meet, but is probably formed from the latter. The infundibulum is beginning to grow towards the pituitary body, and close in front of it are seen the optic nerves which are still hollow. Rudimentary olfactory lobes are seen where the solid olfactory nerves are given off.

Cartilage is forming in the base and sides of the skull, as well as in the ear-capsules. The notochord ascends high into the head and is slightly curved over at the end. The azygous prochordal element, or inter-trabecular bar, is of equal size to the trabeculæ, which are now articulated with the hind part of the basis cranii, in front of the base of the ascending wall.

This stage is especially valuable in helping to a clear conception of the true nature of the prochordal part of the trabeculæ.

3rd Stage, 1¼-in. long.—In this stage the head has almost acquired the adult form, and the carapace is well marked out. The abdominal region is flattened to give rise to the plastron. The limbs have also practically acquired their adult form, and the heart is fairly inclosed in the thorax.

The post-oral clefts are now filled in, and the skull is thoroughly chondrified, forming a cartilaginous trough. The trabeculæ and inter-trabecula have grown into a high septum between the eyes and nose. From the former, the orbito-sphenoids grow, and the alisphenoids extend from the orbito-sphenoids to the auditory capsules. Ossification now begins in the palate.

The notochord turns round in the post-clinoid upgrowth of of the basal plate, and the sheath in its descending part becomes solid, and ends behind the lobules of the rudimentary pituitary body as a tear-shaped drop or lump of cartilage. If the head had been straight, this drop *might* have reached its fore end, directly below the first nerves. The inter-trabecula is a continuation of the same skeletal tract as the sheath of the notochord, and it reaches to the *actual* end of the head, while the drop of cartilage approaches the *organic* end.

4th Stage—two-thirds ripe—3-in. long.—In these embryos nearly all the adult structures can be seen. The epipterygoid is still, however, a cartilaginous hook hanging down from the quadrate. The columella is well developed, and its shaft is ossified.

The parietals have grown down the sides of the skull causing the alisphenoids to be absorbed to a great extent. The investing bones are now rapidly developed, but much of the endocranium is still soft.

5th Stage—ripe—4in. long.—The processes of development and ossification have now gone so far that little can be remarked upon as differing from the adult. The epipterygoid, however, which is wedged in between the descending parietal and the pterygoid, is now a distinct bone, but its apex permanently touches the apex of the pedicle of the quadrate, from which it was segmented.

The development of *Chelone midas* corresponds in all essentials with that of the common snake (*Tropidonotus natrix*) and lizard (*Lacerta agilis*) which the author has recently worked out; but it is well worth remarking that that which distinguishes the chelonian from other reptiles is already manifest in the first stage.

The author considers that there are several things in the head of the vertebrate embryo which are evidently of a segmental nature. Firstly, nerves in the head corresponding to spinal nerves. These constantly fork over clefts, which are also signs of segmentation. The number of inferior arches, whether pre-oral or post-oral, also indicate the number of segments that may exist in the head of a vertebrate. At any rate, wherever there is any diverticulum of a pleuro-peritoneal cavity, although divided off from that of the body by the clefts, there is that which corresponds to a somatome. By this last evidence there is at least one homologue of a pre-oral somatome, and if we go by the nerves, clefts, and cartilages, there are more.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

THE Council of King's College have decided to give the name "Wheatstone Laboratory" to the physical laboratory of the College, in honour of Sir Charles Wheatstone, who was for some years Professor of Experimental Philosophy in the College, to which he also bequeathed his valuable collection of physical apparatus. The report of the laboratory work shows that the physical laboratory was established in the year 1868, and that during the eleven years of its existence about 250 students have been trained in it in the various branches of practical physics. The average number of occasional students—*i.e.*, students who are engaged in research and do not attend with any special class, has been nine a year during the last five years. Among these are graduates of the older universities, who come to reside in London after they have completed their term of residence at the University. Engineering students in their third year's course have the privilege of working in the laboratory free of charge. There are also special practical classes which have been well attended, for the Bachelor of Science and the Preliminary Scientific M.B. Examinations of the University of London, and also special classes for evening class students who are engaged in business during the day-time. In all there are not less than forty students now engaged in practical work in physics in "the Wheatstone Laboratory" in King's College. The Laboratory is greatly in need of endowment, in order that an additional Demonstrator may be appointed, and the usefulness of the laboratory still further extended.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, March.—We note the following papers in this number:—Concerning $\frac{T_1 - T_0}{T_1}$, or the limit of efficacy of steam-engines, by Mr. Klein.—Gauging- and measuring-implements, by Mr. Richards.—A new engine-governor, by Prof. d'Auria.—Conical arches at South Street Bridge, Philadelphia, Pa., by Mr. Stauffer.—Graphic freight diagrams, by Mr. Dudley.

Bulletin de l'Académie Royale de Belgique, No. 1, 1879.—This contains an interesting paper by M. Niesten, on the colours of double stars, which he was led to study by the variations in intensity and colour of planets in relation to the sun. He finds that in systems which allow of connecting the colours with position of the satellite in its orbit, the principal star is white or pale yellow when the companion is at periaster, whereas in other positions it is yellow, gold yellow, or orange. The companion follows the principal star in its fluctuations of colour, and often exceeds it as it removes from periaster (where it is mostly white, like the principal). In perspective groups, the companion is nearly always blue, by an effect (the author suggests) similar to that by which mountains on the distant horizon look blue (and pointing to a gaseous medium in celestial space).—M. Delarge describes some instructive experiments on the telephone, applied in the neighbourhood of ordinary telegraph lines. Secrecy can be insured for telegrams, with dial-apparatus or that of Hughes, but the former is objectionable as leaving no trace, and the latter is very expensive and delicate. Hence recourse should generally be had to cipher.—M. Marchal contributes a revision of American Hederaceæ, describing eighteen new species and a genus.—M. Chevron is led to deny the inalterability of tricalcic phosphate by citrate of ammonia; but the use of this solvent for separation of the phosphate may give sufficiently exact results if a too great excess of the citrate solution be avoided.—We further note an analysis of, and reports on, the second part of M. Lagrange's work on the origin and establishment of astronomical movements, wherein is assumed that the material atoms were originally diffused through space in a state of rest and at the absolute zero of temperature, and endowed simply with reciprocal attraction.—M. Malaise writes on arsenopyrite, or mispickel, and on the arsenical water of Court Saint-Etienne.

No. 2. We have here a paper by M. Saltel on a mathematical paradox, and on a new character of decomposition due to the presence of multiple lines.—M. van Beneden records the receipt of some interesting fossils of cetacea from marls of the tertiary epoch in Croatia.

THE *Revue Internationale des Sciences* (January-March, 1879), contains the following papers of interest: On the cell soul and soul cells, by Ernst Haeckel.—On the nutrition of plants, by J. L. de Lanessan.—Analysis of two memoirs on *Noctiluca*, by G. Carlet.—On a monstrous skeleton of a batrachian, by F. Lataste.—Researches on *Bacteria*, by Dr. Koch.—On vascular innervation, by MM. Grutzner and Heidenhain.—On the action of light and heat upon moving spores, by E. Strassburger and E. Stahl.—On contagious diseases and disinfecting agents, by Prof. Naegeli.—General observations on fertilisation, by E. Strassburger.—On a technical process for the study of fish embryos, by F. Henneguy.—On the retina red and its relation to vision, by

W. S. S.—On the movements of diatoms and *Oscillatoria*, by Th. W. Engelmann.—On the preparation and conservation of inferior organisms, by R. Blanchard.—On the influence of motion and rest upon life, by Dr. A. Horwath.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, April 17.—Dr. Roscoe in the chair.—The following communications were made:—On heptane, from *Pinus sabiniana*, by T. E. Thorpe. Wenzell, in 1872, described, under the name of abietene a hydrocarbon obtained by distilling the exudation of the Californian "nut pine." The author has subjected the crude oil (which occurs in commerce in San Francisco) to an exhaustive chemical and physical examination, and finds that it consists of nearly pure heptane. This discovery, that a paraffin is playing the part of oil of turpentine in a tree now living is exceedingly interesting, as our only natural sources of this hydrocarbon are petroleum and fossil fish oil.—On the determination of tartaric acid in lees and inferior argol, by B. J. Grosjean. The author suggests several improvements in the well-known oxalate process of Warington. The employment of the method of filtration suggested by Casamajor, the addition of potassium chloride to render the precipitation of the potassium bitartrate complete, precipitation of the latter salt by stirring, &c. By these improvements the author has shortened the time required for an estimation to four hours.—Conditions affecting the equilibrium of certain chemical systems, by M. M. P. Muir. The author has carefully studied the influence of time, temperature, and mass on certain reactions: 1. Bismuthous chloride, hydrochloric acid, and water. 2. Calcium chloride and potassium or sodium carbonate.—On the action of oxides on salts, Part II., by E. J. Mills and J. W. Pratt. The authors have examined the actions of aluminic, ferric, and stannic oxides on potassic carbonate at a temperature of 735°.—Examination of substances by the time method, by J. B. Hannay. The author has arrived at the following conclusion:—Two hydrated salts, in forming a double salt containing the normal amount of water, expend one-half of the affinity of the anhydrous salt for its water of crystallisation, in combining with each other, showing that the formation of double salts is comparable with other forms of chemical action.—Preliminary note on certain compounds of naphthalene and benzene with antimony chloride, &c., by Watson Smith. The author has obtained white needles, which he believes to be trinaphthylstibine or naphthyloxystibine. He has obtained other crystalline compounds, which have not yet been examined.

Anthropological Institute, April 8.—Mr. Hyde Clarke, vice-president, in the chair.—Mr. Coutts Trotter, of the Bengal Civil Service, was announced a Member.—Prof. W. H. Flower, LL.D., F.R.S., read a paper entitled "Illustrations of the Method of Preserving the Dead in Darnley Island and South Australia." A mummy from Erroob or Darnley Island, in Torres Strait, inhabited by a Papuan race, was first described. It was fastened in an extended position upon a framework made of pieces of wood, joined together with native cords, and kept in an upright position in the house of the relatives. The surface was covered with red ochre, and a piece of the large Indian volute shell (*Melo indica*), fashioned into the shape of a shield, was suspended in front of the body, as worn by the warriors in battle. The whole of the viscera had been removed through an aperture in the right flank, which had been carefully closed by an interrupted suture. Pieces of light wood filled the abdominal and thoracic cavities. The tongue, larynx, &c., had been removed through the mouth; the lips were not closed, but the jaw was kept from falling by a piece of cord passing close to the bone, through the nostril, and round the ramus of the mandible. The orbits were filled with a resinous substance, and imitation eyes of mother-of-pearl introduced. The second specimen described was a dried mummy from near Adelaide, in South Australia, presented in 1845 to the museum of the Royal College of Surgeons by Sir George Grey. In this case the limbs were bent jointly, and fixed by a band of native netting close to the side of the body, the knees being behind the shoulders, and the feet close to the hips. The internal organs had not been removed, but the mouth had been filled with emu's feathers, and carefully sewn up, a tassel of feathers hanging from one corner. Both cases showed a considerable amount of care and trouble bestowed in what was considered the decent and proper care of the body after death; but, as might be expected, a more elaborate development of art was attained in the Papuan than in the Australian.—A paper by Mr. M. J. Walhouse was read, on rag-bushes and kindred observances. The author, referring to the custom of tying pieces of rag to the bushes near springs of healing repute and by the tombs of holy men, once common in England, and still observed on the Continent, adduced evidence of its antiquity, and instances of its occurrence in Europe, Africa, throughout Asia, and all over America from the north to Patagonia. He also described some apparent varieties of custom, when other objects than rags were used, but with the same motive, and thought that they, as well as the rags, were offered as symbols of sacrifice or gifts, sometimes to deities, sometimes to ghosts, and often as thank-offerings for cures of sickness and other benefits. The worthless form of such offerings might be owing to the sacred spots being frequently in remote and desert regions, where travellers and pilgrims were not likely to have things of value to spare, and would leave trivial scraps and shreds ready at hand rather than nothing at all. Or they might be substitutes for more valuable offerings, once generally made, but which have a tendency to decrease in value, and at last exist only nominally as survivals. The Chinese custom of offering mock food and gilt-paper ornaments at tombs, where costly gifts were anciently made, was referred to in illustration of this. It was further suggested that the *ex voto* offerings, so commonly hung in Roman Catholic churches, are a form and development of the rags and shreds tied to bushes, and that may-poles and even Christmas-trees may have had a similar origin.—A number of antiquities from the United States of Colombia were exhibited by Mr. W. D. Powles.

Meteorological Society, April 16.—Mr. C. Greaves, F.G.S., president, in the chair.—The following were elected Fellows of the Society:—R. W. Abbotts, Rev. S. Allen, D.D., E. H. Banks, F. J. Bramwell, F.R.S., J. A. Caird, E. H. Cardwell, the Earl of Durham, J. Farquharson, W. Garnett, Rev. C. W. Harvey, W. Inskip, the Earl of Powis, and D. Robie. The papers read were: On the results of comparisons of Goldschmid's aneroids, by G. M. Whipple, F.R.A.S.—Observations on the temperature of the Atlantic during the month of March, by P. F. Reinsch.

Entomological Society, April 2.—J. W. Dunning, M.A., F.L.S., vice-president, in the chair.—Mr. McLachlan exhibited the cases of a number of species of Brazilian caddis-flies with the insects bred from the larvæ that manufactured some of them, sent to him by Dr. Fritz Müller from Santa Catharina, and read extracts (with notes) from Dr. Müller's letters on the subject. In reference to the habits of Mantidæ, which had been recently brought under the notice of the Society, Mr. Stainton referred to a larval form of probably *Mantis religiosa*, which had been forwarded to him in 1866 by Mr. Moggridge, jun., and which, from its saltatorial habits, that gentleman had described as a "curious grasshopper." De Geer had also drawn attention to the apparent similarity between these insects belonging to different orders, and Mr. Stainton considered that the peculiar motion of the young Mantis was an illustration of the remark of Mr. Darwin, that the relationships and affinities of animals are often more expressed in the embryonic than in the adult form.—Sir Sydney Saunders exhibited a bag-like fabrication, said to be the production of a large species of spider inhabiting the Fiji Islands.—The Secretary read a note from Mr. J. W. Sclater, on insects destroyed by flowers.—Miss E. A. Ormerod communicated a paper entitled "Observations on the Effects of Low Temperature on Larvæ." From an examination of many species belonging to different orders, during the severe frosts of the past winter, none were found materially injured by the low temperature to which they were subjected.—Mr. Distant communicated a paper containing descriptions of new species of hemiptera collected by Dr. Stoliczka during the Forsyth expedition to Kashgar in 1873-74, to form portion of the general work on the scientific results of the expedition now in course of publication at Calcutta.

Geological Society, April 9.—Henry Clifton Sorby, F.R.S., president, in the chair.—Rev. Joseph Finnemore, Thomas James Slatter, William H. Twelvetrees, Arthur Pendarves Vivian, and Ernest Westlake, were elected Fellows; Prof. Bernhard von Cotta, Freiberg, Dr. Nicolai von Kokscharow, St. Petersburg, and Dr. J. J. S. Steenstrup, Copenhagen, were elected Foreign Members; and Prof. P. J. van Beneden, Louvain, Prof. Guglielmo Guiscardi, Naples, and Prof. Gerhard von Rath, Bonn, Foreign Correspondents of the Society.—The following communications were read:—On the geological age of the rocks of the southern highlands of Ireland, generally known as "the