SCIENCE NOTES AND NEWS

Award of Research Degrees

The Utkal University, Cuttack, has awarded the Ph.D. degree in Chemistry to Shri Rabindra Kumar Nanda for his thesis entitled "Studies on Metal Chelates in Solution".

The Maharaja Sayajirao University of Baroda has awarded the Ph.D. degree in Botany to Shri Gunvantrai Maneklal Oza for his thesis entitled "Flora of Pavagadh".

Nagpur University has awarded the Ph.D. degree in chemistry to Sri. G. Bagavant for his thesis "Studies in reaction mechanisms: Studies in the mechanism of the Dieckmann cyclisation of Diethyl β-ethoxycarbonylpimelate and certain isomerisations related to it; and Synthetic approach to aldosterone analogues", and the Ph.D. degree in physics to Sri. P. L. Khare for his thesis "Investigations on the compressibilities of electrolytes by ultrasonics".

Raptakos Medical Research Board Fellowships for 1963

The Raptakos Medical Research Board will consider applications for the award of Fellowships for research work on medical and allied subjects in recognized 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 contingencies approved by the Board. Applicants should have an M.B., B.S. or M.Sc. degree or its equivalent or not less than two years' experience in research work after B.Sc.

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 reach before September 30, 1962.

Regional Research Laboratory—Cotton Linters Utilization

The Regional Research Laboratory (Council of Scientific and Industrial Research), Hyderabad, will be holding a 'RESEARCH AND INDUSTRY MEET' on 6th and 7th September, 1962, to discuss the various aspects of the effective utilization of indigenous cotton linters and their upgrading. This 'RESEARCH AND INDUSTRY MEET' will provide a forum for a free exchange of views on the subject between research scientists, technologists and producers and consumers of cotton linters. Further details may be had from the Director, Regional Research Laboratory, Hyderabad-9.

Eighth Congress on Theoretical and Applied Mechanics

The Eighth Congress on Theoretical and Applied Mechanics will be held from December 23 to 26, 1962 at M.B.M. Engineering College, Jodhpur, Rajasthan.

Research papers on any of the undermentioned subjects should reach the Secretary with three copies of Abstracts by October 1, 1962: (1) Elasticity, Plasticity and Rheology; (2) Fluid Mechanics (Aerodynamics and Hydrodynamics); (3) Mechanics of Solids (Ballistics, Vibration, Friction and Lubrication); (4) Statistical Mechanics, Thermodynamics and Heat Transfer; (5) Mathematics of Physics and Statistics; (6) Experimental Techniques; (7) Computation Methods.

Any other information may be obtained from the Secretary, Dr. B. R. Seth, Indian Institute of Technology, Kharagpur, India.

New International Journals. (Published by Pergamon Press, Ltd., Headington Hill Hall, Oxford, England). Annual Subscription for each Journal: Institutions £ 10 ($ 30.00.), Individuals £ 3.10 ($ 10.00).

Topology

This is an International Journal of Mathematics founded by Professor J. H. C. Whitehead, Oxford. The Editorial Board consists of Dr. M. F. Atiyah (Oxford), Prof. R. Bott (Harvard), Prof. F. Hirzebruch (Bonn), Dr. I. M. James (Oxford) and Prof. R. Thom (Strasbourg).

Topology will appear four times yearly and will publish papers in topology and related subjects. The contents of the first issue of the Journal, Vol. I, January to March 1962, are as follows: Limits and spectral sequences by Samuel Eilenburg and John C. Moore: Analytic cycles on complex manifolds by M. F. Atiyah and F. Hirzebruch; Uber die Derivierten des inversen und des direkten Limes einer Modulfamilie by Georg Nobeling; Vector fields on spheres by J. F. Adams; H-Spaces with few cells by J. F. Adams; and Remarks on the Plancherel and Pontryagin theorems by J. H. Williamson.

Electronics Reliability and Microminiaturization

The object of this Journal is to bring together under one cover the various publications concerning reliability and microminiaturization which at present would appear in journals not specializing in these subjects. The Editor-in-Chief is G. W. A. Dummer (England). The first volume January to March 1962 of 100 pages contains 9 articles, four of which are on electronics reliability, and four on microminiaturization. Special mention may be made of the introductory paper on Reliability of Electronic Equipment by N. Griffin, and the review of British work on microminiaturization techniques by G. W. A. Dummer. W. Adcock and J. S. Walker have contributed an article on Semiconductor networks.

The Institute of Physics and the Physical Society, London

1. *Conference on Ultra-High Energy Nuclear Physics.*—The Institute of Physics and the Physical Society is to sponsor a Conference on Nuclear interactions at ultra-high energies, to be held in the H. H. Wills Physical Laboratory, University of Bristol, on 7th and 8th January, 1963.

The main theme of the Conference will be strong interactions at energies above 100 GeV. observed in the cosmic radiation. The following are some of the main topics to be covered : Observations of high-energy cosmic ray collisions with emulsions and ionization calorimeters ; The muon component and its interrelation with the characteristics of high energy collisions ; Extensive air showers, and their propagation through the atmosphere ; Field theoretical interpretation of high energy nuclear collisions.

Offers of contributions should be sent to the Conference Secretary, Dr. D. H. Perkins, H. H. Wills Physical Laboratory, Royal, Fort, Bristol 8.

2. *Electronic Processes in Dielectric Liquids.*—The Electronics Group of the Institute of Physics and the Physical Society, London, is arrganging a Conference on Electronic Processes in Dielectric Liquids at the University of Durham from 23-25 April 1963. It is hoped to discuss the whole field of electrical conduction processes and breakdown in dielectric liquids such as simple hydrocarbons, liquid gases (including Helium), and purified insulating oils. Offers of papers not exceeding twenty minutes presentation time should be sent with three copies of abstracts of about 100 to 150 words as soon as possible and not later than 30 November 1962 to Dr. M. J. Morant, Department of Applied Physics, Science Laboratories, South Road, Durham City.

High-Energy Electrons of Solar Origin

The existence of high-energy electrons in the primary cosmic radiation has been well established in recent years. But their origin still remains an open question. Whether the sun which is known to emit high-energy protons, of range from 100 MeV to several BeV, especially during solar flares, can also be the source of electrons of similar range has been the subject of experimental investigation over the past year. P. Meyer and R. Vogt of the Enrico Fermi Institute for Nuclear Studies, University of Chicago, report an observation (*Phys. Rev. Letters*, 1962, **8**, 387), which shows that electrons may be emitted by the sun during a solar flare and that the active region, which passed centre meridian on July 14, 1961, did indeed emit electrons with energies above 100 MeV which could be observed at the earth.

Five measurements with balloon-borne instrumentation were carried out in July to August 1961, from Ft. Churchill, Manitoba. The instrument was capable, over a certain range, of discriminating between electrons, protons, and heavier primary cosmic-ray particles. The first measurements took place on July 22, 1961, after the class 3^+ solar flares of July 18 and 20, 1961, which are known to have produced a large number of protons with energies up to several BeV.

On July 22, a considerably enhanced flux of primary protons which undoubtedly originated in one of the flares was observed. At the same time an increased flux of primary electrons was also observed, and subsequent comparisons with electron flux measurements after July 22 convincingly showed that the increased flux was due to solar emission. The measurement yields a flux of solar electrons of 368 ± 50 particles/metre^2 sec. in the energy interval 100–300 MeV.

The acceleration of electrons in solar flares has been postulated to explain the solar radio bursts (Type IV) of non-thermal origin, which are observed at the main phase of many solar flares. Until now, however, no direct emission of high-energy electrons by the sun had been detected. It was assumed that magnetic fields in the flare region prevent the escape of energetic electrons.—(*Phys. Rev. Letters*, 1962, **8**, 387.)

A New Xenon-arc Lamp

The General Electric Company, U.S.A., has developed a new high-power xenon-arc lamp

which is nearly three times as bright as the Sun The 5,000-W. lamp produces a total intensity of 275,000 lumens, or 55 lumens/W. Its first use is in a solar simulator for space vehicle investigations. In the visible, the light simulates sunlight, and its total spectrum, including the ultra-violet and infra-red, approximates closely to solar radiation. Another expected application is to optical masers. As a source of intense infra-red radiation it will also be useful in connection with solar-type furnaces. Housed in a parabolic reflector, the lamp throws a powerful beam of light, and, used as a searchlight, could throw a beam of 10^9 candle-power, sufficient to enable a person to read a newspaper at a distance of about 15 miles from the source.

The lamp is a direct-current light source in an ellipsoidal-shaped quartz bulb. The bulb is only 3½" in diameter and 4¼" in length although the overall length of the lamp is about 19". The bulb houses two tungsten electrodes with an arc gap of 8 mm. and the arc operates in a high pressure of xenon. A high voltage is applied to start the lamp and a current of 145 amp. flows across the arc from the cathode to the large anode, which weighs ¾ lb. The anode reaches a temperature of 6,000° F. The lamp is expected to have an operating life of 1,000 hr. This is the second lamp of its kind; the first was a 2,000-W. xenon-arc lamp and has been available for several months.

New Results on the Chemical Composition of the Stars

The study of the chemical composition of stars has formed a major project at the Mount Wilson and Palomar Observatories in California during the past decade. As the programme has proceeded, more and more objects have been discovered whose chemical compositions deviate widely from those of the sun and near-by stars. If the composition of near-by stars be taken as a standard for comparison, one star—3 Centauri A—observed during the current year has four times the abundance of iron, five times the abundance of nitrogen, 100 times the abundance of phosphorus, 1,000 times that of Krypton, and 10,000 times that of gallium. On the other hand, oxygen and helium are deficient in this star by a factor of 6, and sulphur by a factor of 10. Observations also show that the isotope of helium of mass 3, rare in nearby stars, is several times as abundant in 3 Centauri A as the common isotope of mass 4.

Numerous other objects showing marked anomalies in abundance of chemical elements have come to light in these studies. Often whole groups of stars and even whole galaxies show major anomalies. The most common deviation involves a deficiency in the heavy elements, including the common metals, all by about the same factor below their abundance in the sun and nearby stars.

As a result of these findings, it may be necessary to revise the calculations of distances in the universe which are based on the brightness of stars. Up to now, such distances have been determined on the assumption that stars of the same class, such as cepheid variables of the same period, have the same luminosity. The discovery of different chemical compositions among the stars may alter this assumption.—(*Carnegie Institution Year-Book 60.*)

Superconductivity of Iridium

Following the recent discovery that very pure molybdenum is a superconductor (T. H. Geballe, *et al., Phys. Rev. Letters*, 1962, **8**, 313), it has now been shown that iridium of very high purity is likewise a superconductor with a zero-field transition temperature of 0·140° K.

It is known that the existence in a superconductor of an impurity such as iron drastically lowers the superconductivity transition temperature, if, and only if, the iron impurity possesses a localized magnetic moment. Localization of the Fe moment has been found to be a function of valence electrons possessed by the host metal. Molybdenum and Iridium are two transition metals in which Fe, if present as an impurity, would possess a localized magnetic moment.

The present discovery of the superconductivity of iridium and the recently reported discovery of the superconductivity of molybdenum suggest that failure of many metals to exhibit superconductivity, even when cooled to ultra-low temperatures, could be due to insufficient purity.

The metal iridium has previously been reported to be non-superconducting down to 0·1° K. However, bearing the above considerations in mind in the present experiment, reported by Geballe *et al.*, and Hein and Gibson (*Phys. Rev. Letters*, 1962, **8**, 408), improved techniques have been used to effect extreme purification of the sample of iridium from the original supply certified to contain only 2 p.p.m. of impurity.

These results suggest that superconductivity is probably a more widespread phenomenon than presently believed.

New High-Energy Electron Accelerator

The new Cambridge Electron Accelerator, which is a joint undertaking of Harvard University and the Massachusetts Institute of Technology, has gone into operation early in March 1962, generating a 2·2 BeV beam—the most energetic electron beam yet produced by man. Its designed output, a beam of electrons travelling at ·999999996 the speed of light and with an energy of 6 BeV, should be attained this summer.

Like the 30-BeV proton accelerator at Brookhaven and CERN, the Cambridge machine is a synchrotron: it accelerates particles held in a circular orbit by a magnetic field. Charged particles moving on a curved path lose energy by electromagnetic radiation, and with electrons having an energy approaching 10 BeV this loss nullifies any increases in power. Electrons with an energy more than 10 BeV can be generated only in huge linear accelerators, such as the 2-mile long 20-45 BeV machine to be built at Stanford University.

Machines like the Cambridge accelerator nevertheless have a key part to play in critical areas of nuclear physics. Until now exotic fundamental particles have been created in the laboratory chiefly with high-energy protons. Such particles can also be produced by 6-BeV electrons, and the processes involved should be easier to analyze because electron interactions involve only the well-known electromagnetic forces and not nuclear forces, which are not so clearly understood.—(*Scien. Amer.*, 1962, 205, 80.)

Ruby Optical Maser as a Raman Source

The first successful use of the ruby optical maser for excitation of Raman spectra is described by S. P. S. Porto and D. L. Wood of the Bell Telephone Laboratories, in a communication to the *Journal of the Optical Society of America* (1962, 52, p. 251).

A successful Raman source must have high radiance, strict monochromacity, and a frequency for which the sample is not opaque. The ruby optical maser of wavelength 6940 Å has, from its first demonstration, been an obvious possibility for this purpose.

In the experiment described by Porto and Wood the exciting lamp was a G.E. FT 524 xenon flash lamp. The ruby rod of 0·05% Cr concentration was supplied by the Linde Company. The ends of the ruby rod was polished flat to 1/5 fringe, and parallel to 30 sec. of arc. One end of the rod was coated with an opaque silver layer, but the other end had a silver coating of 25% reflectance. A flow of gas through a pyrex tube surrounding the ruby rod effected its cooling.

The slightly divergent light beam from the end of the ruby rod was focused with a lens to a spot several millimetres in diameter on the surface of the Pyrex Raman cell. The radiation entering the cell was diffusely reflected many times through the sample by a coating of $BaSO_4$ deposited on the surface of the cell. The scattered light from the cell was collected by a lens and brought to a focus on the slit of a high aperture spectrograph.

The maser was operated about three times a minute with a flash energy of 3,000 joules producing flashes having a total duration of one millisecond. The exposures were recorded on Eastman 35 mm. type IN spectrographic film, and each exposure involved from 1 to 100 flashes, depending on the experiment. The distance between the maser rod and the Raman tube was kept at 150 cm. Raman spectrograms of benzene and carbon-tetrachloride, recorded with 50 flashes of the maser, showed all the well-known Raman lines of these substances.

It hardly needs to be pointed out that this intense, truly monochromatic source at 6940 A in the red, is ideally suited for studying the vibrations of molecules of absorbing substances, of fluorescing materials, and for low-lying frequencies. Studies of the coherent Raman effect may also be possible, though this has yet to be demonstrated.—(*Jour. Opt. Soc. Amer.*, 1962, 52, 251.)

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