

## SCIENCE NOTES AND NEWS

### Lady Tata Memorial Trust

The Trustees of the Lady Tata Memorial Trust announce on the death anniversary of Lady Meherbai Dorabji Tata, 18th June 1959, the awards of scholarships and grants for the year 1959-60.

International awards of varying amounts (totalling £5,065) for research in diseases of the blood with special reference to Leucaemias are made to: Dr. M. Simonsen (Denmark), Dr. M. Bessis (France), Dr. G. Klein (Sweden), Mr. P. A. Pillai (Switzerland), Dr. J. Ponten (Sweden), Dr. (Miss) B. M. Braganca (India), Dr. J. Hastrup (Denmark), Dr. E. Kelemen (Hungary), Dr. A. E. Stuart (Scotland).

Indian Scholarships of Rs. 250/- per month each for one year for scientific investigations having a bearing on the alleviation of human suffering from disease are awarded to: Miss M. H. Gandhi (Bombay), Mr. P. Suryanarayana Murthy (Bangalore), Mr. N. L. Tikotkar (Bombay), Dr. (Miss) M. R. Bakhtiary, (Bombay), Miss M. D. Menon (Cochin), Dr. R. K. Panja (Calcutta), Mr. G. N. Parvate (Bombay).

### Raptakos Medical Research Fellowships

The Raptakos Medical Research Board will consider applications for the award of Fellowships, which commences from January 1960, for research work on medical and allied subjects in recognised institutions situated in the Union of India.

The awards normally consist of Rs. 3,000 per year for a Fellowship and Rs. 750 per year towards special equipments or chemicals approved by the Board.

Applications in the prescribed form, which may be obtained from the Secretary-Treasurer, Raptakos Medical Research Board, Dr. Annie Besant Road, Worli, Bombay-18, should be submitted before 30th September 1959.

### Award of Research Degree

The University of London has awarded the Degree of Doctor of Science (D.Sc.) in Zoology to Dr. Satya Narayan Singh, Department of Zoology, Osmania University, Hyderabad, A.P.

The Utkal University, Cuttack, has awarded the Ph.D. Degree in Physics to Shri Kulamani Samal for his thesis on "Ultrasonic Propagation and Intensity in Liquid Media".

The Andhra University, Waltair, has awarded the D.Sc. Degree in Applied Physics to Shri V. Venkateswara Rao for his thesis entitled "Study of the Rotational Structure of  $C_{12} + \text{Bands}$ "; D.Sc., Degree in Chemistry to Srimati G. Somidevamma for her thesis entitled "Analytical Chemistry of Iron III"; D.Sc. Degree in Geophysics to Shri V. V. R. Varadachari for his thesis entitled "Some Meteorological and Oceanographic Studies of the Coastal Waters"; and the D.S.c. Degree in Geophysics to Shri C. Balaramamurty for his thesis entitled "Studies on Physical Oceanography of the Western Bay of Bengal".

### Symposium on Scientific Instruments

A symposium on scientific instruments is to be held at the Technical Development Establishment (Instruments), Dehra Dun, under the auspices of the Research and Development Organisation of the Ministry of Defence, on November 4, 5 and 6, 1959.

The deliberations are expected to cover all the aspects of instrument industry in India—its present potentialities and future expansion, design and development, inspection and gauging, testing and certification, rationalisation and standardisation, storage, preservation and tropicalisation, etc.

Papers intended for presentation at the symposium should be addressed to the Convener, Dr. C. S. Rao, Superintendent of Development, T.D.E. (Instruments), Dehra Dun, so as to reach him on or before July 31, 1959.

### Indian Standards Convention 1959

The fifth Indian Standards Convention is scheduled to meet at Hyderabad from 27th December 1959 to 2nd January 1960. The previous four Conventions were held at Calcutta, Bombay, Madras and New Delhi respectively. The Convention will divide into nine technical sessions, covering subjects like the Implementation of Indian Standards; Standardisation and productivity; Design for industrial experimentation; Tropicalisation of electrical and electronic equipment; Latest techniques in chemical analysis; Documentation; Certification for small industries products, etc.

### Dr. Irving Langmuir's Complete Works

The complete works of the late Dr. Irving Langmuir are being collected for publication.

in a set of six volumes, according to an announcement by Pergamon Press Inc. of London and New York. Dr. Langmuir, who was associated with the General Electric Research Laboratory from 1909 until his death in 1957, was the first American industrial scientist to receive a Nobel Prize. Among the scientific areas in which Dr. Langmuir made outstanding contributions were: high vacuum, solid surfaces, heat conduction, thermionic and gaseous discharges, monolayers, structure of liquids, aerosols and nucleation. A group of 29 leading scientists from throughout the world will serve as members of the Editorial Advisory Board for the Langmuir books. It is hoped that publication of the first of the volumes can be made before the end of 1959.

#### Five Thousand Revolutions around the Earth

On May 8, at 1-54 a.m., Moscow time, Sputnik III completed its five thousandth revolution around the earth. Sputnik III has now been in flight for 358 days and has covered 228,200,000 km. The first earth satellite in the world, which was launched on October 4, 1957, survived for 94 days, performing 1,440 revolutions around the globe. Sputnik II survived for 163 days performing 2,370 revolutions. When Sputnik III was put in orbit, its maximum distance from the earth (apogee) was 1,880 km., and its period of revolution, 105.95 minutes.

By the time of its five thousandth revolution, the satellite's period diminished to 99.51 minutes, and the apogee of its orbit, to 1,275 km.

To this day both the solar batteries and the chemical sources of power in Sputnik III continue to operate, which makes it possible to monitor it even when it is not illuminated by the sun and is in the earth's shadow. For the results of all the measurements and investigations conducted by means of the satellite to be fixed with respect to place and time, it is necessary to have an exact knowledge of the parameters of its orbit. With this purpose a special automatic measurement centre was set up in the Soviet Union, equipped with the most up-to-date radio instruments. The work of this centre has made it possible to determine the elements of the satellite's orbit with a precision far superior to the precision with which the parameters of the first two satellites' motion were measured.

Since the time of its launching it has been monitored by more than 80 optical stations and observatories throughout the territory of the

Soviet Union and over 110 similar stations abroad.

In the period that Sputnik III has been in existence, the co-ordinating-computing centre has issued more than 29,000 ephemerides (statements of computed places) to Soviet monitoring stations, and upwards of 23,000 to foreign centres. In the same period about 92,500 radio messages of the Sputnik's transmitter "Mayak", 10,900 optical observations of the Sputnik by Soviet monitoring stations and observatories and 3,820 observations sent in by foreign stations have been received and treated. Numerous photographic and high precision kine-theodolite observations of the Sputnik have proved highly valuable.—*USSR News*.

#### A New Ionospheric Phenomenon

Sporadic radio-frequency radiations which are observed sometimes are associated usually with auroral activities. However, as similar effects could be caused by man-made noise or interference, it becomes difficult to establish in an unambiguous way the origin of such unusual radiations. With the object of studying these radiations the Experimental Station at Jodrell Bank initiated a special programme of work, the experimental arrangement of which consists of five separate total-power receivers, all on slightly different frequencies near 80 Mc./s., with the corresponding aerials suitably directed to monitor continuously various sectors of the sky. Two of these aerials are directed at 30° elevation above the northern horizon, one is directed at the zenith, one at 30° above the southern horizon, and the last is rotated continuously so that Cassiopeia 23N5A is always in the beam. Three of the equipments are in Jodrell Bank and the other two are on individual sites 1 km. away. This experimental arrangement allows easy discrimination against localized interference at any one site, and against distant narrow-band radio-signals.

Normal records from the equipments show the expected diurnal variation due to the galactic background and, in addition, the southern aerial records, radio bursts and noise storms of solar origin. However, during the period January 3-10, 1959, there occurred about ten instances of isolated increases in the noise-level recorded by some of the instruments, together with *simultaneous decreases* in the others. A further very striking isolated event occurred on March 25, 1959, at about 1400 U.T. The records of this event are as follows: (i) The two northerly channels

showed *very strong enhancements*, about 200-400%, in the signal level; (ii) The apparatus continuously following Cassiopeia, which at the time had its aerial toward the north-west, showed a *strong enhancement* of about 50%; (iii) The zenith instrument recorded a marked decrease of at least 50%. The Jodrell Bank magnetometer revealed a change in the horizontal component, about 50  $\gamma$ , coinciding with these observations.

This event, with its *simultaneous radio-frequency emission and absorption* in different sectors, was more intense than any observed in the January 1959 series. The suggestion has been made that this phenomenon is caused by passage through the ionosphere of streams of charged particles of very high velocity presumably of solar origin. In the upper ionosphere such particles stimulate the generation of radio-frequency energy while at lower levels the result is a net absorption of the background signal. The absorption mechanism is rather well established, especially in polar regions, and may be attributed to the production of abnormally dense ionization in the lower ionosphere. However, very little is known of processes which can generate radio-frequency noise in our atmosphere. It is believed that the impact of charged particles, both of high velocity and high density, is consistent with the environment for production of Čerenkov-type radiation. Other processes are also being considered. It is significant that these isolated events seemed to be the precursors of a period of intense solar activity with associated terrestrial events such as magnetic storms and auroræ.—*Nature*, 183, No. 4669, 1178.

#### Argus Experiments. Artificial Creation of Electron Belt by High Altitude Atomic Bursts.

The underlying idea for the Argus experiments was due to Nicholas C. Christofilos, Physicist of the Lawrence Radiation Laboratories of the University of California. In October 1957 he called attention to the fascinating physical effects which might be expected to follow an atomic burst in the near-vacuum of outer space, high above the earth and its dense atmosphere. Of the various effects contemplated, the most interesting one promised to be the temporary trapping of high-energy electrons at high altitudes in the magnetic field of the earth. Following the burst there would be thrown off in all directions nuclei of intermediate atomic weight. Most of these

nuclei, as is well known, are radioactive and subsequently decay with the release of energetic electrons and  $\gamma$ -rays. Most of the decays occur within a few minutes. The fission fragments themselves are electrically charged and move at high velocity. Hence their paths in the near-vacuum conditions of outer space would be controlled, in the main, by the earth's magnetic field and would be helical ones around magnetic lines of force. The electrons resulting from their decay would likewise move in helical paths in the magnetic field. In accordance with the theory of such motion it could be expected that these high-energy electrons would be trapped in the outer reaches of the earth's magnetic field and would only slowly leak down into the atmosphere and be lost due to collisions with air molecules in the tenuous upper atmosphere. The trapping region would be in the form of a thin magnetic shell encircling the earth and bounded by lines of force. Trapping times ranging from minutes to weeks were estimated for electrons whose helical paths ranged as close to the solid earth as 100 to 2,000 miles, respectively.

As reported already [*Curr. Sci.*, 28 (4), 144] the atomic bursts occurred on August 27 and 30, 1958, in the early morning hours and on September 6, shortly after midnight. In order to produce an electron shell having quantitative significance, it was desirable to minimise the loss of electrons to the atmosphere, and calculations showed that this could best be done by placing the source of the shell between longitudes 0° and 30° W. This follows from the fact that the earth's magnetic axis is tilted and displaced with respect to its rotational axis, so that the edges of the shell would come closest to the surface at these longitudes. The approximate latitude was 45° S. The site of the tests was such as to place the artificially injected radiation shell in a region where the intensity of the natural radiation had a relative minimum.

The directness and clarity of the artificial injection tests have provided a sound basis for interpretation of the natural radiation trapped around the earth. It is likely that many important contributions will continue to arise from the great diversity of geophysical observations being conducted by other countries participating in the International Geophysical Year.—*From White House Reports on the Argus Experiments.*

#### Heart Faults by Recorder Device

"Inject into the arm and watch the ear" is, in short, the method in this new device for

recording faults in the human heart. An innocuous dye is injected into the patient's arm. It is carried around the blood-stream until it becomes so diluted that the dye concentration reaches a uniform low level. During dilution which lasts about 12 seconds dye concentration is continuously monitored. This is done by passing a beam of filtered light through the lobe of the patient's ear to a photo-electric cell. Variation in dye present in arterial blood causes changes in cell output. This voltage is fed to the recorder.

The high-speed recorder, which operates on the continuous balance potentiometer principle, is designed to register full-scale travel (one millivolt) in one second. A special amplifier provides sufficiently fast response.

The normal curve shows a sharp initial peak followed by rapidly decreasing secondary peaks, thus, recording a steep disappearance curve. In an abnormal condition, e.g., a hole in the septum, blood continuously circulates to the lungs and back without reaching the main circulation. In this case when dye is injected, only part of it is pumped out into the aorta, and the record shows a lower initial peak and the disappearance curve is shallower and longer.—*Electronics*: 32 (8), 74.

#### Powder Pattern Technique for Domain Structure of Crystals

A new method has been evolved by Bell Telephone Laboratories for delineating the domain structure at the surfaces of ferro-electric crystals. In this method colloidal suspensions of commercial spray-grade sulphur and red lead oxide, each suspended in hexane, are separately used for the delineation technique. Although the colloid as a whole is electrically neutral, individual particles acquire a diffuse, double-layer charge when brought in contact with the liquid, and when a few drops of the suspension are applied to the face of the crystal, under the influence of the "built-in" electric field, the colloidal particles are attracted either to the positive or the negative domains depending on the orientation of their dipole layers.

Thus using sulphur suspensions in hexane, the sulphur deposits on negatively charged domains. If after the hexane has completely evaporated, the second suspension of red lead oxide in hexane is applied, the lead oxide

deposits on the positively charged domains. With sulphur and red lead oxide the delineation is brightly coloured and the pattern shows great details.

A dispersion of a cross-linked polymer derived from polystyrene can also be used as the negatively charged colloid, in place of the lead oxide. This can be dyed any desired colour with an oil soluble dye. Hexane is used as the insulating dispersion medium because its low viscosity and low dielectric constant allow the charged particles to move freely toward the ferro-electric domains under maximum electrostatic attraction.

This new powder pattern technique has provided the first information available on the domain structure of a number of ferro-electric materials such as triglycine sulphate and guandinium gallium selenate hexahydrate. It has also confirmed the results of optical and etching methods of delineating domain structure in several crystals.

#### A New Method of Growing Germanium Crystals

Westinghouse Laboratories report a new technique for growing germanium crystals in the form of thin, uniform flat ribbons. To process conventional germanium ingots into useful form, they must be sliced into thin wafers, ground to the required thickness, further cut into small squares and finally polished. Only then is the germanium ready to be fashioned into finished transistors and other devices. In this processing nearly 80% of the material is thrown away as germanium 'sawdust'.

In the new method it is claimed that the material "grows" directly in the exact form in which this semiconducting substance is used for practical purposes in transistors and similar devices. The new method could radically improve existing methods of making transistors. One can visualise, for example, the process at work in a machine that continuously, automatically, and at high speed turns out finished transistors directly from an input of raw germanium and the two or three other materials required to put a transistor into final form.

The new method may lead to the development of outer-space electronic equipment a thousand times smaller and lighter than anything now in existence.

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