

## Research Items.

**Yaksas.**—In 'Yaksas', pt. 2, published by the Smithsonian Institution, Freer Gallery of Art, Dr. Ananda Coomaraswamy continues his study of the Yaksas cults of India. All Yaksas, great or small, are vegetation spirits directly controlling, or bestowing on their *bhaktas*, fertility and wealth. All Yaksas are intimately connected with the waters; for example, Kubera's inexhaustible treasures are a lotus and a conch; innumerable Yaksas have a makara or other fish-tailed animal as their vehicle; Kamadeva has the makara as his cognisance; the greater tutelary Yaksas control the rains essential to prosperity. In the decorative art, vegetation is shown either springing from the mouth or navel of a Yaksa, from the open jaws of a makara, or other fish-tailed animal, or from a conch, but never directly from a symbol representing the earth. But the Yaksas do not so much control the waters as water, as the essence in the water, which is at one with the sap in trees, the elixir of the Devas, especially Agni, with the soma, and the seed in the living being. They are a far greater and mysterious power, and far more significant than the Nagas or dragons, who are also water deities. The importance of the Yaksas in what has been called the Life cult is to suggest that this cult, which is connected with the worship of the Great Mother, may have been the primitive religion of India. A belief in the origin of life in the water was common to many ancient cultures, and must have arisen very naturally in the case of peoples, like those of the valleys of the Euphrates, Tigris, or the Indus, among whom water, whether of the seasonal rains or the overflowing river, was the most serious prerequisite for vegetal increase.

**Hand-Spinning in Egypt and the Sudan.**—The Bankfield Museum, Halifax, has published as No. 12 of the second series of its *Museum Notes*, a study of hand-spinning in Egypt and the Sudan, by Mrs. Grace M. Crowfoot. In this area a number of different types is found, from the most primitive and simple by hand alone to the highest type of suspended spindle-spinning reached before the invention of the wheel. Six types are recognised: (1) Hand-spinning alone, the simplest method known, in which the hand alone is used or with the assistance of the thigh. There is no example in modern Egypt, but it is represented in ancient Egypt. In the Sudan it occurs far to the south among the primitive Nuer. (2) Spinning by twisting a hooked stick, a simple and primitive method found among the conservative nomads, such as the 'Beit Awad' of the Beni Amer. (3) Spinning by rotation of the spindle in the hand, a surprising and beautiful method found among the Sudanese Arab tribes and the Hadendoa of the Red Sea coast. The stick is sometimes plain, and sometimes has a whorl at the tip. Its special value lies in its command over short-stapled wool. (4) Grasped spindle, in which a prepared rove is passed through a ring over a forked stick or other support and is spun on a large spindle suspended in both hands, known only from ancient Egypt. (5) Supported spindle: (a) spindle rests lengthwise on the right thigh and is spun on a large spindle grasped in both hands; (b) spindle spun while standing erect on the ground or in a shell or bowl; 5 (a) is used chiefly for cotton—the only modern example is in Dongola Province; 5 (b), the chief way of spinning cotton in many parts of the world, is used in the Sudan only by immigrants from Sokoto and Bornu. The flax-spinning of modern Egypt shows the influence of ancient Egypt and Europe, cotton-spinning in the Sudan shows strong resemblances to the flax-spinning of ancient Egypt.

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**The Wolf of Corea.**—In Corea a considerable amount of damage is still caused by wolves, and the Tyosen (Corean) Government reports show that rewards are paid annually for the slaughter of more than a hundred individuals. On three occasions, Yoshio Abe visited Corea for material to study the wolves of the region, and these he now describes as belonging to a geographical race of the common wolf, *Canis lupus coreanus*. From the races of the common wolf which inhabit various areas of Asia, the Corean form is distinguishable by the relative slenderness of the muzzle, a character in which it approaches the North American *Canis occidentalis*. In colour, the Corean wolf, which, like other wolves, shows distinct variation in individuals, falls between the common wolf and the pale *Canis lamiger* (*Jour. Sci., Hiroshima Univ.*, Ser. B, Zoo.; Dec. 1930.)

**New North and South American Ascidians.**—Dr. Willard G. Van Name in the *Bulletin of the American Museum of Natural History*, vol. 61, art. vi. pp. 207-225, describes four species of ascidians new to science, and a fifth from Tortugas, Florida, appears to be identical with a Japanese form, *Botryllus primigenus* (Oka), described by Prof. Oka in 1928. This species is noteworthy in that the branchial sac has but 4 rows of stigmata, unlike all other known American and European forms, which have 8 or more such rows—8 or 9 in the common *B. schlosseri*, typical of British waters. In addition the atrial orifices of some of the zooids of *B. primigenus* open directly on to the surface of the colony without the intervention of common cloacal cavities. Of the four species new to science, all are members of well-known families and genera: *Clavelina huntsmani* from the west coast of N. America; *Stolonica zorritensis* from Zorritos, Peru, peculiar in having a small number of gonads all apparently hermaphroditic; *Pyura bradleyi*, also from Zorritos; and *Polyandrocarpa gravei*, a compound styelid of flat encrusting form from Tortugas. As is usual with Dr. Van Name's publications, the descriptions of the species are accompanied by numerous helpful illustrations.

**Antarctic Alcyonaria, Madreporaria, and Antipatharia.**—Sir J. Arthur Thomson and Miss Nita Rennet describe these coelenterates of the Australasian Antarctic Expedition, 1911-14, under the leadership of Sir Douglas Mawson (*Scientific Reports. Series C, Zoology and Botany. Vol. 9, part 3, January 1931*). The collection includes 31 species of Alcyonaria, of which 7 are new, 5 species of Madreporaria, and 2 species of Antipatharia. The most important find is that unique type of alcyonarian *Ainigmaptilon haswelli* Dean, placed provisionally in the Pennatulacea and already described in the *Proceedings of the Linnean Society (Zoology, vol. 36; 1926)* by Miss Isobel Dean. From a narrow main stem, without an axis, numerous short side-branches are given off which subdivide irregularly into twigs bearing many small autozooids. There are four longitudinal septa in the main stem—the most striking pennatulid feature—and the side branches are most nearly comparable, though not identical in structure, with the pinnae of the pennatulids *Virgularia gustaviana* and *V. halisceptum*. However, there is no satisfactory evidence of siphonozooids; also a definite axial canal and an axis are missing. It is, however, possible, although not probable, that the axis was separated from the colony in the dredging, as the septa are torn. *Ascolepsia splendens*, a new genus, is a beautiful alcyonarian belonging to the Primnoidae in the order Axifera. This has a new type of sclerite, chalice-like

in shape. Another species belonging to this genus, *A. spinosa*, is also described, and a form intermediate between these two. The plates are excellent, especially those which are delicately coloured.

**Chromosome Multiples in *Chrysanthemum* and *Potentilla*.**—In a paper just received, N. Shimotomai (*Jour. Sci., Hiroshima Univ.*, Botany, vol. 1, p. 37) describes three species-hybrids of *Chrysanthemum* and the behaviour of their chromosomes. In *Ch. Decaisneanum* ( $n=36$ )  $\times$  *Ch. indicum* ( $n=18$ ) the  $F_1$  hybrid has 54 chromosomes, which form 27 pairs in meiosis, and the pollen grains receive 27 chromosomes. This is presumably because 18 of the chromosomes from the octoploid *Ch. Decaisneanum* pair with each other. Similarly, in *Ch. marginatum* ( $n=45$ )  $\times$  *Ch. morifolium* ( $n=27$ ) the hybrid has 72 chromosomes which form 36 pairs. Again, 18 chromosomes of the higher polyploid parent mate with each other. In *Ch. marginatum*  $\times$  *Ch. indicum*, however, the 63 chromosomes of the hybrid form 18 bivalents and 27 univalents. These hybrids are all intermediate between the parents, but nearer that one with the higher chromosome number. Another paper in the same journal (p. 1) gives chromosome counts in a number of further species of *Potentilla*, and discusses the phylogeny of the genus in the light of the chromosome numbers. It appears that primitive species and subsections have the basal number ( $2n=14$ ) or low multiples, while in the *Hæmatochræ*, regarded as recent in origin and arising in part through hybridisation, the numbers range from 42 in *P. nepalensis* to 112 ( $16n$ ) in *P. hæmatochrus*. It is believed that the originals of *Potentilla* were diploid species with a circumpolar distribution in the Tertiary, whence they afterwards moved southwards, intercrossed, and gave rise to various polyploid species and groups.

**The Classification of Carbonaceous Minerals.**—In 1927 Prof. G. Hickling plotted the percentages of carbon and oxygen recorded in more than a thousand analyses of American and British coals, and found that the points lay on a well-defined and continuous belt covering the whole range from lignite to anthracite, thus demonstrating that these coals are members of a natural, unbroken series. Prof. H. Briggs has now plotted the corresponding data for other carbonaceous materials and recorded the results in the *Proc. Roy. Soc. Edinburgh*, 51, 1931, pp. 54-63. It appears that there are two kinds of cannel coals, the analyses of which fall on distinct 'development' lines. In order of increasing hydrogen, the series recognised are (a) sub-cannels, (b) cannels, (c) paraffin shales, and (d) torbanites. These give lines nearly parallel to the coal belt, and beyond them fall two groups of crude petroleum, heavy and light oils respectively, on lines having a very different slope. It is noteworthy that the further from the coal belt an analysis is situated (in the direction of increasing hydrogen) the more suitable is the mineral as a source of oil. The graphs therefore serve a useful purpose as a standard of reference for distinguishing suitable materials for distillation.

**High Vacua.**—In the June issue of the *Journal of the Franklin Institute*, Dr. S. Dushman, of the research laboratory of the General Electric Company, reviews the advances in the production and measurement of high vacua which have taken place since the issue of his own and of other books on the subject, published five or six years ago. The chief advances are in the introduction of vapour pumps of much higher speeds, the use of what are known as 'getters' to improve the vacuum, and in the more careful investigation of the behaviour of the metal parts of the apparatus towards the vacuum. The usual method of measuring the

speed of exhaust depends on Knudsen's expression for the resistance a tube offers to the flow of gas through it. Condensation pumps are the rule, and the Payne two-stage pump used by the Company is described. It requires a force pump giving a pressure of 2 mm. of mercury, and its speed is given as 60,000 c.c. per second. Pumps using organic liquids instead of mercury, as used in the Eastman Kodak Laboratories, are also described. Magnesium and calcium are the usual 'getters' for oxygen, but for hydrogen and nitrogen, caesium and sodium are more active. Pressure gauges are generally either of the ionisation type, depending on the ionisation produced in the residual gas by accelerated electrons from an oxide-coated filament, or they utilise the temperature or resistance of a thin wire electrically heated in the residual gas. The author collects a considerable amount of information recently obtained on the constitution and amount of the gases in metals and in glass.

**Reflection of Water Molecules at the Liquid Surface.**—Whilst it is relatively easy to investigate experimentally problems connected with the emission and reception of charged particles, the study of the corresponding processes for neutral atoms and molecules often presents considerable difficulty and has received less attention. Prof. T. Alty has contributed a paper to the June issue of the *Proceedings of the Royal Society* in which he describes a determination of the reflection coefficient of water molecules when they are incident on a liquid water surface. The method employed was to measure the rate of evaporation from a water surface of known area as a function of the vapour pressure over the evaporating surface, whence by extrapolation to zero pressure the rate of evaporation into a vacuum could be deduced. The last quantity was then compared with the rate at which molecules struck the surface from the saturated vapour, calculated by the usual kinetic theory relations. The two quantities were of a different order of magnitude, and to reconcile them it is necessary to assume that the large majority of the molecules are reflected from the surface when they strike it, and pass back into the vapour phase. Under the conditions used by Prof. Alty, it appears that only about one per cent of the incident molecules are able to enter the liquid. The average time which a molecule spends in the surface is not greater than about  $10^{-5}$  sec.

**Photochemical Decomposition of Hydrogen Iodide.**—The decomposition of hydrogen iodide gas on exposure to light, first studied by Lemoine in 1877, has been investigated several times, and it has been considered that the gas exhibited continuous absorption to a wave-length of 3600 Å. In the May number of the *Journal of the American Chemical Society*, Rollefson and Booher show that the absorption extends as far as 4000 Å. The absorption on the long wave-length side of 3120 Å. is interpreted as due to dissociation of the molecule into normal atoms (a type of reaction not very common), that on the shorter wave-length side giving an excited iodine atom. Salant and Sandow have reported decomposition with the 4047 Å. line of the mercury arc. The conclusions are based on the value 69,000 gm.cal., or 3 volts, for the heat of dissociation into normal atoms, and the energy 0.95 volt to raise the iodine atom to the first stage of excitation. This gives the corresponding wave-lengths 4120 Å. and 3120 Å. The results are interpreted in terms of potential energy curves. It is concluded that in the zero and first vibrational levels the molecule may be considered as an example of ionic binding.

**Estimation of Bromine in Organic Compounds.**—By substituting butyl alcohol for ethyl alcohol in Stepan-

off's method for the determination of halogens in organic compounds, Dr. F. Schultz claims to have made the method more accurate and even applicable to the determination of bromine in highly brominated hydrocarbons. Stepanoff's method (*Ber.*, 1906, 39, 49) of estimating halogens by treating the substance in alcoholic solution with sodium, thereby converting the chlorine, bromine, or iodine present into the sodium salt, possesses obvious advantages over the Carius tube method. Various modifications have been suggested from time to time, but the method has not hitherto been considered accurate for highly brominated hydrocarbons. In his paper in the May number of the *Collection of Czechoslovak Chemical Communications*, Dr. Schultz describes how he carried out the reaction by gradually adding sodium to the boiling butyl alcohol solution of the bromine compound. Hexabromobenzene, pentabromotoluene and hexabromonaphthalene were examined. After the sodium had all been introduced, boiling under a reflux condenser was continued for an hour. Water was then added before filtration and the acidified solution was precipitated with silver nitrate and 'back-titrated' with ammonium sulphocyanide. The results were in very good agreement with the theoretical values.

**Oxidation-Reduction Potentials in Bacteriology.**—It is now well known that living cells require a constant hydrogen ion concentration in their environment if they are to live and function normally, and in higher animals mechanisms have been developed to maintain this concentration in the tissue fluids constant at a

point close to neutrality. The reducing power of the environment is probably similarly regulated, a balance being struck between the reducing and oxidising tendencies just as there is a balance between the hydrogen and hydroxyl ions. The oxidation-reduction potential can be measured by suitable indicators or potentiometrically. L. F. Hewitt, in a publication, "Oxidation-Reduction Potentials in Bacteriology and Biochemistry", recently issued by the London County Council (pp. 70. Price 2s.), describes a series of investigations on the oxidation-reduction conditions produced by bacteria in the medium by which they are surrounded, and has found striking differences of behaviour between different micro-organisms. Thus aerobes are in general able to reduce ordinary aerobic culture media until a moderately intense reducing level is reached; anaerobes, on the other hand, cannot effect any reduction in ordinary aerobic cultures, but if the medium is partially reduced to begin with, for example, by exclusion of the oxidising effect of air, they are able to establish very much more intense reducing conditions than the majority of aerobes. Pneumococci, again, do not maintain the level of reducing intensity after the logarithmic phase of growth, highly oxidising conditions being gradually established owing to the formation of peroxide. The virulence of hæmolytic streptococci is maintained in culture by opposing the reducing effects of the organisms, through increasing their oxygen supply. It seems possible that a systematic classification of organisms will result from studies of the oxidation-reduction potentials in bacterial cultures.

### Astronomical Topics.

**Distance of the Great Nebula in Orion.**—A *Bulletin* dated June 11, from Science Service, Washington, D.C., gives a summary of a new determination of the distance of this nebula, made by Dr. R. J. Trumpler at the Lick Observatory, and reported by him to the Astronomical Society of the Pacific at Pasadena. He states that three different methods give the distance as 1800 light-years, which is about three times as great as the value generally given; thus Kapteyn gave the parallax of the nebula as 0.0055", implying a distance of 590 light-years. As there is evidence of association between the nebula and many of the bright stars in Orion, their distance is generally taken to be about the same; if the new distance applies to Rigel, it must be of extraordinary brilliance. The table in Russell, Dugan, and Stewart's standard work gives its absolute magnitude as -5.8 with a parallax of 0.006; at three times the distance it would have absolute magnitude about -8.2. The new value gives the diameter of the nebula, neglecting its faint extensions, as 26 light-years. Dr. Trumpler has also investigated the colour of the stars in the nebula; he finds that they are slightly redder than stars of the same type elsewhere, which he ascribes to the absorptive effect of the nebula on their light.

**The Cape Observatory.**—The report of the Cape Observatory for 1930, which has just come to hand, states that the transit circle observations include the sun, Mercury, Venus, and Vesta (which is used to check the equator point), zodiacal stars, and stars south of -30° Decl. down to mag. 7.5. There is the welcome news that the heliometer observations of the outer planets since 1897 will shortly be published. They are likely to help in the determination of Pluto's mass.

Proper motions of stars in the Cape astrographic zone are being deduced by comparing recent photographs, taken through the glass, with those taken several years ago.

The relative trigonometrical parallax of Nova Pictoris came out as -0.013". Another determination was made by co-ordinating the increase of brightness with the expansion indicated by the spectroscope. The value 0.0015" was obtained, which makes the absolute magnitude at maximum -7.9.

The report shows that even before the end of 1930 the Eros programme was in full swing; the most important southern observations would be those made in January and February.

1930 was the driest year at the Cape since 1841, the rainfall being 16.46 in. The extremes of temperature were 104.0° and 35.8°, the annual mean being 63.7°.

**New List of Astronomers and Observatories.**—Prof. P. Stroobant and the other members of the staff of Uccle Observatory have just published a new edition of their useful list. The first edition appeared in 1907 and is now out of date; the new one is brought out under the auspices of the International Astronomical Union, which has assisted in the cost of publication. Very full particulars are given of the observatories; the names of all members of the staff, the department that they are attached to; details about the instruments, and the work for which they are used. The list of astronomers has references to all the pages on which they are mentioned. Full details are also given of the astronomical societies, with a description of their special objects, their dates of meeting, their publications, etc. They are arranged in order of their dates of foundation, the Royal Astronomical Society coming first. Finally, there is a list of astronomical periodicals, with particulars about their special fields of work, dates of publication, and subscription prices. Altogether the volume is one which all astronomers will find most useful; it is printed and edited by Messrs. Casterman, Tournai; the price is not stated.