

which the instruction is efficient. If two languages are taken (other than English), one of the two must be Latin unless "the Board are satisfied that the omission of Latin is for the educational advantage of the school." This regulation has done injury to the study of German, and the British Science Guild and several teachers' organisations have objected. The Board now state that Latin will not be demanded if instruction therein is available in other accessible schools. The Board fear that the prospects of the pupils will be prejudiced if Latin is omitted, as they may be debarred from entry into professions and from university work in literary subjects. To the present writer it appears prejudicial to national progress that the education of thousands of boys and girls should be made less efficient because certain chartered corporations hold antiquated views regarding school curricula (on which subject they are seldom qualified to advise), or because those corporations may regard the exclusion of the un-Latined as a convenient social precaution.

The memorandum contains many useful suggestions with reference to the work of the more advanced pupils, and, so far as science is concerned, the recommendations will be approved by most of those who have had practical experience. Modified specialisation is the keynote—thus pupils specialising in science and mathematics should take English literature and composition and one foreign language, "which for those who have already spent some years in the study of French should by preference be German." Specialisation in art, economics, and domestic courses are also contemplated by the Board as permissible in selected schools, but with provision for the continuance of general education. As regards the main portion of the school, the study of science (including practical work) should extend continuously over four years. "This will be required in all schools unless special reasons to the contrary can be given." Boys who are working in preparation for an advanced course in classics may have a science course for three years (instead of four) between the ages of twelve and sixteen, if this course be supplemented by the inclusion of science among the subsidiary subjects taken at the specialising stage. This and similar statements in the memorandum should strengthen the resistance of enlightened headmasters to the injuriously narrow specialisation which still appears requisite for winning a scholarship at the older universities.

G. F. DANIELL.

#### THE SPREAD OF THE METRIC SYSTEM.

IN a circular letter, dealing with the world-wide spread of the metric system, the Decimal Association points out that the time is soon coming when metric usage, instead of being regarded as a hindrance to British trade with the Far East, will have to be adopted as a necessity in our dealings with China, Japan, and Siam, which have each taken definite steps to establish that system. Already the Advisory Council of China has passed the first reading of a law to that effect, and two Chinese gentlemen are now in Paris studying the technical details of the subject. Japan has for the present four legal systems of weight and measure, but the Government has declared its preference for the metric system by making it obligatory for the services of the customs excepting a few articles. The metric system is taught in all the public schools of Japan, and is prescribed for the army, for medicine, and for electrical work. Siam has employed the system with success on its railways and public works for some years, and last year joined the International Convention of the Metre, from

which it has received the apparatus needed for a Central Bureau of Standards at Bangkok. Siam proposes not to make metric reform compulsory at one and the same time in all parts of the kingdom, but to deal with each province separately at convenient times. Russia also has adopted the metric system for several purposes, and has announced to the Decimal Association that the metric system is favoured, but has to await the necessary arrangement of control and inspection throughout the Russian Empire. This conversion of Russia is notable as completing the solidarity of all Continental Europe in metric reform. All South and Central America are either metric or tending to be so. The Australasian Dominions of Great Britain have urgently pressed the question; and last, but most important of all, are the United States of America, which have gone far in preparing for reform, and will act with vigour when the time comes.

#### ZOOLOGY AT THE BRITISH ASSOCIATION.

SECTION D presented a full programme, the large number of communications rendering necessary morning and afternoon sessions. Interest in the proceedings was well maintained, good audiences being present throughout the meetings. A striking feature of this year's programme was the large number of papers dealing with vertebrate anatomy and morphology.

##### *Some Aspects of the Sleeping Sickness Problem.*

A lecture on this subject was delivered by Prof. E. A. Minchin. He referred briefly to the chief signs and symptoms of sleeping sickness, and described the main features of trypanosomes, remarking that the tendency of natural evolution appeared to be for the pathogenic species to adapt themselves to certain species of hosts, to which they become quite harmless. *Trypanosoma brucei*, *gambiense*, and *rhodesiense*, however deadly to domestic cattle and man, are harmless to the wild game, which appear to be their natural hosts. There is evidence that *T. rhodesiense* is a newly arisen strain of *T. brucei*, which has recently acquired the power of living in human blood, and, as a "new" parasite of man, is extremely virulent. Prof. Minchin pointed out the principal characters of tsetse-flies (*Glossina*), and the part played by certain species in transmitting the trypanosomes of sleeping sickness. In about 5 per cent. of the flies fed on infected blood, the trypanosomes ingested go through a complicated developmental cycle, multiplying in the fly's digestive tract, and, after a time, migrating forwards and passing into the salivary glands, where they establish themselves, multiplying constantly so long as the fly lives. It has been proposed to exterminate the wild game on a large scale in order to remove this "reservoir" of the disease, but Prof. Minchin considered it to be doubtful whether this would bring about the desired effect. Destruction of the game would remove only a portion of the reservoir, for ruminants generally, including domestic stock, can harbour the trypanosomes in question, and, further, such destruction, by removing the natural food of the flies, might cause the flies to move closer to human habitations, and hence increase the transmission of the disease among human beings and domestic stock. He hoped, therefore, that if game is to be destroyed, this will be done in limited areas only, until more accurate knowledge of the results has been acquired. He suggested that reduction of tsetse-flies might be effected, (1) by protecting the wild gallinaceous birds, by introducing species

not indigenous, and by encouraging the natives to keep domestic fowls round their villages, for such birds, when scratching up the ground, would find and destroy the pupæ of *Glossina*; and (2) in areas where *G. morsitans* is common, by tarring or stopping up in some way all holes in trees near the villages.

#### *Bionomics of Amphidinium operculatum.*

Mr. R. Douglas Laurie described observations, made chiefly on the Cheshire coast, on this Peridinium, which occurs in such numbers as to form brownish-green patches on the sand, just below high-water mark of spring tides. The organism exhibits three periodicities (1) A daily periodicity; during the latter half of February the patches were very evident on the surface of the sand until 10 a.m., then the organisms retired below the surface, reappearing shortly after noon, and reaching a maximum from 2 to 4 p.m., after which they again disappeared. Experiments indicate that light and tide are the determining factors, temperature being apparently unimportant. (2) A lunar periodicity, "spring" periods of activity, alternating with "neap" periods of inactivity, being correlated with the amount of water in the sand, for the neap tides do not reach the region inhabited by *Amphidinium*. (3) An annual periodicity, a strongly marked maximum from February to the end of April being followed by decrease during May and June. The patches have not been seen on the sand since the first week of July, though microscopic examination showed that a few *Amphidinium* were still present. Mr. Laurie described a large and more elongate form of *Amphidinium*, which he is inclined to regard as a distinct species.

#### *Influence of Osmotic pressure on the Regeneration of Gunda.*

Miss Jordan Lloyd described observations on the small marine triclad Turbellarian, *Gunda ulvae*, which lives in great numbers at Plymouth, between tide-marks, and near the course of a small stream. The specimens employed in the experiments were about 5.5 mm. long, and were cut transversely into two equal parts. The regeneration of the posterior region only was considered. Whole worms can live in water having an osmotic pressure between 2 and 33 atmospheres. Regulation of an anterior portion of *Gunda*, resulting in the production of a complete worm, takes fifty days in water having an osmotic pressure between 15 and 22.5 atmospheres (the latter being that of ordinary sea-water). Lowering the osmotic pressure below 15 atmospheres retards the rate of regulation proportionately, and below 5 atmospheres no regulation occurs. Raising the osmotic pressure above 22.5 atmospheres retards the rate of regulation, and above 30 atmospheres no regulation occurs. The new posterior region is formed by the migration of large numbers of parenchyma-cells to the region of the wound, where they aggregate and build up the new organs. Inhibition of regulation seems to be due to some factor which checks the migration of the parenchyma-cells. In examples showing retarded regulation, irregularities in the mitotic divisions of the parenchyma-cells have been noticed.

#### *Habits and Building Organ of the Tubicolous Polychaete, Pectinaria koreni.*

As the result of his observations on living *Pectinaria*, Mr. Arnold T. Watson considers that the process of tube-building is as follows:—A working space is first cleared, the sand around the lower, wider end of the tube, which is well below the surface, being removed by a very strong upward current, created within the tube by peristaltic action of the body-wall of the

worm. This current causes the sand to pass rapidly through the tube, between it and the dorsal body-wall of the worm, and to be ejected through the small upper end of the tube, forming a mound on the surface of the sea-floor. A supply of sand is then carried by the tentacles to the head of the worm; one portion of this sand is swallowed for food and passes through the body of the worm, a second portion is carried by papillæ, which form a track from the ventral edge of the peristomium to the bilobate building organ just below, on reaching which, each grain accepted for building purposes is received and held between the two lobes. These lobes apply the sand-grain to the free edge of the tube, where it is fixed by the cement poured out by the underlying cement-gland.

#### *Eelworms.*

Mr. Gilbert E. Johnson described some of the more recent work on eelworms (*Anguillulidæ*), a group of microscopic round-worms which, besides purely free-living forms, includes species living saprozoically in decaying substances, while others are parasitic in animals and plants. The saprozoic forms (*Rhabditis*, &c.) find their nourishment and multiply rapidly among the swarms of bacteria flourishing in substances decaying in the soil and elsewhere, though whether the worms feed on the bacteria or on the products of their action is not yet known. The few species inhabiting animals, and regarded as parasites, are well exemplified by *Rhabditis pellio*, the larvæ of which inhabit the coelom and nephridia of the earthworm. Mr. Johnson traced the life-history of this species, showing that the active forms in the nephridia, and the encysted forms in the coelom, remain larval until the earthworm-host dies and decays in the soil. Then the eelworms feed in its decaying carcase, grow rapidly, become mature, and reproduce. When the nourishment from the dead earthworm is exhausted, the larvæ wander into the soil and infect another worm, entering by the nephridiopores into the nephridia, and by the dorsal pores into the coelom. The larvæ entering the coelom are attacked as foreign bodies by the amœbocytes, and encyst. It is doubtful whether the term parasite should be used for this species, since the mode of nourishment is saprozoic. Other well-known eelworms—*Tylenchus*, *Aphelenchus*, and *Heterodera*—pierce the cellular tissue of plants by means of the hollow stylet protrusible from the mouth-cavity, and absorb the cell-sap. There are also numerous "semiparasitic" forms, which occur round the roots of ordinary healthy plants, and apparently do no damage, but it would be interesting to ascertain what would be the result of their absence on the health of the plant.

#### *The Larva of the Star-fish, Porania pulvillus.*

Dr. J. F. Gemmill has traced the development of this star-fish. The eggs are small, and the general larval history is similar to that of *Asterias rubens*. The late larva is a brachiolaria with a well-marked sucker, and numerous small papillæ on and between the brachia. The features of special interest presented by the larvæ were:—(1) The presence, in early larvæ, of possible rudiments of a posterior enterocœlic outgrowth; (2) the occurrence, among the later larvæ, of several specimens with double hydrocœle formation; and (3) the presence, in normal and in double-hydrocœle larvæ, of a "madreporic" vesicle, the floor of which contracted rhythmically during life.

#### *Observations on Artemia salina.*

Mr. T. J. Evans recorded observations made on this Crustacean, in graded strengths of sea-salt solution from 4 to 25 per cent. It was found that the

Artemia, in 8 and 10 per cent. solutions, attained maturity without the introduction of extraneous food. The food supply was *Chlamydomonas* sp. in various stages of its life-cycle. The nauplius stages of Artemia die unless the brine contains a supply of free-swimming monads, but the adults live on the resting stages of the monads. The food supply present in the surface film is so great that Artemia spends much of its time feeding there, and it is probable that the habit of swimming on its back was adopted by Artemia as an adaptation for feeding in the surface film. In 4 and 5 per cent. and in 20 and 25 per cent. brine-solutions, either the eggs did not hatch or the young nauplii died as soon as the eggshell burst. Adults transferred from the optimum solutions (8 and 10 per cent.) lived in the weaker and stronger brines, and the eggs laid by them lived. It was found that eggs would hatch in any brine solution in which they had been produced. No variation of the order described by Schmankewitsch was found; the tail-lobes were of uniform size in all strengths, and possessed the same number of spines.

#### *Pseudohermaphrodite Examples of Daphnia.*

Dr. J. H. Ashworth directed attention to four abnormal female examples of *Daphnia pulex*, in each of which the antennule of one side resembled that of a male. No other male secondary sexual character was present, except that in one case the margin of the carapace presented almost the configuration of that of a male. The reproductive organs of all the specimens were normal ovaries, and were not parasitised. The offspring of two of the specimens were examined and found to be all normal.

#### *Position of the Order Protura.*

Mr. R. S. Bagnall discussed the position of the order Protura, to the "abdominal feet" of which he did not attach so much importance as some authorities have done. While recognising the affinities of the Protura to the Chilopoda, he considered the relationship with the Insecta to be closer.

Mr. Bagnall also gave a brief account of the hymenopterous parasite, *Thripoctenus russelli*, found in the larvæ of the bean thrips, *Heliothrips fasciatus*. He also recorded *Thripoctenus* found in association with various thrips in several English localities, and commented on the economic importance of these parasites of thrips.

#### *Oviposition of a Fly on Centaurea.*

Prof. Hickson communicated a paper by Mr. J. T. Wadsworth on the oviposition of the Trypetid fly, *Urophora solstitialis*, on *Centaurea nigra* and allied composites. This fly possesses a highly developed piercing ovipositor, which, when fully extended, is nearly twice the length of the fly. During oviposition the abdomen of the fly is pushed down between the bases of the lowest and outermost bracts of the flower-head, and the piercing portion of the ovipositor is forced downwards and inwards towards the axis of the flower-head, and then gradually bends upwards until its tip is finally in the space between the young florets and the overlying bracts, in which space the ova are deposited. The larva, after hatching, burrows through the corolla of a young floret, travels down to the ovary, and feeds there, its presence causing the growth of a "gall."

#### *Observations on a West African Wasp.*

Prof. Poulton recorded observations by Mr. W. A. Lamborn, in Southern Nigeria, on the wasp, *Synagris cornuta*, in the males of which there is remarkable difference in the grade of mandibular development. A

male with very large mandibles terrorised four others with smaller mandibles, and was thus successful in capturing a female (the case being one of marriage by capture), which emerged from a nest under Mr. Lamborn's observation. Prof. Poulton suggested that the immense horn-like mandibles are a disadvantage in obtaining food and perhaps in other ways in the struggle for life, and that the emergence of the females covers a period long enough for this struggle to tell, so that the males with small or rudimentary "horns" have the advantage in the end through the operation of natural selection, while the others have the advantage at the beginning through sexual selection in the form of battles between the males.

#### *Heredity of Melanism in Lepidoptera.*

Mr. W. Bowater described experiments on various melanic Lepidoptera. He pointed out that in *Amphidasya betularia* the melanic form is now more common than the typical form, and stated that a breeding experiment seemed to point to the Mendelian dominance of melanism in this species. He also recorded the results of pairings of typical and melanic examples of *Odontoptera bidentata*. He found that distinct segregation occurred, that homozygous and heterozygous melanic forms were indistinguishable, that extracted types bred as true homozygotes, and that two heterozygous blacks, when paired, gave, in eight families, 75 per cent. black and 25 per cent. type. Mr. Bowater claimed that the specimens bred, 1800 in number, proved that melanism in this species is a simple Mendelian dominant.

#### *Pseudacraeas and their Acraeina Models on Bugalla Island, Victoria Nyanza.*

Dr. G. D. H. Carpenter found that on Bugalla Island, in the Sesse Archipelago, Victoria Nyanza, there abounds a species of Nymphaline butterfly, *Pseudacraea eurytus*, which has several forms closely mimetic of various species of the Acraeina genus Planema. The 356 specimens of *Pseudacraea* caught by him in 1912-13 were excessively variable, intermediates between the various forms being as common as the types. Such intermediates are of the rarest occurrence on the mainland shore of the lake at Entebbe (twenty-five miles N.E. of Bugalla), but the typical forms abound there. On Bugalla Island the model Planemas are very scarce, probably from scarcity of the food-plant, so that their presence can be of little protective value to the *Pseudacraeas*; hence any specimen which exhibits variation away from the type of the model has as much chance of escaping enemies as a form which closely resembles the model. On the mainland, however, Planemas are plentiful, so that their presence is of definite selective value for the mimics; consequently variations of the mimic are at a disadvantage in the struggle for existence, and are rarely found on the mainland, but the typical mimetic forms are abundant. It was claimed that this case afforded strong evidence of the reality of mimicry, and of the power of natural selection to keep up the mimetic likeness.

#### *Geographical Relations of Mimicry.*

Dr. F. A. Dixey pointed out that certain definite schemes of colour and pattern in the wings of butterflies are characteristic of certain definite geographical regions and even of smaller districts, and cited in illustration the well-known combination of red, black, and yellow Ithomiine, Heliconiine, Nymphaline, and Pierine butterflies in Central and South America. He remarked that it was natural to seek for an explanation in the direction of a common influence exercised by the geographical environment, but that this ex-

planation is attended by such extreme difficulty as to be practically put out of court. The interpretation which at present holds the field is that which attributes the resemblances in colour, with their correlated geographical modifications, to the action of mimicry, either Batesian or Müllerian.

#### Mimicry.

Prof. Poulton opened what was intended to be a discussion on mimicry, but the opposition did not appear to be present in force, and there was not a real debate. Prof. Poulton directed attention to the injuries actually seen to be inflicted on butterflies by wild birds, and laid stress on disabling injuries, such as the loss of a whole wing or the head, indicating that the insect had not escaped, but was abandoned by the enemy. Such injuries are especially characteristic of the great groups which supply the models for mimicry, e.g. the *Danainæ* and *Acræinæ* in Africa. The crops of enormous numbers of birds have been examined and stated to contain no remains of butterflies, but Prof. Poulton contended that the force of this requires reconsideration in the light of the recent work of Mr. C. F. M. Swynnerton in south-east Rhodesia. Pellets thrown up by captive insectivorous birds had been collected by Mr. Swynnerton, and were exhibited at the meeting, together with examples of butterflies belonging to the same species as those devoured. These pellets, when broken up, would have come under the well-known classification, "insect débris, unrecognisable," but Mr. Swynnerton has shown that no safe conclusion as to the nature of the pellets can be drawn except after microscopic examination sufficiently minute to detect the presence of lepidopterous scales and their sockets. The objection against the origin of mimicry by small variations was met by the exhibition of mimetic females of *Acraea alciope*, from the west coast of Africa and from western and eastern Uganda. In the first series the female *Acræas* mimic the brown male (and in some species the female also) of the *Acræine* genus *Planema*, in eastern Uganda, they mimic the male of *P. macarista*, and the male and female of *P. poggii*, with an orange bar across the fore-wing and a white bar across the hind-wing. In western Uganda the transitional forms are found, some of the female *Acræas* exhibiting a pattern similar to that of the west coast form, while others show an incipient white bar across the hind-wing, but the fully formed eastern mimic is not known to occur in this locality. In the intermediate zone of country the intermediate variation is met with, connecting the western mimic with the eastern. Prof. Poulton cited examples of mimicry between the genera of certain African Nymphalines, pointed out the development of secondary resemblances between the mimics, and exhibited series of models and mimics taken in one sweep of the net in Lagos, thus showing that the mimics actually fly in the company of their models. He also showed illustrations and specimens of a few cases of mimicry in temperate North American butterflies, and pointed out what he believed to have been the evolutionary history. If this history be correct, then it is impossible to explain the resemblance as due to the influence of environment, because recent invaders from the Old World into this region have caused the mimetic modification of indigenous species. According to the theory of environment the invaders and not the residents ought to have been modified.

Prof. van Bemmelen remarked that mimetic resemblances required to be very carefully analysed. He had attempted to show that some of the patterns on the wings of butterflies were old and others new, and he suggested that some resemblances might be

traceable to a pattern existing far back in phylogeny, and that the subject should be further investigated from this point of view.

#### Other Papers on Lepidoptera.

Sir George Kenrick discussed the classification of the Pierines, and Mr. G. T. Bethune-Baker exhibited, with the aid of the epidiascope, specimens showing changes in pattern, colour, and structure (e.g. the genitalia) in the *Ruralidæ* which lead him to conclude that pattern is very generally correlated with structure. Mr. G. D. H. Carpenter communicated observations on the enemies of "protected" insects with special reference to *Acraea zetes*. Such insects, "protected," for instance, by their distastefulness from the attacks of vertebrates, are preyed upon by predaceous insects and parasites.

#### The Ascidian *Diazona violacea*.

Prof. Herdman exhibited specimens of this compound Ascidian, which he had dredged recently in the Hebrides. When alive the colony was bright green, but when preserved in alcohol it became violet in colour. Other specimens preserved in formalin retained their green colour. Green specimens dredged from deep water changed their colour in sunlight, and finally acquired a violet tint. The green colour is not due to chlorophyll, but to an allied pigment which has been named syntethin. The green Hebridean and the violet Mediterranean form are undoubtedly the same species.

#### Early Evolution of the Amphibia.

Mr. D. M. S. Watson described the osteological characters of the Amphibia of Carboniferous, Permian, and Triassic formations, and concluded that, taken as a whole, the rhachitinous Amphibia of the Permian are intermediate in their structure, as they are in time between the embolomorous Carboniferous and the stereospondylous Triassic types, and it would seem that each of the three groups is to be regarded as ancestral to that which follows it. The almost absolute identity of the skulls of *Pteroplax*, an embolomorous Amphibian of Carboniferous type, and *Seymouria*, which has the most primitive skull of any known reptile, seems to show definitely that the reptiles did arrive from that group of Amphibia, presumably in early Carboniferous or Upper Devonian time. Mr. Watson suggested that the development of the bi-condylar articulation of the skull of Amphibia is to be correlated with the increasing depression of the skull, and is a characteristic Amphibian feature.

Prof. Elliot Smith referred to the difficulty presented by the Amphibian cerebral cortex in regard to the phylogeny of the mammalia. He pointed out that in *Petromyzon* the cerebral cortex is rudimentary, in *Selachians* it is more highly developed, and in *Dipnoi* is almost as well developed as in reptiles, but in Amphibia is degenerate and feebly efficient. But *Amniota* must have gone through some Amphibian ancestry. It is now evident that the retrogression of the Amphibian cortex must have taken place since the reptiles branched off the Amphibian stem.

#### Metamorphosis of the Axolotl.

Mr. E. G. Boulenger gave an account of the experiments which he had recently conducted on the metamorphosis of the Mexican axolotl (*Amblystoma tigrinum*). He concluded that the axolotl will, with a few exceptions, transform if placed under special conditions which force it to breathe air more frequently than usual; that starvation, irregular feeding, and temperature have no influence on the metamorphosis; that elimination of oxygen from the water

has likewise no bearing on the point, as, in these circumstances, the animal will not rise to the surface and use its lungs at more frequent intervals than animals placed under normal conditions. Mr. Boulenger stated that up to a certain point only could the shrinking gills and fins of the animal be made to undergo renewed development (when transferred from shallow to deep water).

#### *Homology of the Gills.*

Prof. H. Braus described the results of a number of transplantations carried out on the larvæ of *Rana*, *Hyla*, and *Bombinator* by Dr. Ekman. The gill-ectoderm was detached before the gills had formed, and was transplanted to some other parts of the tadpole. Such gill-ectoderm gave rise to gill-filaments, but not to gill-clefts; circulation of the blood was also wanting, and the filaments soon perished. If the gill-ectoderm was raised, turned round through  $180^\circ$ , and replanted on the same area, gill-filaments were formed with circulation and gill-clefts, the latter being turned  $180^\circ$  from the normal position. It is concluded, therefore, that the ectoderm alone is able to produce gills, and determines their position and form, but the further development of the gills is dependent on the ingrowth of mesoderm (vascular system). "Foreign" ectoderm, *i.e.* ectoderm which under ordinary circumstances does not develop gills, behaves differently according to the part of the organism from which it is taken. That taken from the trunk or the dorsal part of the head and planted in the position of the gill-ectoderm does not give rise to gills, but if ectoderm be taken from the region above the embryonic heart and transplanted to the position of the gill-ectoderm, there are formed gill-filaments and clefts as in the normal animal. It is not yet certain what factors induce this ectoderm to imitate the gill-ectoderm, but Prof. Braus regards this imitation as of fundamental importance in relation to theories of homology.

#### *Cultures of the Embryonic Heart.*

Prof. Braus exhibited by the microkinematograph the beating heart of a tadpole (6 mm. long), which had been in the culture-medium seven days when the photographs were taken. He demonstrated the regular rhythm, about eighty beats per minute, the suspension and irregularity due to the chemical rays of light, also typical "refractory" periods, and the growth of the pigment cells. At this period of development the heart has no ganglion cells and nerves are not present, nor are muscle-cells distinguishable; it seems therefore that the protoplasmic links between the cells must be the conductors of the stimuli which pass along the heart.

#### *Phylogeny of the Carapace and Affinities of the Leathery Turtle.*

Dr. Versluys directed attention to the special characters exhibited by the carapace of the leathery turtle (*Dermochelys coriacea*), pointing out that in other Testudinata the carapace is formed by a relatively small number of plates firmly united to the vertebrae and ribs, but in *Dermochelys* the carapace is composed of a number of small thin plates, forming a mosaic, separated from the inner skeleton by a thick cutis. *Dermochelys* is not primitive, for its cervical vertebrae show that it is derived from a Cryptodiran ancestor. That this ancestor possessed the typical carapace is shown by the fact that parts of it are still found in a reduced state in *Dermochelys* represented by the deeper or "thecal" layer of the dermal skeleton. Prof. Dollo has maintained that the "epithec" skeleton is a new formation, but Dr. Versluys is in-

clined to assume that, in the ancestors of the Testudinata, there were rows of epithelial elements (though feebly developed) beginning in the neck and continuing over the thecal shell to the base of the sail, and that the ancestors of *Dermochelys* reduced their heavy thecal shell and replaced it by the new mosaic shell formed by a proliferation of the marginals and other epithelial elements.

Prof. Dollo discussed Dr. Versluys's conclusions, and stated the reasons which led him still to regard the mosaic carapace of *Dermochelys* as an entirely new structure. He held that a study of fossil Chelonians permitted no other interpretation. He did not consider *Archelon* (Upper Cretaceous) as an ancestor of *Dermochelys*, but rather *Eosphargis* (Lower Eocene), because of the nature of the plastron.

In reply Dr. Versluys said that whether or not *Archelon* was an ancestor of *Dermochelys*, both possessed an epithelial mosaic carapace, of which the marginals formed part.

#### *Unilateral Development of Secondary Male Characters in a Pheasant.*

Dr. C. J. Bond exhibited the skin of the white-ringed Formosan variety of the Chinese pheasant, the plumage on the left side of which was roughly that of the adult male. The left leg showed a spur, but there was no spur on the right leg. The white-ringed neck feathers occurred in a half-circle on the left side only; the wing primaries and coverts were female in character, except for a few male feathers on the left side; the tail coverts were of the male type. A well-developed oviduct was present on the left side, and a sexual organ was in the usual position of the left ovary, but sections showed that it consisted of ovarian elements undergoing pigmentary degeneration and testicular elements in active growth. Dr. Bond pointed out that such a case presented a difficulty if the ordinary or hormonal explanation of the origin of secondary sex characters were accepted. He suggested that two factors at least are concerned in the origin and development of secondary sex characters: one, a gametic factor—the primary sex gland, and the other a somatic factor, and that the two factors may vary independently of each other under certain conditions of abnormal hereditary transmission.

#### *A Mammal-like Dentition in a Cynodont Reptile.*

Dr. W. K. Gregory exhibited, for Dr. R. Broom, upper and lower jaws of a small species of *Diademodon*, from a study of which Dr. Broom concludes that the *Cynodonts* had deciduous incisors, deciduous canines, and four deciduous premolars, exactly as in mammals. As there is no evidence, in any specimen, of a dental succession after maturity has been reached, he concludes that the two sets of teeth correspond to the mammalian milk set and permanent set.

#### *Notharctus, an American Eocene Lemur.*

Dr. W. K. Gregory exhibited a skeleton of *Notharctus rostratus*, an Eocene lemur, the discovery of several partial skeletons of which in Wyoming, by the American Museum of Natural History, affords material for a fairly complete knowledge of the skull, dentition, limbs, and vertebrae. The material shows that *Notharctus* is a primitive lemur, more primitive than any now living, and possibly ancestral to the Indrisine lemurs. The correspondence in the details of limbs, &c., between *Notharctus* and modern Lemuridæ is remarkably close, but the front teeth of the former are more primitive and have not assumed the lemurid characters; the molars are in pattern ancestral to those of *Propithecus*.

Dr. Gregory discussed the phylogeny of the primates, which he divided into three series:—(1) Lemuroidea, including Prolemures (Notharctidae, Adapidae), Lemures, and Nycticebi; (2) Pseudolemuroidae; (3) Anthropeidae. The Prolemures are the lowest and most generalised, and contain the ancestors of the Lemuridae and Indrididae. Nesopithecus and other ape-like lemurs with enlarged brain-case are closely allied to the Indrididae, and their resemblances to the Anthropeidae are demonstrably convergent, not genetic. The oldest known platyrrhine, Homunculus, of the Patagonian Santa Cruz formation, is definitely a Cebid. The oldest Anthropeidae are those described by Schlosser from the Upper Eocene of Egypt, and they show no special approach to the platyrrhines. The Hominidae are linked securely with the Simiidae, not only by the abundant evidence of anatomy and physiology, but also by recent palaeontological discoveries.

#### *Morphology of the Mammalian Tonsil.*

Miss M. L. Hett gave an account of the principal types of tonsil found in mammals. Tonsils are normally present, and do not atrophy until extreme old age (except in man), in most of the mammalian orders, but they are wanting in many rodents, some insectivores, and most bats. The gross anatomy of the tonsils is very distinctive for each group of mammals, being always characteristic of the order, and frequently also of the family, or even, in some cases, of the genus. Miss Hett remarked that it was not easy to show, in the case of this organ, an actual correlation between structure and habit, but it was worthy of note that the tonsils of carnivorous marsupials bear a remarkable resemblance to those of Eutherian carnivores.

Several other papers were read, which, however, do not lend themselves to the purpose of a summary. Prof. Poulton pointed out that the term mutation has been employed in three different senses, and suggested that it should be restored to its original use and that new terms be employed for the other two uses of "mutation," and for the two kinds of "fluctuation." Mr. R. H. Whitehouse discussed the evolution of the caudal fin of fishes, and the morphology of the elements of the fin. Prof. R. J. Anderson presented notes on the skull and teeth of Tursiops and on the skeletal elements of vertebrate limbs; the Rev. Dr. Irving exhibited teeth and limb bones of the Solutré type of horse from the Stort valley; Mr. Forster Cooper gave an account of Thaumastotherium, a new genus of Perissodactyles; Dr. W. S. Bruce exhibited a series of photographs of the new zoological gardens near Edinburgh, and Mr. F. Coburn submitted observations on the migration of birds over the midland district.

By the courtesy of Major C. C. Hurst, about eighty members of Sections D, K, and M were invited to inspect the Burbage Experimental Station for applied genetics. Attention was particularly directed to six series of exhibits, of each of which Major Hurst gave a brief explanation and demonstrated the special features shown:—(1) garden races of Antirrhinum, illustrating the inheritance of minute variations in tint, height, and habit of growth; (2) segregation of specific characters in  $F_2$  hybrids of Berberis; (3) breeding experiments with racing pigeons, with the view of investigating the transmission of homing powers; it is interesting to note that feeble-mindedness behaves as a recessive in birds; (4) breeding experiments with Dutch rabbits, with respect to the inheritance of coat-colour and markings; (5) the colt of a pure-bred shire mare and a thoroughbred

stallion; (6) breeding experiments with poultry, which suggest that both the male and female parents transmit to their daughters factors for egg-size and egg-colour, that the smaller grade egg is dominant to the larger grade, and the darker tint dominant to the lighter.

J. H. ASHWORTH.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—In a paragraph last week (p. 362) it was stated that the number of students receiving instruction in the school of agriculture was 320. Prof. T. B. Wood, Drapers Professor of Agriculture, informs us that the correct number is about one-third of that stated. The mistake arose by adding together the number of students in each of the three terms.

THE Swiney lectures on geology in connection with the British Museum (Natural History) will be given this year by Dr. T. J. Jehu, his subject being "The Natural History of Minerals and Ores." The lectures will be delivered in the Metallurgical Lecture Theatre of the Imperial College of Science and Technology, Exhibition Road, South Kensington, on Mondays and Tuesdays, at 5 p.m., and Saturdays at 3 p.m., beginning Saturday, November 29, and ending Tuesday, December 23. Admission to the lectures is free.

It is announced in *Science* that complete plans for the new home of the Massachusetts Institute of Technology have now been made public. There are to be nine contiguous buildings, each devoted to a separate department. Building operations have already been started. The principal buildings are expected to be ready for occupancy in two years. Of the 2,000,000. necessary, 1,460,000. has been already promised. From the same source we learn that the Chamber of Commerce of New York City has received a gift from a donor whose name is withheld of 100,000. for a building for a college of commerce. Gifts have also been received of 10,000. from four other subscribers. The Chamber of Commerce proposes to provide a building and to install a commercial and civic museum on condition that the City of New York provides the working expenses.

THE conditions of admission to the new Register of Teachers were approved finally at the meeting of the Teachers' Registration Council held on November 21. The conditions of registration are set out in the text of the regulations which was published in full in *The Times* of November 22. The register will contain the names of all registered teachers in alphabetical order in one column, with the date of registration, and a further statement of attainments, training, and experience. Among the conditions approved under which entries may be made on the register the following may be mentioned:—The candidate must have obtained one of a number of the qualifications specified, produce satisfactory evidence of having completed successfully a year's course of training, and of having had a three years' period of experience as a teacher. In addition, applicants must be twenty-five years of age, and pay a fee of one guinea. Teachers not satisfying these conditions may, up to December 31, 1918, apply for registration if they have had five years' approved experience of teaching, or ten years' not mainly or solely employed in teaching. The period of experience will be reduced if evidence of a year's training can be given. The certificate of registration is valid for nine years, and can then be renewed without fee.

WE have received an interim report of the Book Production Committee of the Library Association.