morphology and systematic botany, with practical work in the Botanical Gardens.

The Demonstrator of Comparative Anatomy will take an advanced class for instruction in the mammalia during the Easter term.

Prof. Stuart next term opens his new workshops and drawing office; in the latter instruction will be given in mechanical drawing and in machine designing, and also in graphical statics and its application to the theory of structures.

Mr. Garnett will commence an elementary course of lectures on electricity and magnetism on May 2 in the chemical laboratory of St. John's College.

The Senate has approved of Lord Rayleigh's appointment of two joint demonstrators of physics instead of one, and of the payment of a stipend of 100*l.* to each.

Mr. Balfour will lecture on the embryology of aves and mammalia next term, and have a practical class in that subject.

The Court of Assistants of the Haberdashers' Company have have given to each of the schools under their management a cabinet of minerals, purchased from the executors of the late Prof. Tennant. The schools of the Company are at Monmouth, Newport, Hatcham, and Hoxton.

## *SCIENTIFIC SERIALS*

*Annalen der Physik und Chemie*, No. 3.—Constants of elasticity of fluor-spar, by H. Klang.—On the source of beats and beat-tones in harmonic intervals, by R. Koenig.—Description of a beat-tone apparatus for lecture experiments, by the same.—Contribution to the theory of resonance, by F. Kolacek.—Some applications of the law of dispersion to transparent, semi-transparent, and opaque media, by E. Ketteler.—Researches on the spectra of gaseous bodies, by F. Lippich.—On the electromotive force of galvanic combinations formed of zinc, sulphuric acid and platinum, or copper, silver, gold, or carbon, by C. Fromme.—On a new form of the Töpler mercury pump, and some experiments made with it, by E. Bessel-Hagen.—Researches on the height of the atmosphere and the constitution of gaseous heavenly bodies (continued), by A. Ritter.—On absorption of solar radiation by the carbonic acid of our atmosphere, by E. Lecher.—On the idea of galvanic polarisation, by W. Beetz.—On an artificially-formed body which takes polar directions and shows polar attractions, by W. Holtz.

*Zeitschrift für wissenschaftliche Zoologie*, vol. xxxv. part 2, February, 1881.—Dr. H. Adler, on the alternation of generations in the oak-gall insects, pp. 150-246, a very exhaustive treatise, with two admirably-coloured plates of the galls and one of the ovipositors, &c., of the gall-insects.—Hans Virchow, on the vessels in the eye and the appendages of the eyes in frogs, with two plates. Elias Metschnikoff, researches on the Orthonectidæ, with a plate.—Jos. Th. Cattie, contribution to a knowledge of the chorda supra-spinalis of the lepidoptera and of the central, peripheral, and sympathetic nerve systems in caterpillars, with a plate.—Dr. H. Bolau, on the pairing and propagation of a species of the genus Scyllium.—N. Kleinenberg, on the origin of the ova in Eudendrium (with a woodcut).

## *SOCIETIES AND ACADEMIES*

### London

**Royal Society**, March 24.—"Observations on the Locomotive System of Echinodermata." (The Croonian Lecture.) By G. J. Romanes, M.A., F.R.S., and Prof. J. C. Ewart, M.D.

The principal results had reference to the tube-systems and nervous systems of the echinoderms. It was shown by injection that the ambulacral system and the so-called blood-vascular system are each closed systems, save at their common origin in the madreporic plate. Both systems communicate through this plate with the internal medium, but the one much more freely than the other, the ambulacral system being the least patent, so that it is only when a pressure of two feet is maintained for a number of hours that the injected fluid slowly permeates the stone-canal, or sand-tube, to ooze through the madreporic plate. Regarding the nervous system, it was found in Echinus that lateral branches arise from the five radial trunks to escape with the pedicels through the apertures of the pore plates. Each of these branches then courses down the pedicel, with which it escapes to the terminal sucker. From these lateral branches there also arises an intimate nerve-plexus, which covers the whole external surface of the shell, lying almost immediately beneath the surface epithelium, and extending from the shell to all the spines and pedicellariæ. In stained specimens the nerve-fibres and cells were traced to the capsular muscles at the bases of the spines, and delicate fibres were detected running up the spines and pedicellariæ, immediately below their epithelium. In the case of the pedicellariæ it appeared from several preparations that delicate fibres extended as far as the sensitive epithelial pod situated on the inner surface of each trident mandible, a short distance from the apex.

Such being the principal morphological results, the paper went on to detail a number of physiological experiments. First it was pointed out that the natural movements of echinodermata exhibit a high degree of co-ordination. Thus, for instance, all the echinoderms are able when inverted on a flat floor to right themselves. The common starfish does this by twisting the ends of two or more of its rays round, so as to bring the terminal suckers into action upon the floor of the tank, and then by a successive and similar action of the suckers further back in the series the whole ray is progressively twisted round, so that its ambulacral surface is applied flat against the floor. The rays which perform this action twist their spirals in the same direction, and by this concerted action drag the disk and the remaining rays over themselves as a fulcrum. Other species of starfish which have not their ambulacral suckers sufficiently developed to act in this way execute their righting movements by doubling under two or three of their adjacent rays, and turning a somersault over them, as in the previous case. Echinus rights itself when placed on its aboral pole, by the successive action of two or three adjacent rows of suckers—so gradually rising from aboral pole to equator, and then as gradually falling from equator to oral pole. Spatangus executes a similar manœuvre entirely by the successive pushing and propping action of its longer spines.

Experiments in stimulation showed that all the echinoderms observed sought to escape from injury in a direct line from the source of irritation. If two points of the surface are stimulated the direction of escape is the diagonal between them. When several points all round the animal are simultaneously stimulated the direction of advance becomes uncertain, with a marked tendency to rotation upon the vertical axis. If a short interval of time be allowed to elapse between the application of two successive stimuli the direction of advance will be in a straight line from the stimulus applied latest. If a circular band of injury be quickly made all the way round the equator of echinus, the animal crawls away from the broadest part of the band, *i.e.* from the *greatest amount* of injury.

The external nerve plexus supplies innervation to three sets of organs—the pedicels, the spines, and the pedicellariæ; for when any part of the external surface of echinus is touched, all the pedicels, spines, and pedicellariæ within reach of the point that is touched immediately approximate and close in upon the point, so holding fast to whatever body may be used as the instrument of stimulation. In executing this combined movement the pedicellariæ are the most active, the spines somewhat slower, and the pedicels very much slower. If the shape of the stimulating body admits of it, the forceps of the pedicellariæ seize the body and hold it till the spines and pedicels come up to assist.

And here we have proof of the function of the pedicellariæ. In climbing perpendicular or inclined surfaces of rock covered with waving seaweeds it must be no small advantage to an echinus to be provided on all sides with a multitude of forceps adapted, as described, to the instantaneous grasping and arresting of a passing frond; for in this way not only is an immediate hold obtained, but a moving piece of seaweed is held steady till the pedicels have time to establish a further and more permanent hold upon it with their sucking disks. That this is the chief function of the pedicellariæ is indicated by the facts that (1) if a piece of seaweed is drawn over the surface of an echinus this function may clearly be seen to be performed; (2) that the wonderfully tenacious grasp of the forceps is timed as to its duration with an apparent reference to the requirements of the pedicels, for after lasting about two minutes (which is about the time required for the suckers to bend over and fix themselves to the object held by the pedicellariæ, if such should be a suitable one) this wonderfully tenacious grasp is spontaneously released; and (3) that the most excitable part of the trident pedicellariæ is the inner surface of the mandibles, about a third of the way down their serrated edges, *i.e.* the part which a moving body cannot touch without being well within the grasp of the forceps.

When the forceps are closed they may generally be made immediately to expand by gently stroking the external surface of their bases.

With regard to stimulation of the spines, if severe irritation be applied to any part of the external or internal surface of an echinus, the spines all over the animal take on an active bristling movement. The tubercles at the bases of the spines are the most irritable points on the external surface.

With regard to stimulation of the pedicels, if an irritant be applied to any part of a row, all the pedicels in that row retract in succession from the seat of stimulation, but the influence does not extend to other rows. A contrary effect is produced by applying an irritant to any part of the external nerve-plexus, all the pedicels being then stimulated into increased activity. Of these antagonistic influences, the former, or inhibitory one, is the stronger, for if they are both in operation at the same time the pedicels are retracted.

Starfish (with the exception of brittle-stars) and echini crawl towards, and remain in, the light; but when their eye-spots are removed they no longer do so. When their eye-spots are left intact they can distinguish light of very feeble intensity.

Experiments in section showed that single rays detached from the organism crawl as fast and in as determinate a direction as do entire animals. They also crawl towards light, away from injuries, up perpendicular surfaces, and when inverted, right themselves. Dividing the ray-nerve in any part of its length has the effect of destroying all physiological continuity between the pedicels on either side of the division. Severing the nerve at the origin of each ray, or severing the nerve-ring between each ray, has the effect of totally destroying all co-ordination among the rays; therefore the animal can no longer crawl away from injuries, and when inverted it forms no definite plan for righting itself. Each ray acting for itself, without reference to the others, there is as a result a promiscuous distribution of spirals and doublings, which as often as not are acting in antagonism to one another. This division of the nerve usually induces, for some time after the operation, more or less tetanic-like rigidity of the rays. This operation however, although so completely destroying physiological continuity in the rows of pedicels and muscular system of the rays, does not destroy or perceptibly impair physiological continuity in the external nerve-plexus; for however much the nerve-ring and nerve-trunks may be injured, stimulation on the dorsal surface of the animals throws all the pedicels and muscular system of the rays into active movement. This fact proves that the pedicels and the muscles are all held in nervous connection with one another by the external plexus, without reference to the integrity of the main trunks.

If a cork-borer be rotated against the external surface of an echinus till the calcareous substance of the shell is reached, and therefore a continuous circular section of the overlying tissues effected, the spines and pedicellariæ within the circular area are physiologically separated from those without it, as regards their local reflex irritability. That is to say, if any part of this circular area is stimulated, all the spines and pedicellariæ within that area immediately respond to the stimulation in the ordinary way, while none of the spines or pedicellariæ surrounding the area are affected, and conversely. Therefore it is concluded that the function of the spines and pedicellariæ of localising and gathering round a seat of stimulation is exclusively dependent upon the external nervous plexus. If the line of injury is not a closed curve, so as not to produce a physiological island, the stimulating influence will radiate in straight lines from its source, but will not irradiate round the ends of the curve or line of injury.

Although the nervous connections on which the spines and pedicellariæ depend for their function of localising and closing round a seat of stimulation are thus shown to be completely destroyed by injury of the external plexus, other nervous connections, upon which another function of the spines depends, are not in the smallest degree impaired by such injury. This other function is that which brings about the general co-ordinated action of all the spines for the purposes of locomotion. That this function is not impaired by injury of the external plexus is proved by severely stimulating an area within a closed line of injury on the surface of the shell; all the spines over the whole surface of the animal then manifest their bristling movements, and by their co-ordinated action move the animal in a straight line of escape from the source of irritation.

We have, therefore, to distinguish between what may be called the local reflex function of the spines, which they show in common with the pedicellariæ, and which is exclusively dependent upon the external plexus, and what we may call the universal reflex function of the spines, which consists in their general co-ordinated action for the purposes of locomotion, and which is wholly independent of the external plexus. Evidently, therefore, this more universal function must depend upon some other set of nervous connections (which, however, the authors were not able to detect histologically), and experiment shows that these, if present, are distributed over all the *internal* surface of the shell. For if the internal surface be painted with acid, or scoured out with emery paper and brick-dust, the spines and pedicellariæ, after a short period of increased activity or bristling, become perfectly quiescent, lie flat, and lose both their spontaneity and irritability. After a few hours, however, the spontaneity and irritability of the spines return, though in a feeble degree, and also those of the pedicellariæ in a more marked degree. These effects take place over the whole external surface of the shell, if the whole of the internal surface be painted with acid or scoured with brick-dust; but if any part of the external surface be left unpainted or unscoured, the corresponding part of the external surface remains uninjured. From these experiments it is concluded:—(1) that the general co-ordination of the spines is wholly dependent on the integrity of the hypothetical internal plexus; (2) that the hypothetical internal plexus is everywhere in intimate connection with the external, apparently through the calcareous substance of the shell; and (3) that complete destruction of the former, while profoundly influencing through shock the functions of the latter, nevertheless does not wholly destroy them.

Echini may be divided into pieces, and the pedicels, spines, and pedicellariæ upon these pieces will continue to exhibit their functions of local reflex irritability, however small the pieces may be. If an entire double row of pedicels be divided out as a segment and then placed upon its aboral end, it may rear itself up on its oral end by the successive action of its pedicels, and then proceed to crawl about the floor of the tank. We have therefore to meet the question: Is the action of the ambulacral feet in executing these righting movements of a merely serial kind, *a*, *b*, and *c* first securing their hold on the tank floor, owing to the stimulus supplied by contact, and then by their traction tilting over the globe, till *d*, *e*, and *f* are able to touch the floor, and so on; *or* does the righting action depend upon nervous co-ordination? Experiments showed that both principles are combined, the action of the pedicels being serial, but also assisted by nervous co-ordination. This conclusion is sustained by the experiment of shaving off the spines and pedicels over one-half of one hemisphere, *i.e.* the half from the equator to the oral pole. When then inverted and forced to use their mutilated pedicel-rows, the echini reared themselves upon their equators, and then, having no more pedicels wherewith to continue the manœuvre, came to rest. This rest was permanent, the animal remaining, if accidents were excluded, upon its equator till it died. The question then here seems to resolve itself simply into this: Is the mechanism of the pedicels so constructed as to insure that their serial action shall always take place in the same direction? For if it can be shown that their serial action may take place indifferently in either direction it would follow that the persistency with which the partly shaved echini continue reared upon their equators, is the expression of some stimulus (such as a sense of gravity) continuously acting upon some central apparatus, and impelling the latter to a continuous, though fruitless, endeavour to co-ordinate the absent pedicels. If the pedicels are able to act serially in either direction, there is no more reason why a partly-shaved echinus should remain permanently reared upon its equator, than that it should remain permanently inverted upon its pole; and therefore the fact that in the latter position the pedicels set about an immediate rotation of the animal, while in the former, and quite as unnatural position, they hold the animal in persistent stasis—this fact tends to show that the righting movements of the pedicels are something more than serial. Thus the whole question as between the two hypotheses amounts to whether the pedicels are able to act serially from oral to aboral pole. Observation showed that they are so, for echini spontaneously rear themselves from their normal position on the oral pole, to the position of resting upon their equators. Further, as additional evidence that the righting movements are at least assisted by some centralising influence, is the fact that when the evolution is nearly completed by the pedicel-rows engaged in executing it, the lower pedicels in the other rows become strongly protruded and curved downwards, in anticipation of shortly coming into contact with the floor of the tank.

Removing the pentagonal nerve-ring has no effect at all upon the pedicellariæ or on the local reflex action of the spines; both these organs continue to close round an instrument of stimulation. But the general co-ordination of the spines is totally and permanently destroyed—their bristling movements no longer serving to convey the animal from a source of irritation, but only causing the animal aimlessly to gyrate. This shows that the pentagonal nerve-ring has in large measure the function of a nerve-centre. The same thing is shown by the effect of its removal upon the righting movements. These are gravely impaired, though not wholly destroyed—four in twelve specimens so mutilated continuing able to right themselves. These facts, together with the fact of separate segments of echinoderms behaving in all respects like entire animals, prove that the nervous system is in function, as in structure, everywhere both central and peripheral; although the impairing influence exerted on the co-ordination both of the spines and pedicels by removal of the pentagonal ring, proves that this ring has a more centralising function than any other part of the nervous system.

**Chemical Society**, March 30.—Anniversary Meeting.—The president, Prof. Roscoe, gave his annual address. He congratulated the Society on its flourishing condition. At no period in its history had the number of Fellows been so large, whilst the number of papers read during the past twelve months had increased both in number and in importance. The research fund founded by Dr. Longstaff had done much for the progress of science. The President touched upon the more important discoveries of the year. The supposed decomposition of chlorine and iodine by Victor Meyer has been found to be capable of another explanation. The solar and stellar evidence of the decomposition of metals accumulated by Mr. Lockyer has not yet found general acceptance by chemists. Capt. Abney and Col. Festing have discovered that the organic radicals methyl, ethyl, &c., give characteristic absorption spectra in the infra-red part of the spectrum. Baeyer has succeeded in preparing indigo artificially, and its manufacture on the commercial scale is rapidly progressing. The Society has lost by death ten Fellows, including Sir B. Brodie, Dr. Stenhouse, Prof. W. H. Miller, and Mr. Tennant.—The Longstaff medal was presented to Prof. Thorpe of the Yorkshire College, Leeds, as the Fellow who had done the most to promote chemical science by research.—The reports of the President and Treasurer were received and adopted, and the Officers and Council elected for the ensuing year. President, H. E. Roscoe. Vice-Presidents: F. A. Abel, Warren De La Rue, E. Frankland, J. H. Gladstone, A. W. Hofmann, W. Odling, Lyon Playfair, A. W. Williamson, A. Crum Brown, J. Dewar, J. H. Gilbert, A. V. Harcourt, J. E. Reynolds, J. Young. Secretaries: W. H. Perkin, H. E. Armstrong. Foreign Secretary, Hugo Müller. Treasurer, W. J. Russell. Council: F. D. Brown, M. Carteighe, H. McLeod, G. H. Makins, E. J. Mills, W. C. Roberts, C. Schorlemmer, J. M. Thomson, C. M. Tidy, W. Thorp, T. E. Thorpe, R. Warington.

**Physical Society**, March 26.—Prof. Fuller in the chair.—New member Mr. Lewis Wright, author and editor.—Dr. James Moser read a paper on electrostatic induction, especially relating to the branching of the induction in the differential inductometer and in the electrophorus. The author's experiments bore out the hypothesis of induction as enunciated by Faraday. Prof. Ayrton suggested the importance of adding guard-rings to the small plates of the five-plate inductometer or balance, since without these mathematical calculations could not be accurately applied, and the experimental determination of specific inductive capacity would be doubtful. Dr. Moser pointed out that though the theory was not absolutely correct it lay with the experimenter to get results very approximately correct.—Prof. Reinold, one of the secretaries of the Society, read a paper by himself and Prof. Rückert on the electrical resistance of liquid films with a revision of Newton's scale of colours. The experiments were in continuation of those published by the authors in 1877. Their object was to determine whether a film thinning under the action of gravity gave any evidence, by a change in its specific resistance, of an approach to a thickness equal to twice the radius of molecular attraction, and also to devise a method of finding the amount of water which might be absorbed by or evaporated from it. The thickness of the films was determined from their colour by means of two beams reflected from different mirrors on them.—Newton's scale of colours was revised by observations on Newton's rings, and partly by more than 2000 observations on the rings themselves. The thicknesses determined by direct observations on Newton's rings and those in the corrected table rarely differ by 1 per cent., while Newton's scale in parts differs from both by as much as 10 per cent. of the thickness. The films were formed from a solution of oleate of soda in glycerine, with a little nitrate of potash added to increase their electric conductivity. They were blown in a glass case from which the outer air could be excluded. Precautions were taken to keep the air in contact with the films inside the case at a proper humidity. These consisted in placing disks containing the solution at the bottom of the case and suspending within it sheets of blotting-paper, the lower edges of which dipped into the liquid. A hair hygrometer indicated changes in the humidity of the interior. The resistance of the films was measured by piercing them with gold wires, which were connected with the electrodes of a quadrant electrometer. The resistance of the film between the needles was calculated by comparing the deflection caused by the difference of potential of the two wires when a current was passing through the film with that produced by the difference of potential above and below a known resistance placed in the same circuit. The specific resistance of the liquid from which the films were formed was measured by a method identical in principle with the above. The liquid was contained in a glass tube with turned-up ends. Platinum wires were cemented into small holes drilled in the straight part of the tube, and their difference of potential compared with that of two points in the same circuit separated by a known resistance. This method has the great advantage of getting rid of any difficulties connected with polarisation. Test experiments on sulphuric acid proved the method to give results agreeing with those of Kohlrausch, who employed alternating currents and Wheatstone's bridge. The results of the experiments may be summed up as follows:—It is difficult to form a soap film under conditions precluding a slight evaporation or absorption of water, but the more nearly these conditions are attained the more closely does the specific resistance of the film agree with that of the liquid in mass. The films observed under the most favourable conditions obeyed Ohm's law with great accuracy, and much better than the others. The films indicate no approach to a thickness equal to the diameter of molecular attraction. A soap-film may even in an inclosed space readily loose 23 out of 57·7 volumes of water contained in every 100 volumes of the solution, when special precautions are not taken to maintain the surrounding space in a constant hygrometric condition. Prof. Ayrton suggested that in measuring the liquids and film the distance between the electrodes should be varied. Prof. Guthrie pointed out that the results of Prof. Reinold and Kohlrausch agreed with his own in showing that the conductivity of liquids obeyed Ohm's law.

**Geological Society**, March 23.—Robert Etheridge, F.R.S., president, in the chair.—Rev. Daniel Dutton and Capt. George Ernest A. Ross were elected Fellows of the Society.—The following communications were read:—The Upper Greensands and chloritic marl of the Isle of Wight, by C. Parkinson, F.G.S. In this paper the author described the Upper Greensand as exposed at St. Lawrence and along the Undercliff. At the base of the St. Lawrence Cliff there are hard bands of blue chert from which astaciform Crustacea have been obtained; and quite recently, in a large boulder of the same material lying on the beach, there were found the remains of a Chelonian, referred by Prof. Owen to the family Paludinosa, and named by him *Plastremys lata*. The presence of these freshwater organisms was thought to imply a connection with the Wealden continent. The chert-bed, 2 feet thick, was regarded by the author as marking the boundary between the Gault and the Greensand. Above it the author described 56 feet of compact red and yellow sands, of which the first 20 feet are unfossiliferous, the upper 32 feet show traces of organic remains; between them there is a fossiliferous zone 4 feet in thickness, containing *Ammonites inflatus*, *A. auritus*, and species of *Ponopæa*, *Cucullæa*, *Arca*, and *Trigonia*, and immediately below this a separate band containing an undetermined species of Ammonite. These sands are followed by 38 feet of alternate beds of hard chert and coarse greensands, having at the bottom 6 feet of inferior building-stone surmounted by 5 feet of freestone. The latter contains *Ammonites rostratus*, and the cherts various fossils, chiefly bivalves. *Clathraria Lyelli* also occurs at this level. Above the greensands come 6 feet of chloritic marl: the upper 3½ feet fossiliferous, with a base of hard phosphatic nodules containing crushed specimens of *Pecten asper*; the lower 2½ feet compact, with darker grains and few fossils. The author compared the sections of this series given by Capt. Ibbetson and Dr. Barrois; his own views closely correspond with those of the latter writer.—On the flow of an ice-sheet, and its connection with glacial phenomena, by Clement Reid, F.G.S. The author considers that the boulder-clays have been formed beneath an ice-sheet, and consequently there must have been formerly a huge mass of ice, which would have to flow 500 miles on a nearly level surface, and then to ascend a gentle slope for nearly another 100 miles. He does not think a great piling up of the ice at the North Pole can be assumed to account for this motion. This he explains by the gradual passage of the earth's heat through the mass of ice, raising the temperature of the whole instead of liquefying the surface-layer. As the heat passes upwards it raises the temperature of a particular layer, causes it to expand, and so to put a strain upon the layer above, and then to rupture it. The broken part spreads out, reunites by regelation, and then, receiving the heat from the layer below, again expands and ruptures the layer next above. Thus the movement is from the base upwards rather than from the surface downwards. The author estimates that the ice-sheet in Norfolk was only about 400 feet thick, because boulder-clay does not appear above that level, but only coarse boulder-gravel; in North Yorkshire it extends up to about 900 feet. The author considers that the shell-beds of Moel Tryfaen were not deposited under water, but thrust up-hill by this advancing ice-sheet.—Soil-cap motion, by R. W. Coppinger, communicated by the president. The author described numerous cases in Patagonia where the stumps, &c., of trees are to be seen in the marginal waters of the sea and of lakes. These, together with stones and rocks, sometimes simulating perched blocks, he considers to have been brought down by the motion of the soil-cap—a thick spongy mass resting upon rock often worn smooth by the action of ice, and o sliding down the more easily under the influence of vegetation. The appearances are not unlike those due to subsidence; but he point out that all the evidence is in favour of recent upheaval, instead of subsidence.

**Victoria (Philosophical) Institute**, April 4.—Prof. Balfour Stewart, F.R.S., read a paper on the visible universe, which he described in general terms, and then sought to trace its history back, giving a passing sketch of the views of the theologian on the one hand and the materialist on the other, through its many forms to its first logical origin. A discussion ensue , which was taken part in by several who had been specially invited, the question being treated from the scientific and the metaphysical point of view.

### Paris

**Academy of Sciences**, March 28.—M. Wurtz in the chair.—On account of the death of M. Delesse, the Academy went early into Secret Committee.—The following papers were communicated:—On the heats of formation of diallyl, chloro-compounds, and aldehyde, by MM. Berthelot and Ogier.—Remarkable case of globular lightning; diffuse flashes near the surface of the ground, by M. Trécul. On August 25, 1880, during a thunderstorm, and in full daylight, he saw a very brilliant body, slightly elongated (say 38 to 40 ctm. long by 25 ctm. broad), and with conical ends, pass from one part of a dark cloud to another; and before disappearing, a small part of its substance fell, *as if having weight*, and gave a luminous vertical track with reddish globules at the sides. It divided in falling, and disappeared a little above the houses. The other phenomenon M. Trécul has often noticed in thunderstorms, viz., a band of feeble light, momentarily illuminating a street and reaching right across it, or only part of the width. The author adds some reflections on the phenomena he described on August 23, 1880.—On the representation of numbers by forms, by M. Poincaré.—On a class of linear differential equations, by M. Halphen.—On the reduction of positive quaternary quadratic forms, by M. Charve.—New researches on the winter egg of phylloxera; its discovery at Montpellier, by M Mayet. To find the winter egg in Languedoc, he recommends searching on young American vines of the species *Riparia*, and only where galls are observed on the leaves; further, only raising the bark of two or three years (preferably the former).—Attempted application of the principle of Carnot to electro-chemical actions, by M. Chaperon.—On the construction of photophonic selenium-receivers, by M. Mercadier. These consist of two strips of brass (1 to 4 or 5m. long) separated by two strips of parchment paper, the whole wound in a close spiral, and held in position by two wooden pieces with screws. The arrangement is heated to the melting-point of selenium, and a pencil of selenium passed over the surface. These receivers are continuous, are easily made and repaired, have the same properties as the discontinuous ones, &c. It is possible to give them a very variable resistance, from 8000 to 200,000 ohms., without their ceasing to act well. A large number arranged in series or in surface may be placed in the battery circuit, and many persons enabled to hear photophonic effects at once. In one of M. Mercadier's arrangements the sounds were heard at 2 or 3 m. distance.—On the causes of disturbance of telephonic transmission, by M. Gaiffe. He notices the disturbing effects of friction of wires with each other, and of vibrations caused by wind or otherwise.—On the preparation and the properties of protochloride of chromium, and of sulphate of protoxide of chromium, by M. Moissan.—On phosphoplatinic combinations, by M. Pomey.—Products of action of hydrochlorate of ammonia on glycerine, by M. Etard.—Irian grafts; pathogeny of cysts and epithelial tumours of the iris, by M. Masse. He has found (with rabbits) that small pieces of the conjunctiva or of skin introduced into the anterior chamber of the eye, through an incision made in the cornea, are pretty easily grafted on the iris. After some time the graft takes the form of a fine small pearl, very like the cysts or epithelial tumours which sometimes appear on the human iris after wounds of the cornea. The grafts with skin consist of a thick layer of pavement epithelium, with connective tissue beneath united to that of the iris In the centre of the grafts of conjunctiva a true cystic cavity is developed. Hairs with their follicles may also be grafted on the iris. Rothmund's theory of the cause of cysts and tumours of the iris (pieces of skin, &c., carried through a wound) is apparently verified by these researches.—On the nature and order of appearance of old eruptive rocks observed in the region of volcanoes with craters of Puy-de-Dôme, by M. Julien.

### Vienna

**Imperial Academy of Sciences**, March 31.—V. Burg in the chair.—The following papers were read:—H. Wild, on the temperatures of the Russian Empire.—Dr. H. Goldschmidt, on the action of molecular silver on carbon chlorides.—Dr. F. Hocevar, on some experiments made with a Holtz's machine.—R. Andrasch, synthesis of methylated parabanic acid, of methyl thioparabanic acid, and of thiocholestrophane.—Dr. Emil Holub and A. v. Pezeln, ornithological results of Holub's voyages in South Africa.—Kachler and Spitzer, on Borneol- and camphor-carbonic acid.—Max Gröger, on sulphochromates.—Alb. Cobenzl, contribution to the dissociation of tungsten from antimony, arsenic, and iron, with an analysis of a so-called pseudo-meteor.

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