Research Items

Behaviour of the New-born Monkey. Observations on eleven new-born monkeys in the Carnegie colony of the Department of Embryology, Carnegie Institution of Washington, are recorded in the Year Book (No. 32, 1933). Additional data were derived from subsequent pregnancies in this colony and from one of another species of macaque born in the Yale colony. The full-term macaque baby opens and closes his eyes, cries, reaches out and grasps objects with his hands before he is completely delivered. At birth his flexor muscles are more precocious than his extensors, and their principal function appears to be the seeking of bodily support. By the second day there is a tendency to climb upward. By the end of the first week all the sensory mechanisms show evidence of functioning and the sensory-motor co-ordination develops much more rapidly than in the human infant. Play activities, such as romping, jumping, attempts to leap upon and seize objects, appeared during the second and third weeks but co-ordination of eye and hand and distance perception were quite imperfect. In the relationship of mother and baby much of the behaviour is subject to mechanistic explanation. Equipped with his grasping tendencies and the associated ventro-ventral position, the nosing and mouthing activities of the infant result in the discovery and seizure of the nipple, unaided by the mother. If the baby, through immaturity, lacks sufficient strength and co-ordination to accomplish these ends himself, the mother instinct is inadequate for the predicament, and he perishes.

Temperature Range in Rats. Alexandrine rats (*Rattus rattus alexandrinus*) found in dwelling-houses in Tokyo, were used by N. Yagi and J. Shimoizumi in experiments to determine the limits of body temperature which could be tolerated (*Sci. Rep. Tokyo Bunrika Daigaku*, 1, No. 22; 1934). The body-temperature was measured by the thermocouple method. Normal body temperature ranged from 36·85° to 37·45° C. Lethal low temperature was found to lie between 12·45° C. and 14·6° C., and lethal high temperature 42–43° C. Almost no relationship was discovered between the range of the lethal temperatures and the body weights of the rats, but male rats had a slightly longer range of tolerance at both ends of the scale, the average lethal low temperature being 13·41° C. for males, 13·76° C. for females; and the average lethal high temperature 42·68° C. for males, and 42·19° C. for females. The numbers of rats used in the experiments were 18 (10 males, 8 females) for lethal low temperature, and 18 (11 males, 7 females) for lethal high temperature.

A Fish New to the British Fauna. Prof. W. M. Tattersall (*Ann. and Mag. Nat. Hist.* (10), 13, No. 75, March 1934) records *Ruvettus pretiosus*, Cocco, for the first time from British waters. This fish was caught in September 1933 by one of the Cardiff trawlers in lat. 52° 20′ N., at a depth of 180–200 fathoms. This is due west of Co. Kerry in Ireland, and lies within the British area. Inhabiting the Atlantic at about 400 metres depth, *R. pretiosus* is common near the Canary Islands and Madeira and off the coasts of Spain and Portugal. It has been recorded from the Mediterranean and in the waters round the West Indies; also from Hawaii and Japan. The present specimen measures 3 ft. 7 in. in length, the largest known being 6 ft. It is apparently a straggler from warmer waters, although inquiries into the temperature from the nearest station of the Irish Fishery Board to the locality at which the fish was taken show that while the surface temperatures exhibit considerable variation over several years, the water at 400 metres has not varied more than half a degree over the whole series of years covered by the data. As the author states, "It would seem therefore that the temperature of the water at the bottom could not have been a factor influencing the distribution in any marked way, and cannot be brought into account for its presence off W. Ireland this year and its apparent absence in other years".

***Uronectes fimbriatus*, a Fossil Crustacean.** Dr. W. T. Calman (*Ann. and Mag. Nat. Hist.*, (10), 13, No. 75, March 1934) gives a detailed description of this interesting Permian fossil which was the first to be discovered of those fossil Crustacea now generally grouped together with the recent *Anaspides* and its allies under Packard's name *Syncarida*. There are a few specimens in the Geological Department of the British Museum (Natural History) from Lebach, near Saarbruck, the type locality. One of these is unusually fine, and from this the present description is mainly taken. A very good photographic plate is given of this, which lies on its side, and a second, ventro-lateral, of one from the same locality from the Geologisch-palæontologisches Museum der Universitat, Bonn, presented by Dr. Jordan who, with Meyer, described this fossil (as *Gampsonyx*) in 1847. The close affinity between the Permian *Uronectes* and the carboniferous *Palæocaris* is confirmed by the identity of shape, position and even state of fossilisation of the appendages that are attached to the bases of the legs. The two genera are distinguished only by the enlargement of the second and third pair of thoracic limbs in *Uronectes*. In *Palæocaris* these limbs are similar to the following pairs. Further consideration of the precise relationship between the recent and fossil Syncarida must wait for a decision as to the nature of the basal appendages of the thoracic limbs in the fossil forms. Although there are probably exopods, they differ from those of the recent forms in absence or paucity of segmentation and lack of setæ.

The Scarlet Tulip of the East. A paper by Sir Daniel Hall in the *Gardeners' Chronicle* of June 16 and 23 clears up many difficulties of nomenclature connected with the scarlet tulip which flowers freely in countries of the Near East. Tulips which bear general resemblances to the scarlet eastern tulip have been variously described as *Tulipa oculus-solis*, *T. praecox*, *T. Boissieri*, *T. cuspidata*, *T. Stapfii*, *T. montana*, *T. undulifolia*, *T. lanata* and *T. Hoogiana*. Sir Daniel considers that these should all be classed as forms of one Linnean species—*T. oculus-solis*—with the possible exception of the triploids *T. praecox* and *T. Boissieri*. The specific characters of diagnostic importance are a woolly coating between the bulb and its tunic, an upright stem with usually a 'leg' of about 2 inches before any leaves emerge, and leaves which are somewhat glaucous and narrow pointed. The flower varies considerably in form and colour, but a central black or dark olive disc is almost universal, though even this is not of absolute diagnostic value.

Early Chrysanthemum Blooms. The fact that some plants bloom when the daily period of light is short, in spring and autumn, whilst others flower only in the long days of summer, was established on a sound practical basis by Garner and Allard in 1920. Since that time, horticulturists have been exploring the possibilities of a commercial application of the principle, and a recent publication by Mr. Kenneth Post reports considerable success in this direction ("Production of Early Blooms of Chrysanthemums by the Use of Black Cloth to reduce the Length of Day". *Bull.* 594, *Cornell Univ. Agric. Exp. Stat.*, Ithaca, New York, April 1934). Large box-shaped screens of black sateen were constructed to fit over chrysanthemum plants growing within a greenhouse. The screens were placed in position at 5 or 6 p.m. and were removed at 7 or 8 a.m., in order to provide a daily period of light of 10 or 11 hours. Large-flowered and Pompon types were caused to flower up to seventy days before their usual times. Treatment must be commenced whilst the plant is in the vegetative state, and is apparently ineffective when the flower buds have once formed. The publication under review reports the results of experiments on the effects of various lengths of day, the part of the plant affected, the time of day of treatment, the types of protective cloth, the dates of propagation and of last pinch, and the effect of short and long days alternated. There seems to be little practical difficulty in producing early chrysanthemum blooms; can they be marketed when grown?

Sexuality in Basidiomycetes. A useful paper dealing with sex in two members of the Basidiomycetes has recently appeared in *La Cellule*, **42**, fasc. 3, pp. 249–266; 1934 ("Sexuality of *Polyporus ostreiformis* and *Polystictus hirsutus*" by Prof. S. R. Bose). Monosporous cultures of several strains of each of the two fungi were made on various nutritive media, and it was established that both were bisexual and heterothallic. Mycelia of both sexes remained stable when exposed to wide variations of temperature and light, and when treated with small amounts of chemical poisons. When haploid mycelia of different strain were sown on the same medium, a line or space of aversion was often formed where the two mycelial masses met, but diploidisation occurred and clamp connexions were formed. Diploid fruit bodies produced spores in abundance, but a few haploid fruiting organs which appeared either shed only a few spores for a short time, or produced none at all.

Re-Surveys in Earthquake Areas. In the United States, a sum of 10,000 dollars has been allotted annually for several years for geodetic surveys in regions of seismic activity. During the past year, an arc of close triangulation has been carried out from San Fernando to Bakersfield, California, 110 miles in length and crossing five major zones of active faulting. Another arc along the Californian coast will be of use in determining future movements along the San Andreas fault. The U.S. Coast and Geodetic Survey is now engaged on a plan for covering the whole country with arcs of triangulation and lines of level of first order, and it is estimated that it may be finished in five or six years. Eventually, when the networks of triangulation and levelling, with the 25-mile spacing of arcs and lines, are finished, it will be possible to measure vertical and horizontal displacements of the crust close to any region in which an earthquake may occur (Carnegie Inst., Washington, Year Book, No. 32, 362–364; 1933). In Japan, the bench-marks are about 2 km. apart, but even this distance may be too great to detect the movements of small crust-blocks. Prof. A. Imamura has studied the tilting of a crust-block only 4½ km. across in the Kyoto-Osaka district by means of a series of eleven new bench-marks only half a kilometre apart. The block is bounded to the east and west by well-marked faults. Up to 1928, it was tilted to the west at the rate of 0·5″ a year. Since then, the tilting has been reversed, though the rate remains almost the same (*Tokyo Imp. Acad. Proc.*, **10**, 69–72; 1934).

Magnetic Survey of Sweden. In *Kungl. Sjokarteverket, Jordmagnetiska Publikationer*, No. 9 (Stockholm, 1934), Dr. Gustaf Ljungdahl gives an account (in English) of the origin, methods and results of the first systematic and comprehensive magnetic survey of Sweden, which was made by the Hydrographic Service in the years 1928–30. Very great care was taken in the selection of the stations (86 in number), choice being made of such as were likely to remain available indefinitely in the future for repeat observations to determine the secular variation; also the variation of the vertical force in the neighbourhood of each station was examined by means of a Schmidt local variometer, in order that the stations adopted should be as free as is possible (in a country so magnetically disturbed as Sweden) from rapid local gradients of the magnetic field. All three magnetic elements were determined at each station using a combined magnetometer and earth inductor (Carnegie Institution of Washington type). The reduction to the mean epoch of 1929·5 was made by reference to the continuous magnetograph registrations of the Swedish observatory at Lovö, the Danish observatory at Rude Skov, and that of Finland at Sodankyla. The methods and results are fully described, and set out in tables and maps. The latter give isomagnetic lines, both 'terrestrial' (or smoothed) and 'true', and there is also a map showing the deviation of each element at each station, from the computed 'terrestrial' value.

Graphical Determination of a Flight Course. Recent research into the effect of meteorological conditions upon the performance of aircraft at considerable altitudes, carried out at the California Institute of Technology (Science Service, April 25), have resulted in the development of an extremely useful graphical method of rapidly determining the most efficient flight course for an aircraft under any given conditions. The theoretically optimum flight of an aeroplane of definite performance for a given distance can be found to consist of a combination of a period of climb at a reduced speed, followed by a prolonged gradual dive at increased speed. Full advantage of this can be taken by making use of modern developments in supercharging the aero engine and using a variable pitch airscrew, which makes it possible to maintain a desired speed at any height, within reasonable limits. The meteorological variables in this calculation are wind velocity, its change with altitude, and its angle to the course, and with the development of the technique of examining these, and the organisation for the rapid distribution of this knowledge, it has become possible to obtain it quickly and accurately enough to make use of it

previous to starting a flight. The scheme proposed by Mr. W. C. Rockefeller of the California Institute consists of a combination of charts and tables to be used systematically in such a way that the best flight path can be determined in fifteen minutes, without the necessity for any extensive knowledge of the theoretical principles involved. Thus the flight can be made in the shortest possible time, or alternatively, if working to a time table, with the lowest expenditure of power for the trip. The accuracy of the result naturally depends upon the maintenance of the assumed meteorological conditions during the flight. There are many technical reasons for limiting the time of an economic commercial flight to about 4 hours and the distance to the order of 500 miles, and within these the above assumption is reasonably correct.

Raman Spectrum of Water. I. Ramakrishna Rao (*Phil. Mag.*, June 1934) has gone over the very extensive work on the Raman spectrum of water in various phases, including some new experimental work of his own. He has compared the Raman frequencies with the infra-red frequencies and obtained some fresh light on the molecular constitution of water. The Raman spectrum of liquid water shows for each exciting line a broad band in which the author finds three maxima. The spectrum with ice showed a band with only two components, and that of water vapour shows one sharp line corresponding to the infra-red absorption band. Water of crystallisation in a number of crystals also shows one or more diffuse bands. A marked change in the Raman spectrum corresponding to the liquid-vapour transition is characteristic of polar molecules, and may be due to the interaction of molecules or to polymerisation. The three-component structure of the liquid water band is ascribed to polymerisation, and preliminary work has shown that the relative intensities of the maxima change with temperature. Thus correlation between the infra-red and Raman spectra of liquid water does not seem very certain. The frequency characteristic of the vapour molecule is entirely absent in the ice spectrum.

The Imperial Standard Yard. When Queen Elizabeth in 1584 took action which resulted in a British system of weights and measures, the most accurate method of comparing lengths was by beam compasses, and the Exchequer yard was an end standard. The micrometer microscope made the distance apart of fine lines a more accurate measurement, and the reconstructed Imperial standard yard of 1855 was defined as the distance apart of two fine lines on two gold plugs near the ends of a certain bronze bar at 62° F. Messrs. Sears and Barrell, of the National Physical Laboratory, have been engaged for several years in determining the yard in terms of the wave-length of the red cadmium line in vacuum, and their methods and results are embodied in two memoirs in the *Transactions of the Royal Society*, vols. A, 231 and 233. Two tubes of invar about 10 cm. long are closed at each end by half silvered glass plates, and the distances apart of the silvered surfaces determined in terms of the wave-length. One of these tubes is then compared in length with one of 33 cm. length by placing them in series and obtaining Brewster's fringes. The 33 cm. tube is then compared by the same means with one about a yard long. The final result is that the Imperial standard yard is 1,419,818·31 wave-lengths of the red cadmium line in vacuum. The value obtained by Dr. A. E. H. Tutton in 1931, and published in his *Phil. Trans.* paper in that year, was 1,420,209·8 wave-lengths.

Isomers of Carotene. From the annual report of the Carnegie Institution of Washington, Year Book No. 22, 1933, it would appear that an active attack upon the complex problems presented by the yellow leaf pigments is continuing in the Division of Plant Biology under the general direction of Dr. H. A. Spoehr. It is now clear that at least two isomers of carotene are usually present in the plant source, α-carotene, characterised by its optical activity, and β-carotene, which is optically inactive. The carotene prepared from leaf sources by the Carnegie workers has always been the optically inactive form, though leaf sources for optically active carotene have been found by Japanese and German workers. Dr. Smith has succeeded in preparing a highly purified preparation of α-carotene from the carotene mixture obtained from carrots. His method consisted mainly in the differential absorption of the optically inactive form by a mixture of 'norit' and siliceous earth, after this had been previously heated to 500° C. *in vacuo* and then allowed to cool in an atmosphere of nitrogen or carbon dioxide. The absorption spectra, solubilities, etc., of both isomers are under study and some evidence has been found of the presence of yet another yellow component, though as a rule the behaviour of the pigment extracts is compatible with the existence of two components in solid solution. A further study of the degree of unsaturation confirms earlier work, and every form of carotene appears to absorb eleven molecules of hydrogen per one molecule of pigment. These studies are of vital importance in view of the significance of carotene in vitamin studies.

Spectra of Wolf Rayet Stars and Novæ. Observations of the contours of emission bands in the spectra of Wolf Rayet stars and novæ have been made by C. S. Beals (*Pub. Dom. Astrophysical Obs.*, **7**, No. 9) with the view of testing the author's theory of the origin of these bands. This theory assumes the continuous ejection of atoms from the surface of a star, and will explain any symmetrical band contours by postulating a suitable frequency distribution of ejected atoms. Flat-topped contours would result when there are no velocities in the vicinity of zero. The author gives a useful account of the method of calibrating stellar plates for spectrophotometric purposes by means of a neutral tint absorbing wedge placed in front of the slit of a spectrograph, and also of a new type of microphotometer used for the intensity measurements. The results show that flat-topped bands are present in the spectra of Nova Aquilæ and Nova Cygni, but in the case of Wolf Rayet stars such contours are exceptional, indicating a very different frequency distribution of the ejected matter. An important by-product of this investigation is the advance made in the classification of Wolf Rayet stars, through the measurements of total intensities in 64 emission bands. It appears that they may be divided into two sequences, called the 'Carbon Sequence' and the 'Nitrogen Sequence'. These are approximately parallel (as regards ionisation level) and the presence of both neutral and ionised helium in each of them has hitherto masked their separate character. The intensities are also used in a brief discussion of the temperatures, using Zanstra's method. Approximate values of 50,000°–100,000° are obtained for Wolf Rayet stars, 65,000° for Nova Aquilæ, and 20,000° for *P* Cygni.