changes produced in the gaseous and liquid states of matter vary as the square, cube, or some other simple function of the temperature; Graham, in like manner, sought to show that the movement of his diffusive molecules, whether in liquids or in gases, was related to some equally simple function of their mass. Henry says of Dalton that "his inmost mental nature, and all its outward manifestations were in the language of the German metaphysicians, emphatically subjective. Thus in special or objective chemistry he has left absolutely no sign of his presence; no great monograph on an individual body and its compounds; no memorable analysis of a substance deemed simple into yet simpler elements; no new element—no Neptune—added to the domain of chemistry." Every word of these sentences could be applied with equal truth to Graham. The tendencies of both men were essentially introspective. Each was capable of the most patient concentrated thought and of steady prolonged attention, wholly abstracted from external objects and events. I have heard the late Dr. Young narrate the most extraordinary instances of Graham's power of mental abstraction. Dalton said of himself that, "If I have succeeded better than many who surround me, it has been chiefly, nay, I may say, almost solely, from unwearied assiduity. It is not so much from any superior genius that one man possesses over another, but more from attention to study and perseverance in the objects before them, that some men rise to greater eminence than others."

It seems like a contradiction in terms when we reflect for a moment upon the characteristic features and tendency of his work, to say that Graham, like Dalton, was utterly devoid of the quality we call imagination. Henry says of Dalton that imagination had absolutely no part in his discoveries; except, perhaps, as enabling him to gaze, in mental vision, upon the ultimate atoms of matter, and as shaping forth those pictorial representations of unseen things by which his earliest as well as his latest philosophical speculations were illustrated. Graham would not allow his fancy even that amount of play. Even in the speculative essay from which I have quoted so largely, it seems as if every word had been weighed and every sentence put together with slow laborious thought. This passionless aspect of his work seems to have greatly impressed Angus Smith, himself a man of lively sympathy and of quick susceptibility. "His works," says Smith, "are full of care, but not of joy."

(*To be continued.*)

SCIENTIFIC SERIALS

American Journal of Science, March.—On the absolute wave-length of light, by Louis Bell. The experiments here described were undertaken with a view to check the results obtained by C. S. Pierce for Prof. Rowland's great map of the solar spectrum, and to furnish a value of the absolute wave-length as nearly as possible commensurate in accuracy with the micrometrical observations. For the wave-length of D, at 20° C. and 720 mm. pressure, Mr. Bell obtains 5896·08, or *in vacuo* 5897·71, as compared with 5896·22, Rowland's micrometer measure from Pierce's preliminary result, and 5895·89, Thalèn's correction of Ångström, both in air at ordinary temperature and 760 mm. pressure. But neither of these was corrected for errors in the gratings; hence, obviously, the cause of the discrepancy.—On the relative wave-length of the lines of the solar spectrum, by Prof. Henry A. Rowland. This measurement of the relative wave-lengths of the spectrum and its reduction to absolute wave-lengths by some modern determination has been undertaken in connexion with the photographic map of the solar spectrum on which the author has been engaged for several years, and which is now finished from the extreme ultra-violet wave-length 3200 down to wave-length 5790. Appended are tables of coincidences and of wave-lengths of standard lines.—The norites of the "Cortlandt series" on the Hudson River, near Peakskill, New York (continued), by G. H. Williams. Here are studied the mica norites, the augite norite (hyperite), pyroxenite, and the iron ore and emery in the Cortlandt norite. Owing to incipient alteration, easily visible under the microscope, the West-Chester County emery appears to be of less commercial value than that of Asia Minor.—Natural solutions of cinnabar, gold, and associated sulphides, by George F. Becker. In the course of investigations on the geology of the quicksilver deposits of the Pacific slope, the author has made some studies, here detailed, on the question of the state of combination in which quicksilver is dissolved in natural waters. The solubility of zincblende, pyrite (marcasite), copper sulphides, gold, and other associates of cinnabar, is incidentally examined, the quantitative analysis involved in the process being made by Dr. W. H. Melville.—Fluviatile swamps of New England, by N. S. Shaler. In examining the fresh-water swamps of this region, the author has carefully studied the geographical distribution of those formed along the banks of rivers. Although the inquiry is mainly limited to the post-glacial changes in the valleys trending northwards, much light is incidentally thrown on the pre-glacial altitude of the continent. It is made evident that these valleys could not have been excavated by streams of their present slope; hence the inference that the descent of the northward flowing rivers must have been more rapid in pre-glacial times than at present; in other words, this part of the continent was at that time relatively less elevated in its northern parts than it is at present.—On the Mazapil meteoric-iron which fell on November 27, 1885, by William Earl Hidden.—On observations of the eclipse of August 18, 1887, in connexion with the electric telegraph, by Prof. David P. Todd. Referring to his remarks in the Proceedings of the American Academy of Arts and Sciences for 1881, p. 359, the author points out how the proposed method of telegraphic transmission of important observations might be adopted during the eclipse of August 18 next.—On two new meteorites from Carroll County, Kentucky, and Catorze, Mexico, by George F. Kunz. The Kentucky iron has some ethnological interest in connexion with the ornaments of meteoric iron occurring in the mounds of the Little Miami Valley, Ohio, all apparently belonging to one and the same meteoric fall. The Catorze mass, weighing 92 pounds, was found near Catorze, San Luis, Potosi, in 1885. It is one of the caillite group of Stanislas Meunier, and shows the Widmanstätten lines very finely. Analysis: Fe 90·09; Ni and Co 9·07; P 0·24; with specific gravity 7·509.

Rivista Scientifico-Industriale, February.—On the cause of the electric discharge accompanying thunderstorms, by Prof. G. Guglielmo. The views of Ermann and Peltier are here subjected to close scrutiny, and shown to be inadequate to account for these electric phenomena.—On the variations in the electric resistance of antimony and cobalt in the magnetic field, by Dr. G. Faé. The author's researches show that, apart from the intensity of the observed effects, antimony behaves in the way determined by Righi for bismuth, and cobalt in the way determined by Thomson for iron and nickel.

Rendiconti del Reale Istituto Lombardo, February.—Summary of the meteorological observations recorded in the Brera Observatory, Milan, during the year 1886, by E. Pini. The daily, monthly, and annual means are tabulated for the atmospheric pressure, temperature, rainfall, velocity, and direction of the winds throughout the year.—Meteorological observations for the month of January, 1887, at the same Observatory.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 10.—"Note on Induction Coils or 'Transformers.'" By John Hopkinson, M.A., D.Sc., F.R.S.

"Note on the Theory of the Alternate Current Dynamo." By John Hopkinson, M.A., D.Sc., F.R.S.

March 17. — "The Embryology of Monotremata and Marsupialia." Part I. By W. H. Caldwell, M.A., Fellow of Gonville and Caius College, Cambridge. Communicated by Prof. M. Foster, Sec. R.S. (Abstract.[1])

(1) *The Egg-membranes.*—In Monotremata, in very young ova, a fine membrane exists between the single row of follicular cells and the substance of the ovum. This membrane, which I will call *the vitelline membrane*, at first increases in thickness with the growth of the ovum, and through it pass numerous fine protoplasmic processes connecting the protoplasm of the follicular cells with that of the ovum, and serving to conduct food granules, which, appearing in the neighbourhood of the nuclei of the cells, travel thence to the ovum; food granules also appear in the neighbourhood of the germinal vesicle, and travel away from it: hence the horseshoe-shape of the yolk-mass as seen in section.

[1] The author being at the present time in Australia and so unable to correct the proof of this abstract, I have undertaken this duty. In doing so I have ventured, for the sake of what appeared to be increased clearness, to introduce into § 1 some modifications of the author's manuscript, being guided therein by the author's more detailed account given in the fuller paper.—M. Foster, Sec. R.S.

The time during which food granules are thus passing from the follicular cells to the ovum may be called "the yolk forming period."

It is succeeded by a period during which the vitelline membrane again becomes thin, the follicular cells are reduced to a single layer, and the cells are very thin and flat. This period may be called the "absorption of fluid period," since during it the ovum absorbs large quantities of fluid through the thin vitelline membrane and single layer of thin follicular cells, and thereby increases largely in size.

This is in turn succeeded by a third period, during which the follicular cells again become active, multiply, increase greatly in size, and give rise between themselves and the vitelline membrane to a deeply standing homogeneous layer, which I will call *the chorion*. This period may hence be called "the chorion forming period." All these three periods are gone through while the ovum is still in the follicle.

Upon the bursting of the follicle and the reception of the ovum in the Fallopian tube, a few of the follicular cells remain attached to the chorion; the majority are left behind within the burst follicle.

During the passage along the Fallopian tube, the vitelline membrane again increases in thickness, and the chorion, also increasing in thickness, absorbs fluid and becomes *the albumen layer*. Outside this now appears a new structure, *the shell* or shell-membrane, of tough parchment-like consistency,[1] not staining with reagents. I have not yet traced the deposition of the shell to the activity of any special glands; but I can say that the shell-membrane does not increase at the expense of the chorion or albumen layer.

After reaching the uterus both vitelline membrane and shell-membrane increase in thickness, but the albumen layer diminishes and disappears, serving apparently for the nutrition of the ovum. Immediately beneath the vitelline membrane a new layer is now seen in hardened preparations; but it may be shown that this layer is really fluid, yielding a coagulum which stains deeply with reagents, the fluid being apparently derived, through the membranes, from the uterine glands.

In Marsupialia the history of the vitelline membrane, save that "the yolk forming period" is not marked off from the "absorption of fluid" period, is similar to that in Monotremata. I have not been able to trace the beginning of the "chorion" while the ovum is still in the ovary, in Marsupialia; but in an ovum of Phascolarctos from the uterus, I found a chorion like that of Monotremata, and surrounded moreover by a thin transparent membrane—a *shell-membrane*. Within the uterus the chorion, increasing in thickness, becomes transformed into an albumen layer, and is eventually absorbed, passing through the vitelline membrane to nourish the ovum, so that eventually the vitelline membrane comes to be close to the shell.

As in Monotremata, a coagulable, and, when coagulated, deeply staining fluid makes its appearance between the vitelline membrane and ovum (blastoderm).

The shell-membrane persists until the developing ovum becomes fixed to the walls of the uterus, after which it disappears.

The paper then compares the egg-membranes just described with those of Placentalia, and those of Vertebrata generally.

(2) *Segmentation.*—The telolecithal ova of Monotremata and Marsupialia go through a partial segmentation. The ova of Placentalia segment completely, but the resulting blastodermic vesicle is identical with that produced by partial segmentation in Monotremata and Marsupialia.

In Monotremata there is a posterior lip to the blastopore similar to that of Elasmobranchii. The epiblast grows in so rapidly from the sides, that a primitive streak region is formed in front of the posterior lip long before the epiblast has inclosed the yolk. This uninclosed area in front of the primitive streak probably includes a region where the hypoblast (yolk) has secondarily broken through the epiblast. The existence of such a region would hide the position of the anterior lip of the blastopore. The circumference of the circle made up by the larger arc of the edge of the blastoderm on the yolk, and the smaller arc of the posterior lip of the blastopore, is a measure of the quantity of yolk in a meroblastic ovum.

In Marsupialia the epiblastic growth incloses the hypoblast at a very early age, except over a narrow slit in front of the posterior lip of the blastopore. This slit corresponds to the area inclosed by the circle described above in a meroblastic egg. The primitive streak is not conspicuous at an early age because of the large size of the cells. No hypoblast projects through the epiblast in front of the primitive streak region. I would explain the segmentation and the gastrula of Placentalia in the same way. Balfour's objection ("Comp. Embryol." vol. ii. p. 187) to Van Beneden's original comparison of the blastopore of the rabbit with that of a frog, is explained away by the presence of a posterior lip to the blastopore in Marsupialia. My explanation postulates the existence of a similar structure in the rabbit. The blastopore of the rabbit corresponds therefore to the whole area marked out by the growing epiblast and the posterior lip of the blastopore, before the closing of the primitive streak region, or to this area minus the secondary extension, caused by the projecting yolk, in Monotremata.

[1] In the laid egg of Echidna I have not detected calcic salts, but that of Ornithorhynchus gives rise to gas when treated with dilute acid.

Linnean Society, March 17.—Mr. W. Carruthers, F.R.S., President, in the chair.—A recommendation of the Council to present to the British Museum, Kew, and the Oxford Botanical Gardens, the Society's carpological collection was submitted to the Fellows, but not approved by them.—Mr. C. B. Clarke, F.R.S., was elected into the Council in the place of Dr. H. Trimen, who resigned.—Mr. A. O. Walker read a paper on the Crustacea of Singapore. These were collected by Surg.-Major Archer during 1879–83. The species were chiefly dredged in 15-20 fathoms, or got on shallow banks. A full list is given of all the forms identified, and several new species are described. Among these are: *Doclea tetraptera*, *Xanthe scaberrimus*, *Maii miersii*, and *Caphyra archeri*.—A paper was read by Dr. Geo. King, on the genus *Ficus*, with special reference to the Indo-Chinese species. The genus *Ficus* was founded by Linnæus, and included seven species ("Species Plantarum," 1st ed.) Later editions contained 118 species. Blume described 93 Malayan figs, and Roxburgh 55 Indian species. In the "Hortus Cliffortianus" Linnæus clearly comprehended the difference of the sexes, *i.e.*, Caprifig = male, the so-called Fig = female, and *Erinosyce* = hermaphrodite. Vahl seems to have misunderstood the arrangement of the sexes, and Blume apparently followed him. Roxburgh is the first writer who examined minutely the florets of nearly the whole of the species, finding two androgynous and the majority monandrous. Later on Gasparini and Miquel each made a careful study of the flowers of the genus, and separately gave different classifications of the group. Miquel subsequently altered his arrangement, making divisions into six sub-genera, while enumerating 405 Old World, 128 American, and twenty-two species of doubtful nativity. In the "Genera Plantarum" of Bentham and Hooker four of Miquel's sub-genera are admitted, a fifth considered doubtful, and a sixth rejected. These authors regarded Miquel's divisions as too loosely defined, and recommended a re-working of the group. Dr. King goes into a lengthened description of the structural peculiarities of the flowers of the genus *Ficus*. He specifies (1) male, (2) pseudo-hermaphrodite, (3) neuter, and (4) female fertile flowers. Besides these, he states that there occurs in all the species of *Ficus* a set of flowers originally named by himself "*insect-attacked-females*," but for which he has adopted Count Solms-Laubach's term "*gall-flowers*" (*Bot. Zeit.* 1885); the latter botanist having anticipated him in publication, though King's researches had been commenced earlier. King enters into the question of these gall-flowers, stating that, in the majority, the pupa of an insect is present, and this pupa can usually be seen through the coats of the ovary. The pupa when perfected escapes into the cavity of the receptacle by cutting its way through or by bursting these coats; and fully-developed winged insects are often to be found in considerable numbers in the cavity of the fig. The opening through which each insect has escaped from the ovary in which it has been developed is afterwards clearly visible. The pupa of the insect must become encysted in the ovary of the gall-flower at a very early period, for about the time at which the imago is escaping from the ovary the pollen of the anthers of the male flower is only beginning to shed. Now, there is nothing in itself remarkable in the mere occurrence in the genus of numerous flowers having the general form of females, which yet by reason of certain peculiarities in their structure are incapable of fertilisation by pollen practically barren; while at the same time their structural defects fit them for becoming the nidus for the larvæ of special insects. But, when the manner in which these malformed female flowers are disposed in the receptacle is inquired into, it becomes clear that through the interposition of insects these malformed female flowers may play a most important part in the life-history of many species of the genus *Ficus*. Thus from the peculiarities in the structure and arrangement of

the flowers, Dr. King is of opinion that the evolutionary history of the genus *Ficus* may be traced. On data derived therefrom he arranges the Indo-Malayan species into two great groups, the second of these being again divided into three subsidiary sub-groups as follows :—

Ficus, Linn.
- Group I. Pseudo-hermaphrodite. . Palæomorphe
- Group II. Unisexual
  - Sect. 1 . . Urostigma
  - Sect. 2 . . Synœcia
  - Sect. 3
    - A: Sycidium, Covellia
    - B: Eusyce, Neomorphe

Physical Society, March 12.—Prof. G. Carey Foster, Vice-President, in the chair.—Mr. Shelford Bidwell described some experiments which seem to show that the electrical resistance of suspended copper and iron wires, alters with the direction of the testing current. The apparatus used consisted of a metre bridge with coils of 100 ohms in the gaps adjoining the standard wire, the other two arms being two suspended wires united at the top, to which point one terminal of the galvanometer was joined. A commutator placed in the battery circuit served to reverse the testing current. When a wire is suspended vertically the stress increases from below upwards, and the author believes the observed effects to be due to the absorption of heat by the current as it passes from a stretched towards an unstretched part of a copper wire, and the evolution of heat when it passes from an unstretched towards a stretched part. As the apparatus was arranged the current passed up one side and down the other, heating the one and cooling the other, thus disturbing the position of balance. If iron wires were used the heating and cooling effects were reversed. Prof. S. P. Thompson suggested loading the wires at different points in order to vary the stress without using such long wires, and Mr. C. V. Boys thought still shorter wires could be used by joining the ends to a revolving spindle and stretching them by centrifugal force.—On a lecture experiment in self-induction, by Mr. Shelford Bidwell. A telephone is placed in series with the secondary coil of an induction coil and another coil whose self-induction can be raised by inserting a core of iron wires, or another coil, or both. The effect of introducing the iron core is very marked, reducing the sound enormously. If a coil of wire containing an iron core be inserted, the effect of short-circuiting the coil is to increase the sound in the telephone. The same author also described and showed an experiment due to Dr. Fleming, in which a disk of copper inclined at an angle of 45° to the axis of a coil of wire and suspended bifilarly, is deflected by passing an undulatory current round the coil. In explanation of the former experiment, Dr. Fleming wrote down the formulæ for the effective resistance and self-induction of a circuit near another closed circuit, which show that the former is greater and the latter less for undulatory than for steady currents. He had not arrived at any satisfactory explanation of the deflection of the copper disk. Prof. Ayrton exhibited a tuning-fork worked electrically, in which the pitch could be varied by altering the self-induction of the circuit, or by varying the position of the make-and-break screw. Mr. C. V. Boys referred to his experiments, published in 1884, on the impulse given to metal disks suspended in a magnetic field whose strength is suddenly changed, as being of a similar character to that described by Mr. Bidwell, and suggested the use of aluminium instead of copper in future experiments, owing to its conductivity for the same weight being greater. Prof. Thompson said he had recently used a similar apparatus to that described by Mr. Bidwell as an illustration of the effect of self-induction, and pointed out the uses of self- and mutual-induction in multiplex telegraphy and telephony. As an explanation of the deflection of the copper disk by alternating currents, Prof. Foster thought it possibly due to its initial position being that of maximum sensibility, and therefore each impulse had less effect than the preceding one. Mr. W. M. Mordey mentioned a simple arrangement for varying self-induction used by Mr. Ferranti to control the power of incandescent lamps worked by alternating currents, and Prof. Ayrton described a closed magnetic circuit of great self-induction, used to protect voltmeters on the telpher line at Glynde from disastrous inductive effects produced by breaking the locomotive circuit. Referring to tuning-forks, Mr. Bosanquet thought some self-induction was necessary in order that the current should act to the best advantage in attracting the prongs at the proper instant. Further remarks were made by Mr. Boys and Prof. Perry.—On a lecture experiment to show that capacity varies inversely as the thickness of the dielectric, by Profs. W. E. Ayrton and John Perry. The authors consider it easy for students to see that, other things remaining constant, capacity is proportional to area. Taking this as proved, a condenser is arranged such that the area A of the insulated inner coating varies as the thickness t of the dielectric, and the potential difference between the coatings is found by experiment to be constant. Then since capacity $= \frac{\text{quantity}}{\text{potential}}$, and both the latter being constant, therefore the capacity of the condenser is constant. But by the construction of the apparatus $\frac{A}{t}$ is constant, and it is assumed that capacity varies as A, therefore capacity must vary inversely as t. —Note on magnetic resistance, by the same authors. Two iron rings about 6 inches diameter, made from the same bar of best Swedish iron about half an inch in diameter, were wound with insulated wire in two halves, so that a current could be sent round either or both halves, and the resulting induction measured by the throw of a ballistic galvanometer placed in series with a few convolutions of wire wound round the outside of the main winding. One of the rings was continuous, and the other had a small air space of about 0·8 mm. in a plane perpendicular to that of the ring and passing through its axis, as if the ring had been cut by a saw. The primary object of the experiments, which were made by Messrs. Aldworth, Dykes, Lamb, Robertson, and Zingler, of the Central Institution, was to determine whether there was any appreciable "surface magnetic resistance." The results do not show any such resistance, and the relative resistance of air and iron as calculated from the unsaturated parts are about as 1200 to 1, a number agreeing fairly well with those obtained by other experimenters. From this the authors conclude that for small distances magnetic resistance of air is proportional to length. When the magnetising current was passed round the one half of the divided ring on which the test coil was wound, a greater induction could be obtained than by any other way of magnetising, and this the authors do not attempt to explain. Mr. Bosanquet said he had always found greater inductions obtainable in the middle of bar electromagnets or open magnetic circuits, than could be produced in closed magnetic circuits, and thought the above observations confirmed his own results. A discussion followed in which Mr. C. V. Boys, Mr. W. M. Mordey, Mr. Bosanquet, and Prof. Perry took part.—On account of the late hour the reading of a note on dynamo machines and motors, by Profs. Ayrton and Perry, was postponed till the next meeting.

Zoological Society, March 15.—Dr. St. George Mivart, F.R.S., Vice-President, in the chair.—The Secretary read a report on the additions that had been made to the Society's menagerie during the month of February 1887.—Mr. Howard Saunders exhibited a young male Harlequin Duck (*Cosmonetta histrionica*), shot off the coast of Northumberland on December 2 last, and remarked that it was the second authentic British-killed specimen in existence.—Mr. Oldfield Thomas read a paper on the Bats collected by Mr. C. M. Woodford in the Solomon Islands.—A communication was read from Mr. W. R. Ogilvie Grant, containing an account of the birds collected by Mr. C. M. Woodford at Fauro and Shortland Islands, in the Solomon Archipelago, and in other localities of the group.—A communication was read from Mr. G. A. Boulenger, containing a second contribution to the herpetology of the Solomon Islands.—Mr. Oldfield Thomas read a paper describing the milk-dentition of the Koala (*Phascolarctos cinereus*), which was shown to be in the same state of reduction as had been described by Prof. Flower in the case of the Thylacine.—A second communication from Mr. Boulenger contained a description of a new Gecko of the genus *Chondrodactylus* from the Kalahari Desert, South Africa, based on a specimen which had been presented to the Natural History Museum by Mr. J. Jenner Weir. The author proposed to call it *C. weiri*.

Geological Society, March 9.—Prof. J. W. Judd, F.R.S. President, in the chair.—The following communications were read :—On *Chondrosteus acipenseroides*, Ag., by Mr. James W. Davis.—On *Aristosuchus pusillus*, Ow., being further notes on the fossils described by Sir R. Owen as *Poikilopleuron pusillus*, Ow. ; on *Patricosaurus merocratus*, Seeley, a lizard from the Cambridge Greensand, preserved in the Woodwardian Museum of the University of Cambridge ; on *Heterosuchus valdensis*, Seeley, a procœlian crocodile from the Hastings Sands of

Hastings; on a sacrum, apparently indicating a new type of bird (*Ornithodesmus cluniculus*, Seeley), from the Wealden of Brook, by Prof. H. G. Seeley, F.R.S. In the last paper, after some remarks on the characters of the sacrum in birds, Ornithosauria, and Dinosauria, the author proceeded to describe a sacrum composed of six vertebræ in the Fox Collection, now at the British Museum, and then to compare the fossil with the corresponding bones of the three groups named. The resemblance to the Dinosaurian and Ornithosaurian sacral vertebræ was less than those which connected the fossil with birds. From the latter it was distinguished by the smaller number of vertebræ in the sacrum, the absence of sacral recesses for the lobes of the kidneys, and the form of the articular face of the first sacral vertebra. But the small number of sacral vertebræ in *Archæopteryx*, the want of renal recesses in *Ichthyornis*, and the characters of the articulation in the Solan goose showed that these differences were not essential; and the author concluded that the fossil belonged to a true bird, but that it formed a link with lower forms, and approximated more to Dinosaurs than did any other Avian type hitherto described.

Chemical Society, March 17.—Dr. Hugo Müller, F.R.S., President, in the chair.—The following papers were read:—The action of heat on nitrogen peroxide, by Dr. A. Richardson.—Supersaturation of salt solutions, by Dr. W. W. J. Nicol. This paper contains an account of experiments on the physical constants of supersaturated and dilute salt solutions. The solutions were examined in two ways: (1) concentration constant and temperature varying; (2) temperature constant and concentration varying; in this way it was possible to pass from dilute to supersaturated solutions, and to examine the change in the various physical constants. The electric conductivity, specific viscosity and rate of expansion were examined by the first method. The specific viscosity and density by the second. In every case it was found that the curve corresponding to the non-saturated solutions was perfectly continuous with that for the supersaturated solutions. From this the author concludes that the constitution of dilute, saturated, and supersaturated solutions is the same. Supersaturation is explained by the hypothesis that the substance in solution is not the same as that which crystallises out. A supersaturated solution of sodium thiosulphate deposited crystals of the composition $Na_2S_2O_3,H_2O$ when evaporated *in vacuo*, showing that the solution does not contain the pentahydrate. The author believes that the salt in solution is combined with the whole of the water, an opinion based on his experiments on vapour-pressures and molecular volumes. Colour changes in solution are not, he believes, due to hydration, but to rearrangements of the salt molecule similar to that which occurs in the case of chromium sulphate. Dr. Nicol's views were criticised by Mr. Pickering and Dr. Armstrong.—The formation of γ-naphthalenesulphonic acid by means of sulphuric anhydride and on γ-dihydroxynaphthalene, by Dr. Henry E. Armstrong and Mr. W. P. Wynne.—α-Cyanonapthalenesulphonic acid, by Dr. Henry E. Armstrong and Mr. S. Williamson.—Addendum to paper entitled an explanation of the laws which govern substitution in the case of benzenoid compounds, by Dr. Henry E. Armstrong.—The transformation of citric acid into pyridine-derivatives, and on the constitution of pyridine, by Dr. S. Ruhemann.—Silver containing bismuth, by Mr. William Gowland.

Royal Meteorological Society, March 16.—Mr. W. Ellis, President, in the chair.—The following papers were read:—Notes on taking meteorological observations on board ship, by Capt. D. W. Barker. The author makes various suggestions as to the placing of meteorological instruments on board ship with the view of securing uniformity.—Marine temperature observations, by Dr. H. R. Mill. After briefly sketching the principal historical methods of observing temperature beneath the surface of the water, Dr. Mill discussed in some detail the relative merits and defects of the two instruments now in common use for this purpose. The self-registering maximum and minimum thermometer on Six's principle, even with the addition of an outer bulb to protect it from pressure, has certain inherent defects. It merely shows the highest and lowest temperatures passed through, the indices are liable to be shaken from their proper position, and it requires long immersion in order to attain the temperature of its surroundings. Mr. J. Y. Buchanan has shown how, by the use of mercury and water piezometers, the actual temperature at a given point may be obtained, no matter how the temperature between that point and the surface may vary. Such instruments have not been much used, and now a modification of the mercurial outflow thermometer, patented by Messrs. Negretti and Zambra as the "standard deep-sea thermometer," is largely used. When fitted in a frame which admits of the thermometer registering at a precisely known depth, admirable results are obtained by it. The manner of using these thermometers in the Scottish frame and of conducting temperature trips in comparatively shallow water was described; and the best ways of recording the observations and elaborating the results were alluded to; the work of the Scottish Marine Station on the Clyde sea area being taken as an illustration. The importance of marine temperature observations as bearing on submarine geography, on navigation, on the distribution of animal life, and consequently on fisheries, was alluded to. The paper was illustrated by diagrams, and by the exhibition of the apparatus which was described.—After the reading of these papers the meeting was adjourned in order to afford the Fellows an opportunity of inspecting the Exhibition of Marine Meteorological Instruments and Apparatus which has been organised under the auspices of the Society.

Victoria Institute, March 7.—The Rev. Dr. Walker read a paper on insect life in the East, in which he gave a full report of his entomological researches in Egypt and the East, and drew special attention to the very great number of British varieties that he had captured in various parts of the world. During the discussion, Dr. Sydney Klein remarked on the value to science of Dr. Walker's labours, and, in regard to insect life in the East at night, said that when passing a night among the ruins of Ephesus he found its superabundance manifested by the actual roar of chirps, scrapings, rattles, hummings, and cries from the country round, quite equalling his experience in the woods of Central America. Mr. Hastings C. Dent gave an account of his observations in South America and elsewhere.

MANCHESTER

Literary and Philosophical Society, January 17.—Prof. W. C. Williamson, F.R.S., in the chair.—Mr. Henry Hyde exhibited a leaf of *Bryophyllum calycinum*, with young plants growing out of the margin.—Dr. Alex. Hodgkinson read a paper on cavities in minerals containing fluid, with vacuoles in motion, and other inclosures.—Prof. W. C. Williamson, F.R.S., gave a practical demonstration by means of sections, shown by the oxy-hydrogen camera, of the structure and development of young roots. Beginning with those of the maize as they appear within the seed, Prof. Williamson exhibited and explained those of the vine, of the bean, of the crown imperial, and of the several species of cycads, illustrating the changes which roots undergo between the uniform structure seen near the root or tip, to their more advanced condition, as seen first in the roots of endogenous plants, and afterwards in the more complicated ones of exogens.

PARIS

Academy of Sciences, March 21.—M. Janssen, President, in the chair.—On the movement of a solid in a liquid, by M. Halphen. A theoretical demonstration is given of the general proposition that this movement consists of (1) a uniform helicoidal motion round a fixed axis in space; (2) a uniform rotation round a fixed axis in the solid; (3) a periodical movement.—On the great atmospheric movements in connexion with MM. Schwedoff, Colladon, and Lasne's cyclonic theories, by M. Faye. The paper is devoted to a refutation of these various theories, which are stated to be mainly due to the confusion caused by failing to distinguish between movements produced artificially in the air or water by a simple rotatory action, and the natural cyclones, tornadoes, waterspouts, &c.; the two orders of phenomena having only an apparent relation to each other.—Some observations and reflections on the earthquake of February 23 at Antibes, by M. Ch. Naudin. At this point of the coast the sea suddenly retired about 3 feet, soon returning with considerable velocity to its normal level. This and the associated phenomena are attributed, not to any volcanic action or to the gases confined in vast subterranean cavities, but to the resistance offered by certain parts of the terrestrial crust to the electricity generated in the globe itself. It is pointed out that these disturbances occur always in districts destitute of forest growths which might serve to discharge the atmospheric electricity, and on this is founded a fresh argument for replanting lands that have become disafforested.—On the red fluorescence of alumina, by M. Lecoq de Boisbaudran. Some experiments are described leading to the inference that this fluorescence is due to the presence of traces of chromium in ordinary alumina, and cannot be produced by the pure earth itself.—Earthquakes in connexion with fire-damp, by

M. F. A. Forel. It is suggested that the series of slight vibrations almost invariably following the first great shocks may tend to cause the escape of fire-damp in mines, and that the precautions against this danger should consequently be redoubled in mining districts within the range of the general disturbance.—On a possible cause of the earthquakes of 1755, 1884, and 1887, by M. A. Blavier. An attempt is made to associate these occurrences with an abnormal accumulation of ice in the Polar waters, causing a deflection of the Rennel branch of the Gulf Stream, attended by great climatic changes and a slight disturbance of equilibrium in the submarine bed, followed by a possible local fracture along the line of least resistance. The in-rush of cold oceanic waters would appear to be indicated by the disappearance of the sardines from the West Coast of Europe in the years in question.—On the employment of gas as a constant source in experiments on radiation, by M. Edouard Branly. In this communication a comparative study is made of the moderator lamp and gas jet, as two sources of mean temperature in these experiments.—On the tartrate of antimony, by M. Guntz. A process is described for preparing in the pure state the acid tartrate of antimony, which Peligot obtains by alcoholic precipitation of a concentrated solution of the oxide of antimony in tartaric acid.—On the presence and quantitative analysis of alumina in wine and the grape, by M. L. L'Hote. The results are given of experiments made to determine the presence in appreciable quantities of antimony in Burgundy, Roussillon, and some other red wines.—Note on some new syntheses in the fatty series by means of the chloride of aluminium, by M. Alphonse Combes.—On the microbe of yellow fever and its attenuation, second note, by MM. Domingos Freire, Paul Gibier, and C. Rebourgeon. In continuation of their studies on this microbe, discovered by them in 1884, the authors describe a process by means of which the virus may be attenuated and converted into a prophylactic vaccine.—Calorimetric studies on sick children, by M. P. Langlois. The experiments here described show that in chronic disorders with hypothermy there is a diminution of caloric, which increases in maladies with hyperthermy.—On certain characteristics of the pulse in morphiomaniacs, by Messrs. B. Ball and O. Jennings. The observations here illustrated by sygmographic tracings serve both to detect the practice in patients secretly addicted to the taking of morphia and to remove the craving for intermittent doses.—Mineralogical study of the Fort Duncan meteoric iron recently presented to the Paris Natural History Museum, by M. Stanislas Meunier. The analysis of this specimen, found in 1882 near Fort Duncan, Maverick County, Texas, shows a remarkable resemblance to the mass which fell at Braunau, Bohemia, on July 14, 1847. It yielded: iron, 92·02; nickel, with traces of cobalt, 6·10; residuum, 1·80; density 7·699.

STOCKHOLM

Royal Academy of Sciences, February 9.—The following papers were accepted for insertion in the Proceedings of the Academy:—On the so-called anomalous dispersion, by the late Colonel C. E. af Klercker. On benzol and toluol monosulcombinations, by Dr. Mats Weibull.—The Lettersted Prize for 1887 for the best original scientific work was awarded to Prof. F. A. Smitt for his "Critical Index of the *Salmonidæ* in the National Museum," whilst the amount of the same legacy for special scientific work was awarded to Prof. A. G. Nathorst for his researches on the Tertiary flora of Japan.—The Secretary announced that the Proceedings of the Academy for 1886 were completed, and that the first part ("Aurores boréales") of Series II. of the work "Observations faites au Cap Thordsen, Spitzberg, par l'Expédition Suédoise," published at the expense of the Academy, was issued.—The following two papers were also presented by Prof. Berlin:—On six isomeric acids of toluol disulphone, by Dr. P. Klason. On the substitution of the amido group in aromatic combinations for hydrothion as well as oxysulphuryl by means of diazo combinations, by the same.—Prof. Edlund advanced a strictly mathematical demonstration showing the correctness of his theory regarding unipolar induction.—Prof. Gyldén presented the following papers:—Untersuchungen über einen speciellen Fall des Problems der drei Körper, founded on studies at the Stockholm Observatory, by Dr. P. Harzer, of St. Petersburg. On the absolute correctness of terms of expression employed by Prof. Gyldén in order to solve the problems of three bodies, by himself, which paper will shortly appear in the *Acta Mathematica*.—Prof. Smitt announced the appearance of a new edition of the illustrated work "Skandinaviens Fiskar" ("The Fishes of Scandinavia"), in which are a number of original drawings by Herr W. von Wright, belonging to the Academy, which have never been published before. He also presented the first report of the Ornithological Committee appointed by the Academy.—Prof. Mittag-Leffler presented the following papers:—On convergents to definite integrals, by Herr C. B. S. Cavallin. On a treatise by Ascoli relating to the integration of the differential equation $D^2u = 0$ for a given Riemann surface, by Dr. G. Enestrom. Integration der differential Gleichung $D^2u = 0$ in einen beliebigen Riemannischen Fläche, by Prof. Giulio Ascoli, of Milan.—The Secretary presented the following papers for insertion in the Proceedings:—On the influence of chlorium on α-acetic naphthalid, by Prof. Cleve. On naphthalid acids, by Dr. A. G. Ekstrand. On α- and β-naphthamidoxim, by the same. On the resin acids in galipot, by Dr. A. Westerberg. On pteropods in the Zoological Museum of the Upsala University, collected by Capt. G. von Scheele, classified by Dr. H. Munthe. Notes on Permian fossils from Spitzbergen, by Prof B. Lundgren. Einfluss der Neutralsalze auf die Reactionsgeschwindikeit der Verseifung von Actylacetat, by Dr. S. Arrhenius.

BOOKS, PAMPHLETS, and SERIALS RECEIVED

Ligaments, their Nature and Morphology: J. B. Sutton (H. K. Lewis.)—School Hygiene: Dr. A. Newsholme (Sonnenschein).—Atlantic Weather Charts, part 1, from August 1 to November 7, 1882 (Stationery Office).—Electrical and Anatomical Demonstrations: Dr. H. Tibbits, (Churchill).—Memoirs of the Literature College, Imperial University of Japan, No. 1; The Language, Mythology, and Geological Nomenclature of Japan, viewed in the light of Aino Studies: B. H. Chamberlain and J. Batchelor (Tōkyō).—Verhandlungen des Naturhistorischen Vereines, Zweite Hälfte (Max Cohen, Bonn).—Colonial and Indian Exhibition; Reports on the Colonial Sections: Edited by H. T. Wood (Clowes).—Monthly Results of Observations made at the Stations of the Royal Meteorological Society for the Quarter ending September 30, 1886 (Stanford).—Instantaneous Photography for Amateurs (Seers, Bath).—General Guide to the British Museum, Natural History.—Quarterly Journal of the Royal Meteorological Society, January 1887 (Stanford).—Studies from the Biological Laboratory, Johns Hopkins University, vol. iii. No. 9.

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