
SCIENCE NOTES AND NEWS

Award of Research Degrees

The Cambridge University has recently awarded the degree of Sc.D. to Dr. M. L. Roonwal, Director, Zoological Survey of India, Calcutta, for his distinguished work in the field of Zoology, and particularly on the population dynamics and evolution of locusts, and on the biology and ecology of mammals and termites.

The University of Bombay has awarded the Ph.D. degree in Physics to Shri H. G. Devare of Tata Institute of Fundamental Research, for his thesis entitled "Beta-ray spectrometer and other studies of the decay-schemes of some radioactive nuclei".

The Osmania University has awarded the Ph.D. degree in Botany to Shri K. Venkatanarasimha Rao for his thesis entitled "Growth Conditions of *Oocystis Marssonii* Lemm and its Nitrogen Metabolism with special reference to Molybdenum".

Andhra University has awarded the Ph.D. degree in Chemistry to Shri V. Ramachandra Rao for his thesis entitled "Studies on Rare Earth — β diketones".

International Geological Congress

The Twenty-Second Session of the International Geological Congress will be held in India in 1964. The sessional Meetings will take place in New Delhi from the 14th to 22nd of December, 1964, with headquarters in the Vigyan Bhawan Building, Maulana Azad Road, New Delhi.

The membership fee for the Twenty-Second Session has been fixed at Rs. 100 for attending members and Rs. 75 for non-attending members.

The following subjects, each corresponding to a section of the Congress, have been selected for discussion: 1. Geology of petroleum; 2. Geological results of applied geophysics; 3. Cretaceous-Tertiary boundary including volcanic activity; 4. Rock deformation and tectonics; 5. Genetic problems of ores; 6. Minerals and genesis of pegmatites; 7. Plateau basalts; 8. Tertiary mammals; 9. Gondwanas; 10. Archaean and Pre-Cambrian geology; 11. Himalayan and Alpine orogeny; 12. Isostasy; 13. Charnockites; 14. Laterites; 15. Sedimentary geology and sedimentation; 16. Other subjects.

A typewritten or printed abstract (not more than 200 words) of each paper to be presented at the Congress must be received by the Secretary-General before June 1, 1963, and the full text of the paper limited to 5,000 words before December 1, 1963.

Some thirty excursions to places of geological interest in India are being arranged both before and after the Session.

All communications, until further notice, should be addressed to the Secretary-General, XXII International Geological Congress, Geological Survey of India, 27 Chowringhee Road, Calcutta-13.

Symposium on "Fresh Water from the Sea"

The First European Symposium "Freshwater from the Sea" was held from May 31st to June 4th in Athens. This Symposium is the 39th Event of the European Federation of Chemical Engineering. Communications and discussions on the recent developments in obtaining freshwater from the sea were the aim of the Symposium. 385 persons from 26 countries participated in the Symposium.

In order to continue this work the European Federation of Chemical Engineering is examining the possibilities of constituting a working party on "Freshwater from the Sea" and of establishing a special Secretariat for this party in Athens.

The Conferences held at the Symposium "Freshwater from the Sea" will be published in the full wording and in the original language in Volume 47 of the *Dechema-Monographien* by the end of this year. For subscription of this volume kindly apply to the Dechema, Deutsche Gesellschaft für chemisches Apparatewesen, 6 Frankfurt (Main) 7, Postfach 7746.

International Measurement Conference (IMEKO)

The First and the Second International Measurement Conferences were held in 1958 and in 1961 in Budapest. The Permanent International Preparatory Committee of the IMEKO Conferences finished its 4-day session on the 2nd March, 1962 in Budapest. Its task was to adopt scientific principles and take the first organizational steps toward the Third IMEKO Conference to be held in 1964.

Thirty scientists and specialists from 16 countries, 13 of them officially representing technical societies, took part in the Session. The International Preparatory Committee accepted the British, Japanese, and Italian Societies as new members, by which the number of Member-Organizations rose to 13.

The Committee accepted the invitation of the Swedish Member Organization (The Royal Swedish Accademy of Engineering Sciences) to arrange the next International Measurement Conference in Stockholm in April 1964. It was agreed that IMEKO 1964 be organized jointly with the traditional Swedish I and M. Conference. It was decided that the scientific programme includes approximately 120 lectures from all important fields of measurement.

Fourth Seminar on Electrochemistry

It is proposed to hold the Fourth Seminar on Electrochemistry at the Central Electrochemical Research Institute, Karaikudi-3, S. Rly., Madras State (India), sometime during the last week of December 1962, the exact date to be November 1962.

Intending participants are requested to send three copies of abstracts of papers (not exceeding 300 words) to the Convener of the Seminar, Dr. H. V. K. Udupa, Assistant Director, Central Electrochemical Research Institute, Karaikudi-3, S. Rly., not later than 15th September 1962, and two copies of the full papers by the 15th November 1962.

Symposium on 'Recent Developments in Iron and Steel-Making'

A Symposium on "Recent Developments in Iron and Steel-making with Special Reference to Indian Conditions" has been jointly arranged by the Indian Institute of Metals, the National Metallurgical Laboratory and the Iron and Steel Institute, England, from February 4 to 8, 1963. The Symposium will be held at the National Metallurgical Laboratory, Jamshedpur.

Further particulars can be had from Dr. T. Banerjee, Dy. Director, National Metallurgical Laboratory, Jamshedpur-7, India.

An Extensible Model of the Electron

The concept of an electron of finite size is an old one, first proposed by Abraham and Lorentz. It is the most natural concept that makes the total energy of the coulomb field of the electron finite.

Recently new evidence has appeared for the finite size of the electron by the discovery of

the muon having properties so similar to the electron that it may be considered to be merely an electron in an excited state. If one works with a point-charge model of the electron, there is no place in the theory for the muon. However, if one supposes the electron to have a finite size, with no constraints fixing the size and shape, one can arrange that the variations of size and shape are stable oscillations about an equilibrium position, and then one can assume that the lowest excited state is the muon.

In a paper (*Proc. Roy. Soc.*, 1962, 268A, 56) P. A. M. Dirac proposes that the electron should be considered classically as a charged conducting surface, with a surface tension to prevent it from flying apart under the repulsive forces of the charge. Such an electron has a state of stable equilibrium with spherical symmetry, if disturbed, its shape and size oscillate. The equations of motion are deduced from an action principle and a Hamilton formalism is obtained. The energy of the first excited state with spherical symmetry is worked out according to the Bohr-Sommerfeld method of quantization, and is found to be 53 times the rest-energy of the electron. It is suggested that this first excited state may be considered as a muon. The present theory has no electron spin, so it cannot agree accurately with experiment.

New Method for Detecting Cosmic Rays

A new approach for recording cosmic-ray showers is suggested by the Soviet physicist Gurgen Askaryan, based on his finding that the electrons and positrons in these showers are absorbed at different rates by solid materials. This asymmetric absorption, he feels, will result in a net charge in the shower, the motion of which will produce radio signals detectable in the earth at depths great enough to shield out all competing radio-frequency noise. Askaryan suggests that recently-discovered underground strata in which radio-waves propagate would aid in detection of showers deep in the earth. —(*Nucleonics*, June, 1962.)

Shearing Interferometer to Test Aberrations of Microscope Objectives

Interferometric measurements of the aberrations of microscope objectives have been carried out so far mainly by means of a modified Twyman-Green interferometer. Such an arrangement has the advantage that it gives directly a picture of the wave front emerging from the microscope objective. Against this must be set the high cost of the apparatus, as

well as its complexity when it is desired to carry out off-axis tests as well as tests on the axis.

In a paper communicated to the *Optica Acta* (1962, Vol. 9, p. 159) P. Hariharan and D. Sen of the National Physical Laboratory of India, New Delhi, describe a new type of shearing interferometer devised by them, and its use for the measurement of aberrations. In this method, two images of the wave front under test which are of different size are made to interfere. When the centres of the two images coincide, this results effectively in shear along the radial direction. The interferogram obtained by this method bears a qualitative resemblance to the actual wave surface, and its exact quantitative interpretation is comparatively easy. The paper describes the application of this interferometer to the testing of microscope objectives. The results of on-axis and off-axis tests with some typical microscope objective are discussed. —(*Optica Acta*, 1962, 9, 159.)

Non-linear Interactions Point to Laser Advances

Availability of optical masers as an intense light source is spurring research into non-linear interactions at optical frequencies. At a meeting of the New England Section of the Optical Society of America, P. A. Miles of the Massachusetts Institute of Technology, reported on a neodymium glass optical maser with primary output of 1.06 microns and harmonic generation at 0.53 micron. At power level of only a few microwatts, little significance is seen for applications at this stage, but experimentation is expected to yield important information about non-linear processes in crystals. The theory of interaction between light waves in non-linear media predicts not only harmonic generators but mixers, modulators and demodulators, limiters and, in general, all the things which radio engineers have done at radio and microwave frequencies.

Satellite Communications

Intercontinental and worldwide satellite communications were discussed at a regional conference held recently in Seattle, U.S.A. Such systems are seen as operational within the next few years. Three families of satellite system will be needed: polar random, equatorial ring and synchronous systems. Synchronous system will employ 3 satellites, an equatorial ring 8 to 12, and a polar group 30 to 50.

Although there is not enough power available for high-quality TV broadcasts, it is expected

that worldwide TV will be possible in the 1970's. In the not distant future satellites will make important contributions in the following three areas of communications: (i) Long-haul, point-to-point links providing few circuits to remote areas of the world having light traffic loads. Transportable ground equipment would establish new circuits on short notice; (ii) Fixed, long-haul, point-to-point trunks providing many circuits between major traffic nodes, and (iii) Mobile communications between fixed points and mobile stations.

Most systems will employ satellites in high-altitude synchronous orbits, or in subsynchronous orbits.—(*Electronics*, June 8, 1962.)

Arsenic Content in Napoleon's Hair

A recent publication about the cause and mode of death of Napoleon has aroused scientific curiosity and some new techniques of modern physics are being used to throw light on the subject. Dr. Sten Forshufvud *et al* of the Department of Forensic Medicine, University of Glasgow, reported in *Nature* (1961, 192, 103), that the illness Napoleon suffered during most of his captivity on St. Helena was actually the syndrome of chronic arsenic intoxication with inter-current attacks of acute arsenic poisoning. Among the facts adduced in support of this theory was the finding that a few short hairs known to have been taken from Napoleon's head, presumably the day after his death on May 5, 1821, showed a total arsenic content of 10.38 p.p.m., a value approximately thirteen times higher than the normal mean arsenic content of about 0.8 p.p.m.

Interesting results of further investigations on the distribution of arsenic in Napoleon's hair have been reported by the same authors in a recent issue of *Nature* (1962, 194, 725). This time the experiments have been conducted on a 13-cm. long hair placed at the disposal of the Forensic Medicine Laboratory by M. Clifford Frey, a textile manufacturer of Munchwilen, Switzerland, from a family heirloom, an authentic souvenir of Napoleon.

The hair was irradiated for 24 hr. by a flux of 10^{12} thermal neutrons/cm.²/sec. in a nuclear reactor at the Atomic Energy Research Establishment, Harwell. On return from the pile the hair was fixed by means of self-adhesive tape to a piece of graph paper and then cut into 5-mm. lengths suitable for counting by an end-window Geiger counter.

The average daily growth of hair on the scalp is about 0.35 mm. On this basis a 13-cm.

hair should register a record of the exposures to appreciable amounts of arsenic for a period of a little less than a year.

From the results it is evident that for a period of about 4 months Napoleon was exposed to abnormally large amounts of a substance which was transformed into a radioactive isotope by the irradiation. This isotope has been confirmed to be arsenic. These distribution studies show that Napoleon was exposed to arsenic intermittently. The periodicity of the exposures agrees remarkably well with what can be deduced about the course of Napoleon's disease from the accounts of the eyewitnesses. No estimate, however, of the size of the arsenic dosage given to Napoleon can be made on the basis of these results.—(Nature, 1962, 194, 725.)

Two Russian Spaceships in Orbit—Vostok III and Vostok IV

A great achievement in satellite launching and recovery was accomplished by Russia when she put into very nearly the same orbit two manned spaceships, Vostok III and Vostok IV, within 24 hours of each other, and, after four and three days of successful orbiting round the earth, effected their safe landing at a predetermined spot within six minutes of each other.

Vostok III was put into orbit at 11.30 a.m. Moscow Time, on August 11, 1962. It was piloted by cosmonaut Major Andrian Grigoryevich Nikolayev. Its period of revolution was 88.3 minutes, the perigee 183 kilometers, and the apogee 251 kilometers. The inclination of the orbit to the plane of the equator was $64^{\circ} 59'$.

Vostok IV, piloted by Lt.-Col. Pavel Popovich, was set in orbit at 11.02 a.m. Moscow Time, on August 12, 1962, when Vostok III was in its 16th revolution round the earth. The initial period of revolution of Vostok IV was 88.5 minutes. Its perigee was 180 kilometers and apogee 254 kilometers. The orbital plane was inclined at 65° to the equator.

The twin cosmonauts landed precisely in the planned area within 6 minutes of each other on August 15, 1962. Nikolayev landed at 09.55 hrs (06.55 G.M.T.), and Popovich landed at 10.01 hrs. (07.01 G.M.T.).

Vostok III orbited the earth more than 64 times in 95 hours covering more than

2,600,000 km. (1,615,520 miles), while Vostok IV made more than 48 orbits in 71 hours covering about two million kilometers.

The task of setting two spaceships on the orbits close to each other was to obtain experimental data on the possibility of establishing contacts between two ships, co-ordinating the actions of the pilot cosmonauts, and to check the influence of identical conditions of space flight on human organism.

Major Nikolayev reported that while controlling his ship he watched through the porthole the flight of Vostok IV.

During flight both cosmonauts released themselves several times from the suspension system, got off their seats and "performed the operations and experiments prescribed by the programme".

The images of the cosmonauts transmitted by television cameras installed in Vostok III and Vostok IV were repeatedly relayed by central television and intervision. The cosmonauts transmitted on frequencies 20.006 and 143.625 Mc. A transmitter signal operating on the frequency 19.995 Mc. was also installed in the spaceships.

Tables of Spectral-Line Intensities

The National Bureau of Standards Monograph No. 32, by W. F. Meggers, C. H. Corliss and B. F. Scribner, published in two parts, constitutes the most extensive set of tables of spectral-line intensities available in book form.

Part I gives the intensity, character, wavelength, spectrum and energy level of 39,000 lines between 2,000 and 9,000 Angstroms. The intensities were observed in a series of copper arcs, each containing 0.1 atomic percent of one of 70 elements. The data are presented in separate tables for each of the 70 elements. Part II presents the 39,000 observed lines in the order of their wavelengths.

Although the NBS "Tables of Spectral-line Intensities" are limited to 39,000 lines of 70 chemical elements, all intensities are calibrated, many wavelengths are improved, and energy levels for about 25,000 lines are included.

Part I is priced at \$ 4.00, and Part II at \$ 3.00. The monograph can be had from the U.S. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

549-62. Printed at The Bangalore Press, Bangalore City, by T. K. Balakrishnan, Superintendent, and Published by S. R. S. Sastry, for the Current Science Association, Bangalore.

All material intended for publication and books for review should be addressed to the Editor, *Current Science*, Raman Research Institute, Bangalore-6.

Business correspondence, remittances, subscriptions, advertisements, exchange journals, etc., should be addressed to the Manager, Current Science Association, Bangalore-6.

Subscription Rates : India : Rs. 12-00. Foreign : Rs. 16-00 ; £ 1-4-0 ; \$ 4.00.