ultimate use in industry, and the solution of practical production problems associated with the manufacture of new products of the Company.

No event comparable to this conversazione had been held at the Laboratories since their inception, and it was expected that much of the work carried out there might be almost unknown to a large number of the invited guests. In their speeches of welcome, Sir Harry Railing, chairman and joint managing director of the Company, and Mr. O. W. Humphreys, manager of the Research Laboratories, emphasized their desire that the achievements of the Laboratories should be made known to as wide an audience as possible, both among men of science and the lay public. In order to give visitors a clear picture of the everyday work of the Laboratories, the number of special exhibits was kept to a minimum, and, as far as possible, work was proceeding normally. The fullest freedom of discussion between guests and staff was encouraged in order to achieve the true spirit of a conversazione.

Many of the activities in the field of lighting and illumination were on view. High-pressure mercury-vapour lamps, ranging from 125 watts to 25 kW. rating, were shown and their construction described. Fundamental research is carried out on the properties of the discharge itself, and a very highly loaded flash-discharge lamp is being used to study the behaviour of extremely high current discharges. The latter has application for photographing particle tracks in a Wilson cloud chamber. Recent improvements in the colour-rendering properties and the increased luminous efficiencies of mercury-vapour lamps have extended their applications, both for street lighting and for illuminating motion-picture and television studios. Complementary work on carbon arc lamps also attracted attention.

The qualitative visual assessment of the colour and colour rendering of fluorescent discharge lamps was demonstrated, some of the newest fluorescent materials being shown. The colour appearance of some objects, particularly foodstuffs, is often dependent on the illumination used, and experiments in which their appearance is assessed by a panel of observers were shown in progress. The design and testing of street-lighting lanterns and of fittings for interior lighting were also demonstrated

Samples from each batch of lamps manufactured by the Company are tested for length of life and luminous performance. The racks for the routine testing of tungsten filament, tubular fluorescent, high-pressure mercury vapour, neon and sodium lamps were on view. Photo-electric photometers are used for making accurate routine measurements of

the luminous efficiency of these lamps, initially and throughout life. A spherical integrating-photometer, 12 ft. in diameter, has recently been built and is used for measurements on tubular fluorescent lamps up to 10 ft. in length, as well as large lighting fittings.

Of the large number of projects in the field of telecommunications in hand at the Laboratories, a few deserve particular mention. Concerning pulse-modulation, demonstrations of an experimental 28-channel pulse-system were in progress. The signals can be compressed at the transmitter and expanded at the receiver, thus considerably improving the signal-to-noise ratio in this type of communication. Apparatus for generating very short pulses, of the order of 0·01 μsec. duration, was on view.

A system, using the frequency bands 70–72·8 and 85–87·5 Mc./s., has been developed to provide a long-distance six-channel multiplex circuit using radio links. This system uses wide-band frequency modulation. Intermediate stations, spaced about every fifty miles, may use a simple combination of terminal-type transmitters and receivers or may incorporate a special type of non-demodulating radio-repeater.

In order to cover the greater area required in fixed-mobile communication, as, for example, in systems used for police cars, a very high frequency modulated system has been developed. Instead of using a single transmitter, several remote transmitters are used and their transmitting frequencies synchronized. This synchronization is obtained by radiating signals of multiplied and divided frequency to the satellite stations, where they are divided and multiplied and re-radiated. The talk-back signals from the cars are received at either master or satellite stations, the whole system being arranged to operate without the attendance of operators other than the message dispatchers.

A wide selection of cathode-ray tubes, valves and components was displayed. Intensive research on secondary emission is carried out, and valves employing one or two stages of secondary emission, in use as wide bandwidth amplifiers, were shown. Visitors also saw high back-voltage germanium point-contact rectifiers, based on the old 'cat's-whisker' principle. The current-voltage characteristic of such a germanium rectifier was displayed on an oscillograph screen and compared with that of a low back-voltage silicon type.

An item of exceptional interest was the new germanium triode amplifier and oscillator. This device consists of two point-contacts mounted close together and in contact with a piece of germanium material which forms the third electrode. The necessity for manipulative skill in its manufacture has been greatly reduced in a new type which can be made quickly and efficiently by accurate machining only. This triode operates with a negative voltage of the order of 20 volts on the anode and a small positive voltage on the grid, no heater being necessary.

All valves, germanium crystals and Geiger–Müller counters manufactured by the Company undergo the same rigorous life- and performance-tests as lamps, and visitors were able to see the apparatus with which these are carried out.

The alloys of which valve-cathode-filaments are made must lie within close composition specifications, and the technique of powder metallurgy, used in their manufacture, was demonstrated. This technique is also used for making 'G.E.C. Heavy Alloy', which is composed of tungsten, nickel and copper and has a density of about 17 gm. per c.c. 'Heavy Alloy' is therefore particularly suitable for making screens against harmful radiations and for radium containers, the purpose for which it was originally developed. Another major use is in the aircraft industry, for balancing ailerons, rudders and elevators and in crankshaft balance weights for aero engines.

The new method, developed in the Laboratories, for welding aluminium and its alloys without the application of heat has recently aroused much interest. The main factors ensuring the satisfactory use of this cold-welding process are the preparation of the surface to be welded and the design of the tools used. Examples of the many possible types of structures and joints were shown, and practical demonstrations given.

The high precision necessary in the manufacture of magnetrons was demonstrated by two machines which carry out the grooving and slotting respectively. The former machine automatically cuts the strap grooves in magnetron anode blocks, without leaving any burr in the holes or slots. The slotting machine cuts the radial slots, which connect the central bore with the planetary holes, to a minimum width of 0·004 inch.

Development work on diamond dies for drawing the very fine wires used in lamps and valves is carried out at the Laboratories, and visitors were shown experimental work on the various methods used for piercing holes of correct profile through diamond.

Sapphire crystals, for use as gramophone needles, and for jewel bearings in instruments, are synthesized, either in the form of 'boules' or long rods. The automatically controlled furnaces, in which fine alumina powder is converted into the required crystalline form, were shown.

A large number of demonstrations connected with the manufacture and working of glass was given. General glass-blowing and hand bulb-blowing was in progress, while equipments for measuring the creep of refractory materials, the devitrification temperature of glass and the low-temperature viscosity of glass aroused considerable interest.

This brief summary cannot adequately cover the varied activities of the Laboratories as shown to its guests. The motive underlying the occasion is best expressed in the words of Mr. Leslie Gamage, the vice-chairman and joint managing director of the Company. When addressing visitors from the Press on the second day of the conversazione, he said: "We want you to feel that we are always ready to try to give you the information you may need, and to answer any questions you may have. Only if those who carry out research are in the closest possible touch with those who will ultimately benefit from that work can we achieve our aims and can our efforts reach full fruition."

OBITUARIES

Mrs. R. H. A. Plimmer

Violet Geraldine Sheffield, whose death occurred on July 4, became the wife of R. H. A. Plimmer before her academic career was far advanced. She had one son and three daughters, and she applied her scientific training and knowledge to the rearing of them in a thoroughly wholesome and healthy