SCIENCE NOTES AND NEWS

Award of Research Degree

The Bombay University has awarded the Ph.D. degree in Physics to Sri. B. N. Subba Rao of Tata Institute of Fundamental Research for his thesis entitled "Experimental studies of Some Medium Odd-A Nuclei".

The Maharaja Sayajirao University of Baroda has awarded Ph.D. degree in Biochemistry to Kumari Dharmishtha Kantilal Patwa for her thesis entitled "The Mechanism of Carotene Biosynthesis in Mangoes and Carrots".

Indian Phytopathological Society

The Fifteenth Annual General Body Meeting of the Indian Phytopathological Society was held on 9th February 1963 in the Division of Mycology and Plant Pathology, I.A.R.I., New Delhi-12.

There was a business meeting in the morning at which Office-bearers for the year 1963 were elected. There was a symposium in the afternoon on "The Role of Therapeutic Treatments for Controlling Plant Diseases" in which several papers were discussed. Dr. D. J. Raski, Visiting Professor in Nematology from the University of California, gave an illustrated talk on "Control of Plant Pathogenic Nematodes". Dr. P. R. Mehta, President of the Society, delivered the presidential address on "Plant Pathology in India".

The Institute of Physics and the Physical Society

(*i*) *Conference on Low and Medium Energy Nuclear Physics.*—The Institute of Physics and the Physical Society announces that it is arranging a Conference on "Low and Medium Energy Nuclear Physics" to be held at the University of Manchester from 4 to 6 September, 1963. The main topics to be covered will be: The production of beams of heavy ions; Heavy ion reactions; Properties of nuclear states, their measurement and comparison with theories of nuclear structure; Nuclear reactions at low and medium energies.

The foregoing topics will be reviewed in approximately nine invited papers. Offers of short contributions in these subjects for discussion should be sent before 21st June 1963 to the Conference Secretary, Dr. W. R. Phillips, The Physical Laboratories, The University, Manchester 13, accompanied by abstracts of about 300 words.

(*ii*) *Solid-State Physics.*—The Institute of Physics and The Physical Society announces that it is arranging a Conference on Solid-State Physics at the H. H. Wills Physics Laboratory, University of Bristol, from 1-4 January, 1964.

One of the main themes of this Conference will be the Fermi surface, and the invited speakers will include Professor A. B. Pippard (University of Cambridge) and Professor M. H. Cohen (Chicago). The Conference will provide an opportunity for workers in the solid-state field generally to meet and discuss recent developments. Accordingly, contributions on any topic of current interest in solid-state physics will be considered.

Offers of contributions should be sent to the Conference Secretary, Dr. R. G. Chambers, H. H. Wills Physics Laboratory, Royal Fort, Bristol-8.

Further details of the above conferences will be available from the Administration Assistant, The Institute of Physics and The Physical Society, 47, Belgrave Square, London, S. W. 1.

Science Progress

The latest issue (January 1963, Vol. LI, No. 201) of this Quarterly Review contains the following articles: "Freshwater Fishery Research in East-Africa" by the late Dr. V. B. Van Someren; "Environmental Studies in Sedimentary Geochemistry" by G. D. Nicholls; "Tectonics and Palæogeography in Northern England" by T. Neville George.

The section on Recent Advances in Science includes "The Magnetic Field of the Galaxy" (Astronomy), "Micrometeorological Researches in Japan" (Meteorology), "General Synthetic Method" (Organic Chemistry); "Production Ecology" (Botany) and "Whale Biology" (Zoology).

Twin and Forked Awning in Rice

Occurrence of double and triple awning in the rice spikelets has been recorded previously (*vide Curr. Sci.*, 1936, 4, 739 and 1962, 5, 221-22). Shri P. Narahari of the Biology Division, Atomic Energy Establishment, Trombay, Bombay, reports yet new variations in this regard. During the main crop season of 1960, a single panicle of rice in one of the plants of the

tetraploid mutant of variety SR 26 B of Orissa, showed five unusual spikelets. One of them was sterile and lacked the middle nerve lemma. However, the two central nerves developed into a case of twin awning while the marginal nerves showed prominent endpoints. This suggests that each nerve of lemma or palea, under certain abnormal conditions, has the potentiality to develop into a separate awn. The other four spikelets, fertile and with short awns, showed forking at the tips. This forked nature of the awns, however, failed to occur in the subsequent generation showing that it is only a teratological variation with no genetic basis.

Some Properties of Silver-Rich Tin-Silver Alloys

The mechanical properities of silver can be improved by alloying and for many applications, such as tableware and various items of jewellery, a silver alloy rather than pure silver is usually employed. Copper is a widely used alloying element and in sterling silver, for example, 92·5% is silver and the balance is usually copper. A disadvantage of the copper-containing alloys is their liability to develop green stains on prolonged contact with chlorides such as table salt or splashes of sea-water.

The Tin Research Institute has made a report of work carried out in its laboratories with the view to finding whether tin could with advantage replace copper as the hardening agent in silver within the solid solution range. The solid solubility of tin in silver at 700° C. is approximately 12% by weight, decreasing only slowly with decreasing temperature to approximately 10% at 300° C.

The work showed that copper in sterling silver could be replaced by tin to produce an alloy with improved resistance to some forms of corrosion while retaining comparable mechanical properties, including excellent ductility. The silver hardened with tin is not discoloured by contact with salt and is more resistant to amospheres rich in sulphur dioxide than the copper containing alloys (Publication of Tin Research Institute, England).

New Experiments on Large-scale Breeding of Micro-organisms

The demand for bacterial preparations, in the form of the micro-organisms themselves or the products of their vital activity, is steadily increasing. Microbiologists use them in many fields of science and technology, such as medicine, chemistry, soil biology, animal breeding and agriculture. To meet this growing demand the microbes have to be bred in large quantities, several hundred kilograms at a time. This has posed the problem of evolving a dependable method of standard breeding of microbes without any hazard of breaks or accidents in the process.

It is being realised more and more that the classical nutrient medium for the micro-organisms, namely, meat broth, is becoming an impediment to their multiplication. Microbes develop well in meat broth, but sometimes, for reasons unknown, the whole batch perishes, or develops only partially. One method of standard breeding of microbes will be to make them grow and develop in a simple and well-known chemical nutritive medium. It has been noticed that micro-organisms develop most readily in casein solutions. In the U.S.S.R., the Gamaleya Institute and the Vologda Milk Institute and Regional Laboratory have jointly developed a special process of producing bacteriological casein.

Casein solutions, or meat and bone broth which micro-organisms can assimilate are not simply transformed into nutritive media. The complex molecules of broth proteins must be split into simple, easily assimilable compounds either by chemical means, or with active ferments which promote the quick disintegration of the protein molecules. For this purpose usually animal proteins are added to casein solutions. The new way of splitting broth proteins which has been found is by using fungus ferment instead of animal ferment. The fungus ferment is a preparation of mould fungus *Aspergillus terricola*, in the presence of which proteins are split into basic amino-acids. The fungus is not difficult to breed. Big colonies develop in two or three days on slightly moistened bran. They can be dried and kept in storage for an unlimited time, during which the ferment does not lose its quality.

The new method consists in effecting sharp changes in the temperature at which fungi are bred. It has been found that the activity of the ferment so prepared is raised about four times.—(*Courtesy of U.S.S.R., Embassy in India, New Delhi.*)

Ceramic Photon Counters

The Geophysics Corporation of America, jointly with the NASA Goddard Space Flight Centre, have developed a new series of photon counters for inclusion in rocket and satellite space probes, or for use in laboratory research.

These counters may be described as small optical devices which measure the intensity and variability of ultra-violet radiation in narrow bands of the solar spectrum. External dimensions are: main body 1·000 in., mounting flange diameter 1·365 in., length 1·490 in., window aperture 0·375 in.

Aboard a rocket or satellite these ceramic counters can be used to measure Lyman-alpha radiation and other portions of the solar spectrum which do not penetrate to the earth's surface. In the laboratory, in conjunction with light sources able to simulate these wavelengths, the counters may be used to perform absorption studies of gases or to determine the reflectivity of metals. Measurements may be performed in such narrow spectrum bands as 1050-1180 Å, 1050-1250 Å, 1050-1350 Å, and 1225-1350 A.

Counters are filled with a variety of gases and are equipped with a variety of crystal windows depending upon the experiment. Exhaust and filling tabulation is provided with either metal or glass pinch offs for mounting on a vacuum system. The instruments can be calibrated for absolute photon flux measurement, can be operated under gas amplification conditions, and may be used in combinations of two units to perform studies of other spectral regions.—(*J. Frank, Inst.*, 1962, 274, 532.)

Diamond Pressure Cell for High Pressure Optical Studies

A diamond pressure cell used along with a polarising microscope enables direct visual observations to be made of phase transitions and other changes occurring in transparent solids and liquids as a result of application of extremely high pressures. The device is being used by the National Bureau of Standards, U.S.A. for routine observations up to 70 kilobars (1 million lb./in.^{2}), and observations up to 115 kilobars have also been made. So far alkali halides, and halides of thallium and silver, and a few other selected materials have been studied by this procedure.

The anvil-type diamond pressure cell consists of two carefully ground diamonds, each with a diameter of 1/16 in. For observing high pressure transformations at room temperature, the specimen is placed between the two diamond surfaces which are then squeezed together using a spring loading mechanism. This compresses the specimen into a film, and friction between the sample and the diamond surfaces prevents the specimen from completely extruding.

Some of the visual effects accompanying phase transitions are extremely vivid. Crystal growth phenomena have been studied with the diamond squeezer and microscope. In potassium nitrate, for example, the crystals grown in the central high pressure region are much smaller and denser than those propagated in the peripheral, lower pressure regions of the cell. Further, it is observed that the crystals in the low pressure regions have a preferred orientation with their longest directions radial to the centre ; this is also the direction of the pressure gradient. By changing pressure a growing crystal front that has the appearance of a liquid surface can be produced.

An absorption phenomenon that has been observed in thallium halides does not appear to be related to a phase change. At calculated pressures of 40 kilobars, thallium bromide changes from a near white to a lemon yellow colour when observed in monochromatic light. As pressure is increased, this colour changes to orange, then to a deep red, and finally, at about 90 kilobars, the material becomes opaque. On release of pressure the colour reverts back to the original white. The same behaviour is noted in thallium iodide and thallium chloride but at different pressures.

These changes are related to the changes in optical absorption and electrical resistance in the thallous halides at high pressures and are attributed to a decrease in the gap between the valence and conduction bands of allowed electronic energy.—(*Industrial Diamond Review*, 1963, 23, 42.)

Structure of Lysozyme

With the success achieved of the elucidation of the structures of myoglobin and hæmoglobin (Kendrew *et al.* and Perutz *et al.*) by X-ray diffraction analysis, scientific interest is now being focussed on the study, by the same method, of the molecular structure of lysozyme. The enzyme lysozyme was discovered by Fleming in 1922. It is responsible for "the power of rapidly dissolving certain bacteria which is possessed by many animal and vegetable tissues and secretions, and to a very marked degree by egg-white". Recent studies have shown that the enzyme attacks a mucopolysaccharide component of bacterial cell-walls, liberating acetyl amino-sugars derived from glucosamine and muramic acid. The reaction appears to involve the breaking of a β-glycosidic linkage.

Chemical analysis of hen-egg-white lysozyme has shown that the molecule consists of a single polypeptide chain of about 129 amino-acid residues, cross-linked by four disulphide bridges. The amino-acid sequence is known in some

details but the position of the disulphide bridges have not yet been determined.

A detailed X-ray crystallographic investigation of the structure of hen-egg-white lysozyme is likely to lead to a knowledge of its molecular configuration which would be of special interest in connection with the mechanism of cell lysis and the structure of cell-walls.

Egg-white lysozyme can be crystallised in several crystal forms as the salts of mineral acids. Crystals of lysozyme chloride grown at pH 4·7 are tetragonal with cell dimensions $a = b = 79{\cdot}1$, $c = 37{\cdot}9$ Å, and space group $P4_1\ 2_1\ 2$ or $P4_3\ 2_1\ 2$. Each unit cell contains eight lysozyme molecules (one per asymmetric unit), mol. wt. about 14,600, together with I M sodium chloride solution which contributes about 33·5% of the weight of the crystal.

Three laboratories have sent preliminary reports of the results of their X-ray investigations on the structure of lysozyme (*Nature*, 1962, 196, 1173). The work at the Davy Faraday Research Laboratory of the Royal Institution, London, has been reported by D. C. Phillips *et al.* The structure of tetragonal lysozyme chloride has been determined at 6 A resolution by the method of isomorphous replacement, the heavy atom parameters used in the investigation being $PdCl_4$, MHTS (mercuri hydroxytoluene sulphonic acid) and mercuri-iodide. An X-ray crystallographic study of tetragonal lysozyme chloride crystals containing complex ions of niobium and tantalum has been reported by Prof. Corey *et al.* from the California Institute of Technology. A third preliminary report on lysozyme structure is by Dickerson *et al.* of the University of Illinois, in which they have calculated the three-dimensional structure of triclinic lysozyme nitrate to a resolution of 6 Å, using three isomorphous heavy atom derivatives : $HgI_4 =$, $Hg\,I\,Br_4 =$ and $Pt\ Cl_6 =$.

The first electron density distribution in lysozyme in these investigations is suggestive of a polypeptide chain in a folded configuration. However, the analysis has to be carried further before this interpretation can be considered to be established.—(*Nature*, 1962, 196, 1173).

Particulars of *Current Science*—The Monthly Science News Journal of India—as per Form IV under Rule 8 of the Registration of Newspapers (Central) 1956.

1. Place of Publication: Bangalore.
2. Periodicity of Publication: 26th of each month.
3. Printer's Name, Nationality and Address: Sri. T. K. Balakrishnan, Indian, Superintendent, Bangalore Press, Bangalore-18.
4. Publisher's Name, Nationality and Address: Sri. S. R. S. Sastry, Indian, Manager, Current Science Association, Bangalore-6.
5. Editor's Name, Nationality and Address: Dr. A. S. Ganesan, Indian, Editor, *Current Science*, Bangalore-6.
6. Name and Address of the Individual who owns the Paper: The Current Science Association, Bangalore-6.

I, S. R. S. Sastry, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Bangalore-6,
March 20, 1963.

(Sd.) S. R. S. Sastry,
Publisher, *Current Science*.

185–63. 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.