mens of *Iguanodon* in the British Museum, however, show that these elements of the pectoral arch were present in that genus. Some other *Dinosauria* possess clavicles, but in several families of this sub-class, as I regard it, they appear to be wanting.

The nearest approach to birds now known would seem to be in the very small Dinosaurs from the American Jurassic. In some of these the separate bones of the skeleton cannot be distinguished with certainty from those of Jurassic birds, if the skull is wanting, and even in this part the resemblance is striking. Some of these diminutive Dinosaurs were perhaps arboreal in habit, and the difference between them and the birds that lived with them may have been at first mainly one of feathers, as I have shown in my Memoir on the *Odontornithes*, published during the past year.

It is an interesting fact that all the Jurassic birds known, both from Europe and America, are land birds, while all from the Cretaceous are aquatic forms. The four oldest known birds, moreover, differ more widely from each other than do any two recent birds. These facts show that we may hope for most important discoveries in the future, especially from the Triassic, which has as yet furnished no authentic trace of birds. For the primitive forms of this class we must evidently look to the Palæozoic.

SCIENTIFIC SERIALS

Journal of the Asiatic Society of Bengal, vol. l. part 2, No. 2 1881 (July 30), contains:—H. F. Blanford, F.R.S., on the relations of cloud and rainfall to temperature in India, and on the opposite variations of density in the higher and lower atmospheric strata, and description of a rain-gauge with evaporimeter for remote and secluded stations (plate 15).—J. Wood-Mason, on some insects belonging to the Rhopalocera from India and Burmah.—W. T. Blanford, F.R.S., on the Voles (Arvicola) of the Tibet Himalayas and Afghanistan (plates 1 and 2); and on *Myospalax fuscicapillus*, Blyth.

Gegenbaur's morphologisches Jahrbuch, vol. vii., part 2, 1881, contains—R. S. Bergh, on the organisation of the cilio-flagellate Infusoria; a phylogenetic study; plates 12–16. Contains diagnoses of the genera Ceratium, Dinophysis, Protoperidinium (nov. gen.), Peridinium, Protoceratium (nov. gen.), Diplosalis (nov. gen.), Glenodinium, Gymnodinium, Polykrikus, and Protocentrum, with descriptions of several species in each.—Dr. W. Pfitzner, on the minute structure of cell-nuclei.—Prof. Bischoff, on the third or lowermost frontal gyrus (Stirnwindung), and the inner upper lobulus-parietalis gyrus in the gorilla.

Zeitschrift für wissenschaftliche Zoologie, August, 1881 (vol. xxxvi. part 1), contains; Dr. H. Simroth, on locomotion and the organ of locomotion in *Cyclostoma elegans* and other indigenous land and freshwater mollusca (plate 1 and many woodcuts).—Dr. P. Stöhr, on the development of the skull in the Anura (plates 2 and 3).—Dr. A. Gruber, on division in the monothalamous rhizopods (plates 4 and 5).—F. Blockmann, on the development of *Neritina fluviatilis* (plates 6, 7, and 8).—Prof. W. Krause, on the human allantois (plate 9).

SOCIETIES AND ACADEMIES

MANCHESTER

Literary and Philosophical Society, October 4, 1881.—J. P. Joule, F.R.S., &c., in the chair.—On drops floating on the surface of water, by Prof. Osborne Reynolds, F.R.S. It is well known that under certain circumstances drops of water may be seen floating on the surface for some seconds before they disappear. Sometimes during a shower of rain these drops are seen on the surface of a pond, they are also often seen at the bows of a boat when travelling sufficiently fast to throw up a spray. Attempts have been made to explain this phenomenon, but I am not aware of any experiments to determine the circumstances under which these drops are suspended. Having been deeply engaged in the experimental study of the phenomena of the surface-tension of water and the effect of the scum formed by oil or other substances, it occurred to me that the comparative rarity of these floating drops would be explained if it could be shown that they required a pure surface, a surface free from scum of any kind. For, owing to the high surface-tension of pure water, its surface is rarely free from scum. The surface of stagnant water is practically never free except when the scum is driven off by wind. But almost any disturbance in the water, such as the motion of a point of a stick round and round in the water, or water splashed on the surface, will serve to drive back the scum for a certain distance. This may be shown by scattering some flowers of sulphur on the surface. This powder is insoluble and produces no scum, and hence it serves admirably to show the motion of the surface and whatever scum there may be upon it. If when the surface is so dusted a splash be made by a stick so as to throw drops on to the sulphured surface, at the first splash no floating drops are produced; but after two or three splashes in rapid succession it will be seen that the sulphured scum has been driven back by the falling water, leaving a patch of clear surface, and on this drops will float in large numbers and of all sizes. These drops are entirely confined to that portion of the surface which is clear. The drops, either by their initial motion or by the current of air, glide rapidly over the surface from the point at which they are formed. When, however, they reach the edge of the scum they disappear, apparently somewhat gradually. I have this summer made the experiment on several ponds and on various days, and I have never found any difference. Any scum, however transparent, prevented the drops, and they always floated in large numbers when the scum was driven back in the manner described, by the wind or any other way. This result points to the conclusion that whatever may be the cause of this suspension, it depends only on the surface of the water being pure, and not at all on the temperature or condition of the air.—On the mean intensity of light that has passed through absorbing media, by James Bottomley, D.Sc., F.C.S.—Note on the colour relations of nickel, cobalt, and copper, by James Bottomley, D.Sc., F.C.S.

VIENNA

Imperial Academy of Sciences, October 13.—V. Burg in the chair.—The following papers were read:—A. v. Liebenberg, experiments on the part of lime in germination.—E. Weiss, computation of the elements and ephemeris of Barnard's comet.—E. Brücke, on some consequences of the Young-Helmholtz theory.—T. W. Brühl, on the connection between the optic and thermic properties of liquid organic bodies.

PARIS

Academy of Sciences, October 17.—M. Wurtz in the chair.—The Secretary presented the instructions formulated by the International Conference for Observation of the Transit of Venus.—Crystalline sulphurated copper (*cupréine*), formed at expense of old coins, apart from thermal springs, at Flines-les-Roches, Departement du Nord, by M. Daubrée.—Observations of the comet *b* 1881 (Tebbutt-Gould-Cruls) at Paris Observatory, by M. Bigourdan.—On a remarkable configuration of circles in space, by M. Stephanos.—On Fuchsian functions, by M. Poincaré.—On an experimental peculiarity relative to the equipotential law of Nobili's rings, by M. Guébhard. He has studied, under strong light, the trajectories of minute bubbles between electrodes in badly-conducting liquids; these are quite determinate and independent of gravity, and (friction and agitation of the liquid apart) seem to represent lines of force of the electric flow. With variously formed electrodes he has repeated Antolik's and Mach's experiments made with static discharge; and profiting by certain effects of polarisation, and counter-currents arising on quick reversal of the principal current, has obtained a fixed trace of the lines of flow.—Theory of a rapid vessel, by M. Pictet.—On the currents generated by atmospheric electricity and earth-currents, by M. Landerer. At Tortosa he stretched a wire between the roofs of two houses in a direction making a small angle with the magnetic meridian, and connected it with the water-pipes. The currents generated are variously due to condensation of aqueous vapour, to lightning-discharges, to action of wind, and to earth-currents. The first two and the fourth affect a telephone in the circuit, but not the third (these, however, as well as the second and fourth, deflect a galvanometer). The earth-currents are distinguished from atmospheric currents by their regularity and continuity during pretty long intervals. Variation of the earth-current is a sign of change of weather.—Action of sulphur on alkaline sulphides in very dilute solution, by M. Filhol. In such action on dilute solutions of monosulphide of sodium a polysulphide is formed, without notable production of hyposulphite, and it seems as though the original monosulphide has subsisted, spite of the dilution. But more probably it is decomposed and reconstituted.—On a new series of bases derived from morphine, by M. Grimaux.—On a new alkaloid of quinquinas, by M. Arnaud. The formula adopted for *cinchonamine* (this new alkaloid) is

$C_{19}H_{24}N_2O$. The author found it, simultaneously with cinchonine, in a very dense dark brown-red bark, of resinous fracture, from Santander; there being 0·8 to 1 per cent. of cinchonine, and 0·2 of the other. It differs from cinchonine in having two atoms more of hydrogen.—On the dissociation of carbamate of ammonium, by MM. Engel and Moitessier.—On the subcutaneous sacs and the lymphatic sinuses of the cephalic region in *Rana temporaria*, L., by M. Jourdain. He modifies the enumeration of sacs by Dugés, and indicates some relations hitherto overlooked. *Inter alia*, the lingual sinuses, forming cavities which communicate with the neighbouring reservoirs only by narrow orifices, form a nearly closed system, and M. Jourdain finds in this an explanation (different from that of Dugés) of the mechanism by which the tongue, become turgid, is protruded.—On a curious case of prefecundation observed in a Spionide, by M. Giard.—Contribution to a study of the Flagellata, by M. Kamstler. He has observed in *Cryptomonas ovata*, Ehrbg., transverse striation of the two flagellums serving for locomotion; also a group of long fine flagellums (hitherto unknown), which are also striated and serve for prehension of food; four layers in the body-wall, the outer one colourless, the others having chlorophyll (their structure is described); a spacious stomach with a sort of vestibule (but no œsophagean tube), intestine, and anus; small organisms therein, proving that Cryptomonas does not live on liquid food alone; a pore through which the contractile vesicle communicates with the exterior; an organ which is probably a male apparatus, &c. He also describes the oculiform point in *Phacus pleuronectes*, Dugard, which organ he developed by cultivation in intense light. He considers the structure to prove its visual function beyond a doubt.—On the cause of immunity of adults of the bovine species towards symptomatic or bacterian charbon in localities where this malady is prevalent, by MM. Arloing, Cornevin, and Thomas. Most of the young animals in an infected district are spontaneously inoculated with various quantities of the virus, and while those receiving much take the disease in fatal form, those receiving little have a mild attack, sufficient to insure future immunity. M. Bouley remarked on the bearing of hereditary influences, and M. Pasteur on the error of supposing that young animals had a greater aptitude to receive contagion.

October 24. M. Wurtz in the chair.—The following papers were read:—Detonation of acetylene, cyanogen, and endothermal combinations in general, by M. Berthelot. Gases formed with absorption of heat (acetylene, &c.), which do not detonate under simple heating, may be brought to explosion through sudden shock (*e.g.* through fulminate of mercury); this shock acts only on a certain layer of gaseous molecules, communicating enormous kinetic energy; the molecular edifice loses its relative stability and falls to pieces, and the initial energy is instantly increased by that corresponding to heat of decomposition of the gas. Hence a new shock produced on the next layer, which causes the same decomposition, and so on, to total destruction of the system.—On a general determination of the tension and volume of saturated vapours, by M. Clausius.—On an apparatus for determining, without pain to the patient, the position of a projectile of lead or other metal in the human body, by Prof. Bell. This is a modification of Hughes' induction-balance. One flat coil is superposed on another, so that the edge of the former is near the axis of the latter. One has thick wire, and is the primary circuit, the other has thin wire, and is the secondary. The two are dipped in paraffin and fixed in a wooden frame with handle. A vibratory current from a battery traverses the primary coil, and a telephone is put in circuit with the other. When the common part of the two coils comes near a metallic body silence gives place in the telephone to a sound which varies in intensity according to the nature and form of the body. It is found advantageous to insert in the two circuits two other coils similar to the first, but much smaller, and the common surface of which can be altered with a micrometric screw; also to insert an electrostatic capacity in the primary.—On the parasitic nature of disorders arising from impaludism, by M. Leverson. The efficiency of sulphate of quinine as an antidote is thus accounted for (various parasitic elements in the blood are described).—Note on the quality of waters of the Isère as regards the project of an irrigation-canal from the Rhone. Owing to the presence of salts of soda and magnesia in considerable quantity, the water of the Isère is absolutely unfit for irrigation.—On a configuration of fifteen circles, and on the linear congruences of circles in space, by M. Stephanos.—On the mathematical theory of the vibratory movement of bells, by M. Mathieu.—On the electrolysis of water, by M. Tommasi. A zinc-copper or zinc-carbon element, immersed in dilute sulphuric acid, does not decompose water, conformably to theory, if the two electrodes are of platinum. For this decomposition to take place, the positive electrode must be formed of a metal which, under influence of the voltaic current, can combine with the oxygen of the water.—On a proportion-compass (*boussole de proportion*) for measurement of resistances, by M. Carpentier. Suppose on the surface of a sphere, the vertical diameter of which is taken as polar axis, two similar circuits along two meridians at right angles to each other. Currents along these circuits affect a small magnetic needle hung at the centre of the sphere, which needle sets in the direction of the resultant of the two forces. This depends on the ratio of the intensities, and this ratio of the strength of one component to that of the other is precisely measured by the trigonometric tangent of the angle formed by the resultant with the other component. For measurement of resistances a current is made to divide between the circuits, and of course does so equally. Then the resistance to be measured is added to one circuit, and the current then divides inversely as the resistances. Two ways are indicated of eliminating the influence of terrestrial magnetism.—On the variation of the annual number of thunderstorms at Rio de Janeiro, by M. Cruls. In the period 1851–1876 (during which the annual number of thunderstorms is found to vary between eleven and forty-nine), he makes out a close correspondence between the curve of storms and that of solar spots. A curve for Toronto shows the same thing, though less distinctly. M. Faye expressed a feeling of reserve as to this correspondence. The period of spots could be reproduced in that of thunderstorms only if the spots sensibly affected the heat sent us by the sun; but no trace of an eleven-years' period has been found in annual temperatures. The conclusion is that solar spots and our thunderstorms are not in the relation of cause and effect. The correspondence indicated by M. Cruls is not sufficient to prove the necessity of finding a connection between the two phenomena.—On a new hydrate of carbon, by M. Morelle. He calls it *bergenite* instead of *bergenin*, the name given (1850) by its discoverer, M. Garreau, who did not study it very fully. It is got from Siberian saxifrage. M. Morelle arrives at the formula $C_{16}(C_4H_4O_4)_5$ (which corresponds to 75·75 per cent. of acetic acid). It is a pentatomic alcohol, ranking with pinite and quercite.—On the comparative toxicity of different metals, by M. Richet. Instead of injecting, he rendered the medium poisonous (*e.g.* the water for a fish). He named the *limit of toxicity* the quantity of poison per litre of water, allowing a fish to live more than forty-eight hours. Thus he shows that there is no precise relation between the atomic weight, or the chemical function of a body, and its toxical power.—Researches on the circulatory system of *Spatangus purpurense* by M. Kiehler.

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