Research Notes.

On the Graptolites prepared by Holm.

OLIVER M. B. BULMAN, (*Arkiv for Zoologi*, Band 24, Hafte 2, 1932) in a series of papers makes a distinct contribution to our knowledge of Graptolites, based on the magnificent collection of 'etched' Graptolites prepared by Holm. The greater part of the material in the Holm collection was obtained from Gra Lituitkalk and the Glauconithaltig, Gra Vaginatumkalk of Oland and the Ordovician limestones. The forms described are referred to their particular stratigraphical formations and the paper is profusely illustrated with beautiful photographs and figures. The descriptions of the different genera are exhaustive and the paper forms an excellent work of reference for all students of Palæontology.

Continuous Cometary Spectrum.

THE continuous cometary spectrum has recently been attributed by Willi M. Cohn (*Astrophys. Jour.*, **76**, 277, 1932) to the bombardment of ions of different materials in the rarified tail of the comet by electrons assumed to be constantly emitted from the sun. Laboratory experiments are given which show that the cometary spectrum is unpolarised according to theory. On the other hand if the scattering is of the Tyndall type a complete polarisation is to be expected which is almost entirely absent in the violet type spectrum of comets. The appearance of CO^+ and N_2^+ bands favours the suggested origin of the spectrum and indicates that the pressure in comets may be of the order of 10^{-4} to 10^{-5} mm. of mercury. Since the electron velocity is reduced by its travel through the turbid medium of cometary matter, the theory explains also why with increasing distance from the head of the comet the maximum is shifted from 4000 to 4700 Å in the tail of the comet Morehouse.

Spraying in Coffee Production.

THE function of spraying in coffee production is the subject of two recent articles by W. W. Mayne in *The Planters' Chronicle* (**28**, 34, 53, 1933). After drawing attention to the fact that the Leaf-Disease is almost specific to coffee, the author adduces evidence to show that treatments like cultivation and manuring, though helpful to plant growth, will also, generally, favour the development of the fungus causing the disease. On the other hand, spraying eliminates the fungus and, by minimising the risk of leaf fall or destruction, it also provides the plant with an increased effective leaf area for the photosynthetic assimilation of carbon dioxide. The plant bears more flowers and fruits than it might have done in the diseased condition and thus gives a bigger yield of seed. The available evidence would also suggest that manuring, though helpful in maintaining soil fertility, does not appreciably increase crop-yields.

The author does not, however, explain how spraying leads to increased crop-production even in areas where the destructive effect of the Leaf-Disease is not perceptible. Furthermore, the effects of the sprayed chemicals both on the physiology of the plant and on the chemical composition and microflora of the soil into which it is ultimately washed down cannot be entirely ignored, particularly in the light of the literature that has been accumulating in recent years. It is known that the more progressive planters are liberal in their sprayings so that the quantities of chemicals thus applied per unit area would be considerable. It is suggested therefore that a systematic investigation directed towards the elucidation of the biochemical significance of spraying not only in the case of coffee but also in those of other plantation and horticultural crops of economic importance should be undertaken.

Kaolin Minerals from Felspar.

IN a recent number of *Journal of Geology* (**40**, No. 8) Messrs. A. E. Badger and Abde Ally have published a short note on their experimental work on the formation of kaolin minerals from felspar. Selected felspars of known composition have been subjected to attack by dilute hydrofluoric acid or carbonic acid under specific conditions of temperature and pressure, and the resulting alteration product studied by X-ray methods. The action of dilute hydrofluoric acid at about 225° C. on a potash felspar resulted in the formation of a kaolin mineral—kaolinite or dickite. The action of carbonic acid on powdered felspar did not result in the formation of any kaolin mineral. The authors consider that this

may have been due to the relatively short duration (156 hours at temperatures up to 60° C.) of these experiments.

Comparative Studies on the Physiology of the Iris.

J. Z. YOUNG (*Proc. Roy. Soc. Lond.*, **B. 112,** 776. Jan. 1933), after a comparative study of the iris muscles of different fishes, has come to certain important conclusions regarding their physiology. In Selachians of which Scyllium, Mustelus and Trygon have been chosen as examples for study, he has found that the sphincter iridis muscle is not under direct nervous control. A quite different result has been obtained in bony fishes like Lophius and Uranoscopus. The varied effects of drugs like adrenaline, acetyl choline, pilocarpine and eserine have been noted on the different muscles of the Iris.

Study of the Upper Ionised Atmosphere in Bengal.

PROF. S. K. MITRA and Rakshit have recently communicated the results of their study of the upper ionised atmosphere in Bengal by wireless echoes of short delay (*Phil. Mag.*, **15,** 20, 1933). The group retardation method as developed by Breit and Tuve has been employed with a transmitter of the type originally suggested by Appleton and Builder. From a knowledge of the time interval between the direct and reflected pulses reaching the receiver, the equivalent height of the upper F-layer has been calculated. The recording system, which is located at a distance of 3·8 km. from the transmitter, consists of a receiver and a cathode ray oscillograph. One pair of the deflecting plates of the latter are connected to the receiver output and the other to the neon tube oscillator for obtaining the linear time base. The height of the F-layer is observed to decrease gradually as the day progresses, the evening value being usually about 20% lower than the midday value. The average height of the F-layer in the afternoon is about 250 km. Multiple echoes become very conspicuous near sunset and their number increases as one moves away from the transmitter. Though no regularity in their relative intensity is noticed, the time intervals are absolutely constant thus supporting the hypothesis that echoes are caused by multiple reflection between the earth and the ionised layer.

Magnetic Properties of Wood Ashes.

E. WEDEKIND has recently investigated the magnetic properties of the ashes of a large variety of woods in the Forest Academy of Hannover Münden and his results have been published in *Naturwissenschaften*, **21,** 24, 1933. He finds that most ashes have distinct ferromagnetic properties, due probably to the presence of iron as magnetite. The magnetisibility is dependent on the strength of the magnetic field and even minute differences in the iron percentages have apparently quite a considerable influence. As all the woods that were investigated were grown on the same kind of soil, differences in the constitution of the same are eliminated. It was found that the magnetisibility decreases in the order : larch-pine-fir-Scots-fir-oak-beech-ash-alder-birch. The preparation of the ash from the wood was carried out by a uniform method and the temperature was not allowed to raise above 600°. Higher temperatures apparently decrease the magnetisibility by chemical or physical processes. The ashes, obtained thus, even show differences in the colour, etc.

It would be very interesting to find out why certain plants possess a higher absorption capacity for iron and what influence this factor has on the other properties of the wood obtained from them.

Abundance Ratios of (rare) Isotopes.

[H. Kallmann and W. Lasareff. *Zs. f. Phys.*, **80,** 237, 1933.]

BY means of some improvements effected in the mass-spectrograph (using an electrometer whose reading gives the intensity of the mass-spectrum line) the authors have determined the abundance ratio of O^{18} to be 1/630 of O^{16} while the intensity of O^{17} could not be measured. By comparison of their results in Neon with previous determinations they find that the intensity of a mass line does not depend on the conditions of discharge in their form of apparatus. This is important since there are variations of more than 100% in the intensity ratios of isotopes deduced from band spectra, due to variations in the conditions of excitation (see F. A. Jenkins & L. S. Ornstein, *Proc. Kon. Akad. Wet. Amsterdam*, **35,** 1212, 1932). Thus $C^{13} : C^{12} = 0 \cdot 2$ in stellar spectra, 0·005 in the furnace spectrum and somewhat larger in the Mecker flame and vacuum tube, but C^{13} does not at all occur in the arc. With

the new apparatus the authors find that Ne^{20} : Ne^{21} : Ne^{22}=93·7 : 1 : 9·75. They have also found traces of another isotope of mass 23 whose intensity is 1/2000 of that of Ne^{20} and they think that the corresponding mass spectrum line must be due to a new isotope and not to $Ne^{22}H$, since such compounds do not occur in other rare gases. Working with HCl they find also another chlorine isotope Cl^{39} which is 1/1920 times as intense as Cl^{37}. Using negatively charged ions they found that Cl^{39} : Cl^{37} as 1 : 1850. Hence the result, Cl^{39} : Cl^{37} : Cl^{35}=1 : 1850 : 6000. Cl^{40} did not occur; if it exists at all it is less than 1/10000 of Cl^{37}.

Optical Orientation in Felspars.

A VERY interesting paper on "*Permanent changes in the optical orientation of Felspars exposed to heat*" has been recently published by F. W. Barth (*Norsk Geol. Tidsskrift*, **12**, 1931) and the following new data are furnished on this subject:

"Orthoclase frequently exhibits conspicuously large changes of the optic axial angle, whereas the position of the optic indicatrix remains unchanged. It was found to be a general rule that the more potassic the felspar the bigger the change.

Microcline is *not* changed by heat treatment. Since it has been claimed that microcline, if heated long enough, will slowly invert to orthoclase, it is worthy of notice that this assertion is proved to be false.

Albite and oligoclase are very slightly changed on heating.

Labradorite exhibits appreciable alterations of both the position and shape of the optic indicatrix."

Time-Variation of Gravity.

[Tomaschek and Schaffernicht. *Ann. d. Physik*, **15**, 789, 1933.]

ACCORDING to Couvoisier the cosmic motion of the earth should result in a diurnal variation of gravity by about 6×10^{-7} of its value, *i.e.*, by about $5\cdot9\times10^{-3}$ cm./sec^2. The authors describe a gravity meter which is claimed to be capable of detecting a variation of 10^{-9} of the value of gravity. A long spiral, about 18 mm. in radius and made of Krupp's elinvar steel wire of 0·5 mm. radius, is attached to a torsion head at the top and to a small pulley at the bottom. A rod attached to the pulley along its axis carries a gilded weight of 52·5 grm. The spiral weighs 12 grm. and when stretched by a weight of 52·5 grm. its length is 110 cm. The pulley is supported partly by a bifilar suspension of phosphor bronze, 43 cms. long, attached at the ends of a diameter. The torsion head can be rotated and its position can be read correct to 20″. It is also capable of being moved up and down to within 10^{-3} mm. so that the part p of the weight balanced by the bifilar suspension can be varied. By making p small and rotating the torsion head so that the pulley is in a position of critical equilibrium, the slightest alteration of the length of the spring is made to cause a rotation of the pulley. This rotation can be detected by means of a mirror fixed to the rod which carries the weight. This weight forms part of an attracted disc electrometer and the change of weight compensated by a potential of V volts is $0\cdot945\times10^{-11}gV^2$. The whole apparatus is enclosed in an evacuated vessel and an attached barometer and thermometer indicate changes of pressure and temperature amounting to 10^{-2} mm. of mercury and $7^\circ\times10^{-1}$ respectively. Automatic records of the motion of a spot of light reflected from the mirror clearly show the daily periodic variations due to the lunar tide and to the declination of the moon, but no effect of the nature predicted by Couvoisier's theory is observed. The expected value for this effect at Marburg was $3\cdot2\times10^{-8}g$ and could have been easily detected. The authors conclude that a Lorentz contraction of the earth cannot be detected even by its gravitational effects just as it cannot be made manifest by electrodynamic experiments.

Recent Researches on Vitamins.

A SURVEY of the latest researches on vitamins is the subject of a special article in a recent issue of *Nature* (**131**, 118, 1933). After drawing attention to Prof. J. C. Drummond's useful summary of the position (*J. Roy. Soc. Arts*, **80**, 919, 959 and 983, 1932), the reviewer draws attention to the more important findings of the past few months. There is increasing evidence to show that narcotine derivatives possess no antiscorbutic properties: on the other hand, the identity of the antiscorbutic factor in lemon juice with a hexuronic acid (ascorbic acid) is gaining support. It is now generally agreed that crystalline vitamin B_1 contains sulphur: the recent observation of Guha and Chakravarty that ultra-violet irradiated

adenine sulphate possesses the properties of that vitamin would appear to bring us nearer to its synthesis than ever before. Vitamin B_2 would appear to be a neutral substance with a higher molecular weight than vitamin B_1. The preparation of a crystalline compound with vitamin B_4 activity and an empirical formula $C_4N_4H_5Cl$ has been described. Karrer and his co-workers suggest that vitamin A is an unsaturated alcohol with the empirical formula $C_{20}H_{30}O$ or $C_{22}H_{32}O$, an observation which is supported by the work of Heilbron, Drummond and their co-workers. Owing probably to the presence of substances which interfere with the development of the blue colour, the Carr-Price reaction does not yield results which are in keeping with those obtained by biological methods. The intensity of the band at 3280 Å in the whole oil appears to be a very satisfactory measure of biological activity. The mechanism of the transformation of carotene into vitamin A is still obscure: the conversion occurs, presumably, in the liver but there is no evidence to suggest that it is brought about by an enzyme. Deficiency in vitamin A leads to increased nitrogen metabolism resulting in less nitrogen being deposited in the body and more being lost by excretion than when the supply of that vitamin is adequate. The growth-promoting and anti-infective properties of vitamin A are due to its ability to maintain a normal structure in the different tissues of the organism. The isolation of crystalline vitamin D has reduced the interest in biological tests for the antirachitic vitamin. Mention should however be made of the prophylactic radiographic method of Bourdillon and Bruce, bone analysis of Hume, Pickersgill and Goffikin, and analyses of 'line' test and growth-promotion studies of Key, Cowart and Morgan. The review ends with a suggestion that a dietary survey should be carried out to determine the extent to which the various minor diseases are traceable to deficient intake of vitamins. It need hardly be added that similar surveys carried out in the different provinces of India will lead to findings of considerable practical importance.

Method of Manufacturing a Leather Substitute.

[*Ind. Pat.*, No. 18519 dated 23rd November 1932.]

THE above invention by Seiichi Yamamoto, a Japanese engineer, relates to the utilization of the bark of *Arto carpus Kunstleri* known also by the name, 'Kayutarap' in the South Sea Islands. The bark contains a very strong fibre together with 8–12 per cent tannin. The latter is removed by either extraction or spontaneous fermentation: the residue is opened in a wet condition with a roller or by beating to make a coarse network. The clean fibrous product thus obtained is pasted together with couchoc or balata dissolved in a volatile solvent with sulphur, pressed and finally steamed for vulcanization. Boards of artificial leather are thus obtained which have a pleasing appearance, are flexible, elastic, water-proof and resistant to mildew and possess at the same time, high tensile strength comparable only with leather of best quality.

There are numerous trees and shrubs in India the barks or stems of which contain fibre of the desired quality. It is not improbable that some of them may be useful for manufactures similar to those claimed in the above patent.

Science News.

Mr. K. R. Venkatasubban, Science College, Trivandrum, has sent a note in which he records a case of abnormal strobilus of Lycopodium, section Phlegmaria.

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Miss Oldroyd's note on "Liverworts and Fern Sporophytes" published in *Cur. Sc.*, **1**, 7, 216, suffers from the defect that the specific name of the plant is not mentioned. Rai Bahadur Professor Shivaram Kashyap and Mr. A. C. Joshi of Benares Hindu University draw the attention of the author that the specimen she has described is *Gymnogramme leptophylla Desv.* and that the observation she has made has already been recorded by previous authors.

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MR. M. KRISHNA MENON, University Zoological Laboratory, Madras, writes:—

"Larvæ of Decapod Crustaceans form an important constituent of the plankton of the Madras coast. Large numbers of them belonging to most of the families of the order were captured soon after the rains. This abundance seems to be due to the fact that the adults begin to breed as soon as the rainy season has set in. Their number falls gradually towards the close of March and in April; but in the succeeding four months which form the hottest part of the year the fall is sudden and considerable. Further, it has been noticed that the larvæ occurring in the townet collections of these months belong mostly to Anomura and Brachyura. They occur also