

SCIENCE NOTES AND NEWS

Award of Research Degree

Andhra University has awarded the D.Sc. Degree to Sri. E. Bhagiratha Rao and Sri. P. Venkata Rao for their theses entitled "Studies on Drifts and Travelling Disturbances in the Ionosphere" and "Analysis of Electrical Machinery" respectively.

Symposium on Pilot Plants

Under the auspices of the National Metallurgical Laboratory, Jamshedpur, a Symposium on "Pilot Plants in Metallurgical Research and Development" will be held early in February 1960. Technologists and Research Scientists in the field are expected to contribute papers for discussion and take part in the Symposium. For further particulars please write to Dr. T. Banerjee or Mr. R. M. Krishnan, NML, Jamshedpur.

Symposium on "Hydraulic Machines"

A Symposium on "Hydraulic Machines" will be held in the last week of October in the Civil and Hydraulic Engineering Section of the Indian Institute of Science, Bangalore, in connection with the Golden Jubilee Year Programme of the Institute. Those interested in participating in the Symposium may please contact the Convener of the Symposium on "Hydraulic Machines", Civil and Hydraulic Engineering Section, Indian Institute of Science, Bangalore-12, for further details.

Fast Neutron Reactor

The August issue of the *Atomic Energy* magazine reports that the USSR has fully brought into commission a 5,000 kw. fast neutron reactor, the "BR-5". The reactor permits the use of Uranium-238 and Thorium for electric power generation. This will make the building of industrial atomic power stations economically profitable.—*USSR News*, August 21, 1959.

Gas Sterilisation of Seeds to Combat Pests

A new method of combating agricultural pests by treating seeds with gaseous nitrogen dioxide and ethylene monoxide has been evolved by Russian scientists. Experiments have shown that the pre-sowing gas treatment of seeds destroys all organisms causing infectious plant diseases of microbic, virus and helminthic

origin. Even the most hardy spore micro-organisms perish completely. Gas sterilisation of seeds has no effect on their vitality. Maize grown out of sterilised seeds in experimental fields stood four metres high, and cotton had 25 to 27 bolls in every plant. There was no case of disease among experimental plants throughout the season.—*Soviet News*.

The Compton Current

The absorption of energetic X-rays and γ -rays by an insulator is due mainly to the Compton effect. It is also known that the Compton electrons are scattered preferentially in the forward direction. If, therefore, a unidirectional beam of X-ray or γ -ray photons falls on a slab of an insulator, there should be an electron current following the Compton effect. With present high-intensity radiation sources this Compton current can reach appreciable values and can be measured by suitable means. Incidentally, a measurement of the current can give information on the absorbed radiation dose.

In a recent paper (*Zeit. für Phys.*, 1959, 155, 479), B. Gross has discussed the theory of the Compton current and derived an approximate expression for its value based on some experimentally valid assumptions.

In the experiment to test the theory, a beam of γ -rays of 1.26 Mev. from a Co-60 source is made to fall on a sheet of plexiglas in contact with a lead cube which acts as the collector of the Compton electron flux and at the same time completely absorbs the γ -ray beam. Since plexiglas has a low atomic number it also minimizes backscattering. A potentiometer system using a vibrating reed electrometer as a detector is employed to measure the current. The result of the experiment is shown to confirm the theoretical conclusions.

International Panel on Heavy Water Reactors

At the Second United Nations Scientific Conference on the Peaceful Uses of Atomic Energy, held in Geneva in September 1958, there was a proposal for holding panel discussions for exchange of experience in some specialized fields related to the basic design of reactors. Considerable work on reactor design has been done independently in different countries. If the data obtained from this work were co-ordinated

and made generally available, a great deal of duplication of effort could be avoided. It was suggested that the IAEA (International Atomic Energy Agency) should take the initiative in arranging international co-operation in this field.

After examining the various aspects of reactor physics, the Agency decided to convene a panel to review, assess and correlate data on the physics of heavy water "lattices". For various reasons there is a widespread interest in the use of natural uranium as reactor fuel, and this has focussed attention in the design of heavy water moderated reactors. The term "lattice" refers to the pattern in which the fuel elements and the moderator are arranged in a reactor. The panel which met in Vienna from 31st August to 4th September 1959 was attended by leading scientists from different countries which have made significant progress in reactor physics and design. The publication of the results of the panel discussion will be a major contribution in reactor physics which will benefit all interested in the subject.

The Earth, Rockets and Meteors

Artificial satellites and rockets have become an important means of investigation of meteoric bodies in space. Particularly valuable data were obtained when they entered rather dense swarms of meteors. Each year our planet regularly meets certain streams of meteors, and at present the Earth is passing through the big Perseids meteoric stream, named after the Perseus constellation from which the cosmic particles seem to come. The existence of this stream, the largest known today, was known 1,200 years ago. It is scores of millions of kilometres wide and the total weight of the meteoric bodies it contains is about 500 million tons.

The Earth passed through the densest part of the stream on August 11-12. At this time the number of "falling stars" in the sky reached 50 to 60 an hour.

Sputnik III carries special apparatus to register the number of meteoric particles that strike its surface and their energy. With these apparatuses the density of meteoric matter in space surrounding the Earth has been determined. Calculations showed the average number of collisions was 0.1 to 0.15 per square metre per second. But at times, when the Sputnik passed through meteoric swarms, the number rose to several dozen and even hundreds.

A particularly important study of meteoric bodies was made by the cosmic rocket launched last January 2 that became a satellite of the sun. When the radio signals were deciphered and the calculations made, it was found that meteoric particles with a mass of about one-millionth of a gram strike the surface of the rocket once in several hours of flight.—(Article by V. Lutsky, through the courtesy of the USSR Embassy in India.)

Orientating Action of Polarised Light on Certain Dye Molecules

The following simple but remarkable phenomenon has been reported by A. Teitel, in *Die Naturwissenschaften*, 1957, Vol. 13, p. 370. A film of gelatine spread on a microscope slide and stained with a suitable dye, such as Congo Red, represents a surface which—when moist—is sensitive to polarised light. If the film is irradiated with white polarised light during the drying process, the irradiated spot exhibits a more or less permanent birefringence. Thus an invisible birefringent image of the light source or of a diapositive may in this manner be impressed on the surface, the image becoming visible only if the slide is viewed between crossed polaroids. As a detector of partially polarised light such a surface has an advantageous feature: in contrast to a usual analyser such as a nicol (which responds also to half of the unpolarised part of the incident light) the dye surface responds only to the polarised part, and hence may be useful for detecting feeble traces of polarisation.

The axes of birefringence of the irradiated spot lie along and perpendicular to the electric vector of the light, the latter (according to the explanation of Teitel) causing a mechanical orientation of the dye molecule. The observed sign of the birefringence is explicable only if the molecules tend to align themselves with their lengths perpendicular to the electric vector of the light, so that it must further be supposed that the light acts on certain active side radicals which lie perpendicular to the length of the molecule.

New Theory of the Expanding Universe

Lyttleton and Bondi have recently developed a new theory to explain the expansion of the universe. Basically, the theory rests on the hypothesis that the magnitude of the charge of the proton exceeds that of the electron by about 2 parts in 10^{18} . Such a difference would mean that the smoothed-out background material of the universe would have a volume

charge sufficient to produce an electrical repulsion giving the observed expansion rate. The galaxies and clusters of galaxies occur in the theory as condensations in ionized regions, and take part in the expansion because they form and continue to grow from the dispersing background material, which is maintained at constant density by continual creation of matter.

The theory has other consequences. For example, potential differences of the order of 10^{19} volts occur between ionized units (galaxies and clusters), and the charge-excess is driven off from them as protons with energy of this order. In this way the theory may give a reasonable explanation of how these ultra-high energy cosmic rays are produced.

The charge-excess required by the theory could equally well result from a slight excess in the number of protons over electrons everywhere, with their charges exactly equal and opposite. In either form of the hypothesis, creation of matter implies creation of charge, and the Maxwell equations accordingly require a minute amendment involving cosmical terms.

If the proton and electron charge do differ slightly, very small particles of matter would necessarily have non-vanishing electric charge. No experiments made to date would have disclosed the requisite small charge difference, but it is just possible that tests could be devised that would do so, and establish how closely the two charges do in fact approximate to equality in magnitude.—*Research*, June 1959, 12, 240.

Emission of He I, $\lambda 10830$ in Solar Flare

The presence of the infra-red helium line $\lambda 10830$, in the Fraunhofer spectrum was first reported in 1934 by H. D. and H. W. Babcock. It appears to have its origin entirely in the chromosphere, and outside the solar limb it is seen in emission.

The emission of this line on the solar disc has been reported only once before in 1939, when it was seen over a solar eruption of intensity 3 that occurred near the centre of the disc on December 7, 1938.

It is well known that the D3 line of He I, $\lambda 5876$, appears in emission in solar flares. Since $\lambda 10830$ (2^3S-2^3P) and $\lambda 5876$ (2^3P-3^3D) belong to the same triplet series and share a

common level one would expect the former also to be seen in emission in flares. This has been observed and reported by E. Tandberg-Hanssen, W. Curtis and K. Watson in a recent issue of the *Astrophysical Journal* (1959, 129, 238).

On August 26, 1958, there was an outstanding solar flare rated at 3+, beginning 0005 U.T., maximum 0027, end 0124. The above authors report that observations of this flare were made at Climax Observatory and good spectra of the infra-red region were secured. The spectra show the $\lambda 10830$ line both in emission and absorption in a flaring region. The paper contains a first analysis of the emission profile with a calculation of the intensity ratio of the two components. The He I, $\lambda 10830$ is really a triplet with its bright two red components very close together at 10830.25 and 10830.34 (not resolved in the spectra) and the blue component at 10829.04 very weak.

The Vertebrate Ear

Even in its most highly evolved state the vertebrate ear is a dual—or even triple—purpose sense organ. It incorporates receptors for angular acceleration (semicircular canals), for linear acceleration including gravitational stimuli (otolith organs) and for oscillatory changes in linear acceleration such as vibration in general and sound in particular (otolith organs, cochlea). The vertebrate ear appears to be a phylogenetic novelty derived by modification from the lateral-line organs of early fish-like vertebrates and not from the statocyst of the invertebrates. Thus, the ear is probably not the comparative-anatomical homologue of the invertebrate statocyst. There is no doubt, however, that the two organs are functionally analogous.—Prof. O. Lowenstein at the Symposium on *The Ear Under Water*.

ERRATUM

Dr. N. K. Iyengar, the author of the article entitled "Applications of Electrophoresis Technique in Forensic Science," published in *Curr. Sci.*, 1959, 28, 316-19, writes that the following reference has been inadvertently omitted in his article. The same will read thus: (13) Goldbaum, R. and Williams, M. A., *J. Forensic Sciences*, 1959, 4, 144-52.