The monograph is so interesting and so packed with facts, that to quote is a temptation fraught with danger; but no apology is perhaps necessary for two short extracts on two matters of supreme importance to Indian sericulture—especially Mysore and Kollegal sericulture—namely, seed production and sale of cocoons. It is obvious that a defect in either will rob the farmer of the fruits of his labour.

In Japan "Rearers of silk-worms are prohibited by law from producing eggs for rearing. The Imperial Sericultural Experimental Station is engaged on testing silk-worms from all over the world, and selecting suitable ones for Japan. It recommended for rearing the F_1 crosses of certain races. These races are made available to the Prefectural Experimental Stations which test them for .....local conditions. The parent worms are reared in the Prefectural Experimental Stations and made available to licensed seed-producers for producing F_1 cross for the general rearer.....There are 8,000 licensed egg-producers, and more than 40,000 persons engaged in the sale of these eggs."

Perhaps the most notable achievement of the Sericultural Department in Mysore has been in this direction. Races of worms from all over the world have been tested, and crosses selected such as would result in an increase of 40% in the return to the rearer. What is even more important is that the rearer, that most conservative member of a conservative race, has been educated to recognise and accept the improvement. But for want of sufficient grants from the Government, the industry has been denied anything like appreciable benefit from this great achievement.

Again in regard to sale of cocoons:

"The recent development is sale through co-operative drying societies. Government is encouraging and subsidising these in order to foster the trade in dried cocoons."

This is a measure well worthy of adoption in all parts of India, except Kashmir where silk is a state monopoly.

The monograph is so economical in words that further condensation would probably result in unintelligibility, and we shall, therefore, commend a study of the text itself to such of our readers as require more information than can be expected in a review. The high message of Japan to India is seriousness and a realisation that the human value of industrial research lies in the speedy incorporation of its results in industrial practice. Else, knowledge comes, but wisdom lingers. The example of Japan should teach us how knowledge and wisdom can march hand to hand to prosperity.

Research Notes.

A Cathode Ray Furnace.

THE cathode rays produced in a rarified medium by a high tension current heat up very strongly any body (anti-cathode) placed in their path. This has been used by different experimenters to realise very high temperatures. Crookes (1879) was the first to make use of such an arrangement to melt platinum. In a recent paper in *Bull. Soc. Chem. de France*, Feb. 1934, p. 262, M. F. Trombe has described with details another cathode ray furnace worked by a transformer 110 to 20,000 volts, and utilising a current of 100 m.a. at the high tension. It consists essentially of a quartz bulb of three litres capacity into which are ground the aluminium electrodes—cooled by a current of water—and the support for the anti-cathode. A plane window placed near the tungsten anti-cathode crucible makes it easy to observe and measure optically the temperature realised. The apparatus is characterised by a regularity in functioning, and the temperature reaches to 2700°C. in 15 to 20 seconds.

M. A. G.

On a New Mass-Spectrograph.

IN the *Zeitschrift für Physik* (1934, **89**, 786), J. Mattauch and R. Herzog describe a new form of mass-spectrograph and the advantages it possesses over the forms used by Aston and Dempster. The focussing method of Aston utilises the prism-like action of the deviating fields so that ions of different velocity but same mass come together to a focus, when the initial direction of all the rays is the same. In the method of Dempster the lens-like action of a magnetic field is used to focus ions of the same velocity but issuing in different directions so that they come together. Now R. Herzog has

shown that a radial electric field or a homogeneous magnetic field act as a combination of a prism and a cylindrical lens (*Zs. f. Phys.*, 1934, **89**, 447). Hence if a canal ray containing particles of various masses and velocities is compared to white light, a combination of two such lenses should make it possible to obtain an achromatic image of the slit, *i.e.*, one focus for particles of the same mass but different velocities and directions. The authors now describe a form of mass-spectrograph which makes it possible to realise such a focussing. The canal rays proceeding in all directions from a slit are subjected to the action of a radial electric field and then to a homogeneous magnetic field in such a way that rays passing out in different directions and also containing particles of various velocities are brought to a focus at a single point. For special values of the angle of deviation by the electric field, the foci corresponding to particles of different mass lie on a straight line as in Aston's instrument. The form of pole-pieces is calculated in the paper. The advantages claimed for the new form of mass-spectrograph are the following:

(1) Since there is a focussing both with regard to directions and to velocities collimation by means of two narrow slits is not necessary and the canal ray beam will be more intense and the accuracy of measurement will be increased.

(2) Besides the greater sharpness and intensity of the lines, the resolving power for apparatus of similar dimensions is ten times as large as in the case of Aston's instrument.

(3) The mass-scale is simpler and easier to calculate than in the case of Aston's spectrograph. The distances of the lines from a fixed point are proportional to the square roots of the masses.

(4) The resolving power is the same all along the line of foci and for all masses.

(5) The angle at which the rays meet the photographic plate is the same for all masses and is much larger than in Aston's instrument.

(6) Since the angle of deviation by the magnetic field is only half as large as in the apparatus of Dempster or Bainbridge where it is 180° the strength of the magnetic field need not be so large.

The results obtainable with such an instrument would be interesting if all the conditions are realised in practice.

On Demonstrations with very short Sound Waves and the Reaction of a Sound-Wave Field on the Source.

IN the *Physikalische Zeitschrift*, (1934, **35**, 524), E. Meier describes improved apparatus for demonstrating the properties of a field of very short sound waves. In order to increase the intensity of the radiation, a parabolic reflector having a depth equal to twice the focal length was used, so that more than half the energy of the source was converted into a parallel bundle. The reflectors were made of brass plate 1 mm. thick and had a diameter of 50 cm. When a grating made of two or six slits in a plate covered the opening of the reflector and the whole apparatus was rotated, the audience at successive positions could hear the sound when the diffraction maxima fell in their direction. For an objective demonstration sensitive flames were used. The flame was usually at the focus of a cylindrical parabolic mirror which served also to screen the flame from other influences. Useful forms of the burner for producing the sensitive flame are described. A brass tube of 8 mm. internal diameter tapers conically to a diameter of 2 mm. in a length of 40 mm. and the total length of the tube is about 100 mm. Such a burner is not too sensitive and is well suited for an auditorium. The shape of Galton-whistle was also modified to obtain a series of plane wave-fronts. The article contains a figure showing the new form. During the course of experiments with the apparatus described, it was found that a plane reflector placed at right angles to the parallel beam from the parabolic reflector influenced the state of vibration of the source. When the reflector was moved to and fro in front of a whistle served with a strong blast, the sound of the latter waxed and waned. In the case of a weaker blast some positions of the reflector could be found at which the whistle was completely silenced. If the ear is placed near the whistle one only hears a siffling of the escaping wind but no sound. The corresponding positions of the reflector are situated at intervals of $\lambda/2$. It appears as if the reflected wave interferes destructively with the vibrations of the air coming from the source. With a very weak whistle it was also possible to find positions of the reflector midway between the positions above described so that the sound was enhanced.

Geochemistry of Living Matter.

THE progress achieved in Prof. Vernadsky's laboratory devoted to the study of biogeochemical problems, forms the text of a contribution by Uvarov published in a recent issue of *Nature* (1934, **134**, 11). A special laboratory devoted to the investigation of the geochemical rôle of organisms was created by the Russian Academy of Sciences in 1928, and in the short period of its existence, a number of valuable results have accumulated from the labours of Prof. Vernadsky and his collaborators.

The quantitative investigation of the chemical composition of living organisms has shown that certain organisms function as accumulators of definite elements; thus ants accumulate manganese and Lycopodiaceæ accumulate aluminium. The organisms which are geologically ancient possess the ability to concentrate a very wide range of elements. Vinogradov has, by means of a graph, demonstrated that every sixth element in the periodic table is of special significance to organisms.

Another important problem studied in the laboratory is the atomic weights of elements obtained from living organisms. The hypothesis propounded by Vernadsky in 1926, that living organisms possess selective powers in utilising isotopes of the elements, has been experimentally verified by Loving and Druce, who have shown that in potato, the isotope 41 of potassium predominates. In ordinary potassium, the chief isotope is of atomic weight 39.

These and several other problems relevant to the fundamental conception that living matter is a factor in the history of the earth, are being investigated in the laboratory under the inspired leadership of Prof. V. I. Vernadsky and important results which would establish closer relationship between the organic and inorganic worlds are awaited.

Vitamin C and Amylases.

ON account of their relation to carbohydrate metabolism, Vitamin C and Amylase are both important in cancer research. The influence of Vitamin C (Ascorbic acid) on amylases forms the subject-matter of an important communication by Purr (*Biochem. J.*, 1934, **28**, 1141) from the Cancer Research Laboratory, Pennsylvania.

From a study of the effect on various animal amylases, Purr concludes that ascorbic acid possesses a specific activating influence on β-amylase at the optimum pH 6·8. The activation is linked with an increase in the transition point and in this respect is sharply differentiated from the activation by calcium salts and amino acids, where the transition is hastened but not affected. The activation of calcium salts and amino acids is observed only at a higher acidity (pH 5·1).

The effect of ascorbic acid on plant amylases is altogether different; an inhibition is observed in all cases. Plant β-amylases are strongly inhibited by reduced ascorbic acid but unaffected by the oxidised form, while in the case of α-amylases, the activity is inhibited by the oxidised form but unaltered by the reduced form of ascorbic acid.

The author further observed that in the ripening grains—barley, rye, or oats—the α-amylase is progressively inactivated, and this is probably related to the gradual decrease in Vitamin C observed by Virtanen and collaborators, during ripening.

The Beech Bark Disease.

THIS serious disease, which has been known to exist in Europe since 1849, has, within the last fifteen years, been noticed to spread steadily and to cause extensive mortality among the beech trees in N. America and Canada. A disease survey, by Ehrlich (*Canadian J. Res.*, 1934, **10**, 593–692) who investigated this disease in Canada, showed that in two areas as much as 50% of the trees had been killed, and 90% of the stands infected. The external symptoms of the disease are manifested by the gradual drying up of the foliage and twigs, the loosening of the bark in patches, and the ultimate death of the trees.

The disease has always been associated with the appearance on the bark of a scale insect *Cryptococcus fagi* (Baer), which, by feeding, injures the underlying tissues of cortex and the phloem. The fissures thus caused, provide an entry for the fungus Nectria, which gradually invades the Phelloderm, Cortex, Phloem and Cambium. This sequential attack by the insect and the fungus which was long ago indicated by Boodle and Dallimore and later by Rhumbler, has now been definitely established by Ehrlich by inoculation experiments. Morphological and cultural studies of the fungus are described, and data given

on the height of ascospore discharge which takes place after rain. Neither the insect nor the fungus by itself when placed on the bark was able to produce the disease symptoms on the tree. Inoculations with the fungus on mechanically wounded or Cryptococcus infested bark always produced infection.

The fungus causing the American disease has been identified by Wollenweber as *Nectria coccinea* (Pers) Fries while the European species has been reported to be *N. ditissima* Tul.

The disease can be controlled on ornamental trees by the application of insecticides such as Carbolineum-Sunoco oil, or Kerosene-soap emulsion. In the forests, removal of dying and dead trees and the possibility of biological control are indicated as remedial measures. Growing of beech on broad ridge tops rather than on steep slopes, and early introduction of young supplies in place of old trees, are likely, in the opinion of the author, to mitigate the ravages of the disease.

M. J. NARASIMHAN.

Biological Effects of Heavy Water.

E. NEWTON HARVEY has critically examined the results of previous workers on the effects of heavy water on animals and plants (*Biol. Bull.*, 1934, **66**, 2). It has generally been known that heavy water has deleterious effects on the growth of micro-organisms but the cause of this action is not known. It is observed that heavy water has no effect on the luminosity of *dried cypridina*, nor on fresh-water luminous bacteria but diminishes the luminiscence and retards the growth of marine bacteria. Protozoans and rotifers are seen to become gradually slow in their activity resulting in death but *Euglena*, though affected by heavy water, recovers after favourable conditions are restored. A tentative theory has been advanced that the deleterious effects of heavy water are probably due to the accumulation of hydrogen peroxide.

Chromosomes of Grasshoppers.

T. RAMACHANDRA RAO describes the structure and the behaviour of chromosomes in the spermatogonia of *Aularches* in a recent contribution (*Proc. Ind. Acad. Sci.*, 1934, **1**, 1). Aularches is a Pyrgomorphine grasshopper and possesses 19 telomitic rod-shaped chromosomes. During the several stages in the mitotic cycle they offer strong evidences for the chromonema theory as recently developed by certain plant cytologists. During the telophase processes the chromosomes gradually form vesicles, which show the presence of two thin intertwining chromonemata embedded in a lighter matrix. This observation also confirms the views of Robertson and McClung on the occurrence of telophase splits in Orthopteran chromosomes. The two threads gradually become very thin and finally pass beyond the limit of visibility. The interphase vesicles are quite independent of each other and during the prophase the characteristic spirals arise entirely within the limits of their own vesicles. The sex-chromosome offers striking pictures during the telophase when it is the first to diffuse and during the prophase when it is the last to re-condense.

On the Morphology of the Epipubis, the Nobelian Bones and the Phallic Organ of *Ascaphus Truei* Stejneger.

PROF. C. G. S. DE VILLIERS in an interesting paper (*Anat. Anz.*, 1934, **78**) describes some of the hitherto obscure points in the morphology of *Ascaphus*. The sub-pelvic skeletal rods which were supposed to be cartilaginous are now shown to be bony; these Nobelian bones are not cartilaginous derivatives. The prepubic skeletal element is cartilaginous and finds a homologue in the epsiloid process of urodeles or the epipubis of *Xenopus*. In two other animals the presence of epipubis has been noticed, *Ascaphus* and *Liopelma*. The musculature and vascularization are described.

Depth of Oil.

IN a recent number of the *Oil Weekly* (1933, **71**, No. 2), R. A. Jones has tried to answer the question 'How deep may Oil exist in the earth's crust?' For doing this he points out how necessary it is to know the depth to which porosity extends and proof of the existence of suitable rocks at that depth. In the light of the generally accepted geological estimates of the maximum thickness of sedimentary rocks, the author advances the idea that petroleum may occur in certain basins at depths of 20,000 to 30,000 feet below the surface.

Plagioclase Determination.

R. C. EMMONS of the University of Wisconsin has published a very important paper on 'Plagioclase Determination by the Modified Universal Stage' in the latest number of the *American Mineralogist* (June 1934, **19**, No. 6). The paper describes a modification of Federov's Universal Stage which both simplifies and speeds up the procedure for the determination of plagioclase felspars and their twin laws. The actual technique of this work is explained in detail and amply illustrated in the paper. It is also suggested that the same procedure may be extended to an intensive examination of all minerals in which optic orientation is a good diagnostic criterion.

Marchese Marconi.

(Born 1874.)

IN the history of engineering endeavour of recent times, the name of no worker is so widely known as that of the distinguished Italian whose sixtieth birthday on April 25th was the occasion for tributes from every part of the globe wherever radio communication and broadcasting affects the daily life of the community. In contrast to those among scientists who insist that the pursuit of science is a form of self-expression and therefore an end in itself, Marconi has steadfastly adhered to the view that all scientific work has for its fundamental aim the promotion of human welfare and prosperity. His is the unswerving devotion of a life-time to the pursuit of the great objective of developing radio methods for the communication of intelligence between men and nations the world over. If his field of activity has been a small patch in the vast expanse of scientific and engineering endeavour, he has, nevertheless, been an intensive worker and a remarkably successful one. With the vision and courage of the pioneer, Marconi has worked persistently at his ideas undismayed by the scepticism of contemporary scientists and undeterred by the inevitable obstacles of vested interests.

His contributions to the development of radio communication are remarkably impressive in both volume and quality. They began in 1895 in early youth with his experiments in his father's garden, at a time when hertzien waves were yet a newly discovered scientific toy of the laboratory. But after Marconi entered the field, each year saw an increase in the distance bridged across, culminating in communication across the English Channel in 1895 and the wonderful and spectacular success two years later in bridging the Atlantic between Cornwall and Newfoundland. That great achievement of Marconi formed the starting point for the gigantic progress of the later years in the spread of world-wide radio communication, in which Marconi and his famous company have played so great and distinguished a part.

We owe him the earthed antenna, the improved and extensive use of the principle of tuning, the use of parabolic reflectors for directional working, and many others. The world does not now remember the rôle played by Marconi's improved coherers, his magnetic detector, the disc discharger, the timed spark and so on. Subsequent to the advent of that wonderfully versatile engineering instrument, the thermionic vacuum tube, Marconi and his able engineers have been responsible for the conception, development and inauguration of the first short wave directive system of radio telephony and telegraphy, which by its spectacular success has revolutionised long distance radio communication over the earth.

At sixty, Marconi is still active and has obtained during the last few years, interesting results in the use of extremely short waves of the order of a small fraction of a metre. It falls to the lot of few men to contribute so greatly to the growth of a world industry of such fundamental importance and to witness its phenomenal growth from a mere scientific toy to a dominating influence in the daily life of the world within the short period of four decades in their lives.

If honours from governments, honorary degrees from universities, membership of learned bodies in different lands and prizes and medals are any indication of a man's worth, Marconi has them in abundant measure. The Mussolini regime has elevated him to a hereditary Italian marquis, and he is the first president of the newly formed Italian National Academy, the highest