visitors had been either medical men, architects, or engineers. The representatives of the exhibitors, who have been in daily attendance during the Exhibition, marked their appreciation of the arrangements made for their convenience by presenting on Saturday a small purse of gold to the superintendent, Mr. Smithson. The closing of the Exhibition was taken advantage of by the St. John Ambulance Association to give a demonstration of ambulance practice, and during the afternoon a large number of the visitors assembled in the conservatory to witness the practice, which was conducted by Major Duncan, Mr. Cantlie of Charing Cross Hospital, Mr. Furley, Dr. Crookshank, and Surgeon-major Baker. Prizes were competed for by squads of the Grenadier Guards, the Finsbury Rifles, and the Metropolitan Police. Mr. John Eric Erichsen (the chairman), Dr. Poore, Dr. Steele, Mr. George Godwin, Mr. Rogers Field, and other members of the Exhibition Committee were present during the day. It is expected that the prizes which have been awarded will be distributed at the Annual Meeting of the Parkes Museum in the autumn.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*) from Madagascar, presented by Mr. E. O. Brookfield; a White-collared Mangabey (*Cercocebus collaris*) from West Africa, presented by Mr. James Jameson; a Diana Monkey (*Cercopithecus diana*) from West Africa, presented by Mr. Louis Wyatt; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. R. Edge; two Vulpine Phalangers (*Phalangista vulpina*) from Australia, presented by Mr. George White; a Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*) from the Moluccas, presented by Mrs. Beard; two Wonga-wonga Pigeons (*Leucosarcia picata*) from New South Wales, presented by Mr. J. Burnham; a Royal Python (*Python regius*) from West Africa, presented by Mr. G. H. Garrett; a Grey Parrot (*Psittacus erithacus*) from West Africa, deposited; a Lesser White-nosed Monkey (*Cercopithecus petaurista*), two Pluto Monkeys (*Cercopithecus pluto*) from West Africa, purchased; a Zebu (*Bos indicus*), a Pampas Deer (*Cariacus campestris*), born in the Gardens. Amongst the additions to the Insectarium during the past week are pupæ of *Attacus aurota* (one of which has since emerged) and *Ceratocampa ixion*, from Brazil; larvæ of the Madder Hawk-Moth (*Deilephila galii*), the Death's-head Hawk-Moth (*Acherontia atropos*), the Poplar Hawk-Moth (*Smerinthus populi*), and Fox Moth (*Bombyx rubi*), and perfect insects of the Water Stick-insect (*Ranatra linearis*).

PHYSICAL NOTES

M. SAMUEL, of Ghent, has brought before the Belgium Academy a method of registering telegraphic signals received through the mirror galvanometer (*Bull.*, No. 5). On the screen receiving the light are fixed two selenium elements, one to the right, the other to the left. When either is illuminated its conductivity of course increases, and it acts as a relay on an electro-magnet, which causes a Morse dot or dash to be marked on paper. There are two local batteries, one having two circuits, which pass through the selenium pieces and the electro-magnets, while the other is for the electro-chemical writing. In this latter, a band of paper saturated with iodide of potassium passes continuously over a small copper cylinder which is connected with one pole of the second battery. Above the paper are the ends of the armatures of the electro-magnets; to one is attached a vertical platinum rod, to the other a small triangle with platinum base (horizontal). The rod and triangle are connected, through the armatures, with the other pole of the second battery, and they press the paper band on the cylinder each time the armatures are attracted, giving a dot or a dash as the case may be. The dashes, instead of being longitudinal, are at right angles to the length. If the ordinary lamp of the galvanometer be replaced by sunlight or lime-light, the electro-magnets (M. Samuel points out) may be actuated directly without use of a galvanometer relay; Bell's selenium elements having an average resistance of only 150 ohms in sunlight, and 300 ohms in darkness.

AN evaporimeter with constant level has been recently described by Prof. Fornioni (*Reale Ist. Lomb.*, vol. xiv. fasc. x.-xi). It consists of an oblong wooden case with a brass spiral descending into it from a micrometric screw. The spiral carries at its lower end a small glass vessel which acts as feeder. A glass siphon extends outwards horizontally from the feeder, and has at its outer end a small cup, in which the evaporation takes place. As the water evaporates in the cup the feeder is lightened, and rises by action of the spiral, thus keeping the level constant. A fine layer of oil in the feeder prevents evaporation from its water-surface. There are guides to control the vertical movements of the feeder, which, moreover, are indicated by means of a weighted thread, affecting an external index on a disk. The graduation of the instrument is expressed in millimetres of the height of water in the evaporating vessel.

SIGNOR MAURI (*Riv. Sci. Inst.* No. 11) obtains an economical and very compact battery carbon, intimately united with the electrode, as follows:—Finely-powdered graphite is mixed with an equal weight of sulphur (which should be free from carbonates), and the mixture is heated in an iron vessel until complete fusion of the sulphur. The temperature should not be raised beyond 200°. When the mass is fluid it is poured into a suitable metallic mould, and a thick copper wire, bent zigzag, is quickly inserted, a part being left projecting. The mass is let cool slowly: then it is easily drawn from the mould and is ready for use. These carbons have a conductivity practically equal to that of retort carbon, and are more electro-negative, consequently better adapted for electromotive force. Coke-powder cannot be substituted for graphite, because it has too little conducting power. By increasing the proportion of sulphur, the resistance may be increased at will, and strong resistances may be thus easily prepared in place of resistance-coils of copper wire. (S. Mauri further indicates a way of utilising graphite in construction of a miner's fuse.)

REPEATING Mercadier's experiments in which an intermittent beam meets smoked a surface within a glass tube containing aqueous or ammoniacal vapour, and furnished with an ear-tube, Prof. Mugna lately (*Riv. Sci. Ind.* No. 11) made the effects much better heard by attaching a small microphone to an elastic membrane closing the tube; and it was possible to operate at such distance from the interrupting apparatus, that its noise was no longer disturbing. Prof. Mugna further experimented by suspending horizontally from a cocoon-fibre, within a glass case, a short fine glass rod, with terminal laminæ of card or glass, or very fine metallic foil. An intermittent beam sent against one of the laminæ when they were in a position parallel to the wheel drove the system round in direction of the beam, indicating (the author considers) a direct action of the latter. An air-current due to thermal action should produce the opposite motion. Besides, the phenomenon is still better when the air is rarefied.

IN a note to the Vienna Academy, Dr. Margules calls attention to the beautiful figures that are produced in glycerine, when the liquid is moved in a regular way, by rotation of a disk in contact with it. These figures afford an insight into the form of the surfaces and paths of the currents. They are due to the water contained in the glycerine.

THE method described by Herren Kirchhoff and Hahnemann last year for determining the heat-conductivity of metals, has been applied by them (*Wied. Ann.*, No. 7) to three varieties of iron, and to lead, tin, zinc, and copper; and the electric conductivity of these metals has also been measured. The conclusion is that the ratio of these conductivities is in general constant in these different metals, with exception of iron, and it is thought the exception may be connected with magnetic properties. Herr H. F. Weber's result disagrees with this, for he finds the ratio to be a linear function of the product of specific heat and density. The authors are unable to discover the cause of this discrepance.

AN initial attempt to elucidate the ratio of the specific heat of liquid organic compounds to their composition has been made by Herr von Reis (*Wied. Ann.*, No. 7). It appears from his researches that the difference of the molecular heat of homologous compounds at 20° boiling point, and from 20° to 100°, is very regular: in the former case it is 8·0 and in the latter 7·5.

Alcohols form an exception, having a comparatively high specific heat; they gave the differences 9·7 and 8·5 respectively. Isomeric substances of similar composition have the same molecular heat, while those of unlike composition have a different. In the tables which give carbon and hydrogen differences there are exceptions along with regularity. For a right development of the theory Herr von Reis feels that more extended observation is necessary.

THE idea of qualitative analysis of substances by microscopical examination of crystalline forms is worked out to some extent by Herr Lehmann (*Wied. Ann.*, No. 7). A shallow watch-glass is substituted for the cover glass, and serves for turning over in various ways the crystals which form in the inclosed solution. The domain of regular forms is avoided as unsuitable, and only irregular forms observed—the so-called growth-forms, crystal skeletons, trichites, &c., produced by acceleration of crystallisation, viscosity, and so on. For details of Herr Lehmann's method and apparatus we must refer to his paper.

HERR SCHULLER has lately described to the Hungarian Academy of Sciences (*Wied. Ann.*, No. 7) a mercury air-pump which works automatically, and in which all greased glass combinations are dispensed with, the hermetic closure being effected with only glass and mercury. The evacuating power of the apparatus was not exactly measured; there are proofs that it is high.

MR. J. MILNE has written a careful account of the vertica and horizontal motions accompanying the earthquake of March 8, 1881, in Japan. This is believed to be the first earthquake in which a complete continuous record of both components of the motion has been obtained for a period exceeding twenty-five seconds. The actual maximum displacement appeared to be about 1·33 millims., recurring at the rate of about seven vibrations in five seconds. From the phenomena of this shock, and from some experiments on artificial earthquakes produced by letting an iron ball weighing about one ton fall from a height of about thirty-five feet, Mr. Milne argues that the waves that are felt are *transverse* to the line of propagation of the shock.

BIOLOGICAL NOTES

RELATIONS BETWEEN THE CRANIUM AND THE REST OF THE SKELETON.—These relations form the subject of a paper by M. Manouvrier, read at the last meeting of the French Association. The following are the author's conclusions:—1. The weight of the cranium varies, in a general way, with the weight of the skeleton, but not proportionally, like the weight of the brain. 2. The weight of the skeleton, less the cranium, in a given race, varies nearly in proportion to the weight of the femur. 3. The weight of the cranium is greater relatively to that of the femur, the lighter the latter is. 4. The weight of the cranium is much more considerable relatively to that of the femur in woman than in man. 5. This sexual difference is so pronounced that it constitutes one of the best secondary sexual characters. About 82 women in 100 have the cranium heavier than the two femurs, while 82 men in 100 have it lighter. 6. The lower jaw is heavier relatively to the cranium in the anthropoids than in man, is inferior than in civilised races, in man than in woman, and in the adult than in the child. 7. The weight of the cranium is smaller relatively to that of the lower jaw, the heavier the latter is, &c.

THE COLOUR CHANGES OF AXOLOTL.—Prof. Semper has lately examined axolotl with regard to the influence of light on its colour (*Würzburg Phys. med. Ges.*). When young axolotl are reared in darkness they become quite dark; nearly as dark in red light; in yellow, on the other hand, pretty bright; and brightest in bright daylight. The difference is connected not only with the chromatic function found in various degrees in all amphibia, but on pronounced formation of a peculiar diffuse yellowish green colouring matter, increase of white, and diminution of dark chromatophores. Further, when axolotl are exposed to daylight in white dishes covered with white paper, much less dark pigment forms in them than when they are kept in white dishes without a paper cover (other things equal); though in the latter case they are apparently exposed to the most intense light; these darker axolotl are, however, still much brighter than those reared in red light or in darkness. Since (as experiment showed) the white covering paper let through much light, but very little of the chemical rays, it appears that chemical rays play no part in the formation of pigment. But the causes of the whitening in bright daylight and the darkening in absence of light remain unknown as before.

SIREDON LICHENOIDES.—Mr. W. E. Carlin publishes in the June number of the *Proceedings* of the United States National Museum some very interesting details about this remarkable form. Its chief habitat is a body of water some two and a half miles in circumference called Como Lake. This has no known outlet, but is fed by a perennial stream of pure spring water. The lake is shallow, and its water very strongly impregnated with an alkali; it is very disagreeable to the taste. The Siredon never enter the freshwater stream; they abound in the alkaline waters of the lake in immense numbers. When about one hundred and fifty were placed in fresh water they seemed to suffer no inconvenience, but it had a remarkable effect in hastening their metamorphosis into the Amblystoma form. Of an equal number kept in fresh water and in the lake water, quite a change occurred with the former after twenty-four hours, while the latter showed no change after several days of captivity. Those that were kept well fed in jars usually began to show a slight change in from two to three weeks, and all of them completed the change into the Amblystoma inside of six weeks, while in some kept, but not specially fed, there were but three changes in three months. Specimens kept in captivity became quite tame, soon learning to know that tapping the jar in which they were, meant a fly, and, rising to the surface, would snap at whatever they saw first, pencil or fly.

FISH MORTALITY IN THE GULF OF MEXICO.—We glean a few more particulars as to this strange mortality from the June *Proceedings* of the United States National Museum. The fishing interest of Key West is an important one, supplying thousands with the means of subsistence. The fishermen state that a volcanic spring exists, the waters from which are of a high temperature. The polluted waters are of a red brick colour; their influence is seen for a distance of 200 miles. A scant supply of sea water from the Gulf of Mexico sent to Washington was examined by Mr. F. M. Endlich of the Smithsonian Institution. That in which the fish died (A) contained a large quantity of algæ and infusoria, and the pure water (B) had none. They gave the following analysis:—

	A.	B.
Spec. grav.	1·024	1·022
Solids per cent.	4·0780	4·1095
Ferric compounds per cent. ...	0·1106	0·0724
Injurious organic matters ...	ratio = 3	= 2

Even on spectroscopic analysis Mr. Endlich could not find in A any mineral constituent which could noxiously affect the fish, and he thinks that death must be caused by parasitic algæ, while Surgeon Glazier agrees with the prevalent opinion that the catastrophe is due to the salt water being impregnated with gases discharged from volcanic or geyser-like springs. During November last the waters of Tampa, Sarasota, and Charlotte Harbour were covered with thousands of dead fish, and the stench was quite overpowering.

THE BLOOD OF INSECTS.—Operating with the larva of *Oryctes nasicornis*, M. Fredericq has observed (*Bull. Belg. Acad.*) that the blood of the animal, drawn off in a small glass cannula, is a colourless liquid, but on exposure to the air presently takes a decided brown colour, and coagulates. The coloration he regards as a purely cadaveric phenomenon. The substance which becomes brown is probably formed in the moment of coagulation, and does not serve in the body as a vehicle between the external air and the tissues, like *hæmoglobin* in Vertebrates and many Annelids, *hæmocyanin* in Crustaceans, &c. When the larva is kept a quarter of an hour in hot water (50° to 55°), the blood extracted does not coagulate or become brown. Once the substance which browns is produced, even a boiling temperature does not prevent its browning. The brown substance once formed is very stable, not being decomposed either by acids or alkalies, and not made colourless by being submitted to vacuum or kept in a closed vessel. The existence of an intermediary in insects corresponding to hæmoglobin M. Fredericq thinks very problematical in view of the anatomical system, letting air penetrate into the heart of the tissues.

NEW PYCNOGONIDA.—The result of the examination of the collection of Pycnogons made during the cruise of the U.S. steamer *Blake* by Edmund B. Wilson, has just been published as No. 12, vol. viii. of the Harvard College Museum *Bulletin*. This collection was found to possess features of considerable interest, and though the species in it were few, some of them