by M. Alexéeff.—On the rotation of Jupiter, by M. Kortazzi.—Crystals of beryl from a part of the Southern Oural, by M. Kokscharow.—On the formation of some nitrated derivatives of some hydrocarbons of the fatty series by direct action of nitric acid, by M. Konowalof.—On the variability of forms of *Lubomirskia Baïcalensis*, and on the distribution of sponges of Lake Baikal, by M. Dybowski.—On universal time, and on the choice for this purpose of a prime meridian, by M. Struve.—Anatomy of the lactiferous glands during the period of lactation, by M. Saefftigen.—On the spectroscopy of hydrogen, by M. Hasselberg.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol. xiv. fasc. 4 (February 24).—On a method of finding with the microscope the adulterations of the more common varieties of farina, by Dr. Cattared.—Experimental researches with the Crookes' apparatus, by Prof. Ferrini.—On a quadratic Cremonian correspondence between the elements of two fundamental forms of the fourth species, or ruled spaces, by S. Aschieri.—Considerations on new species of partial blindness in Arachnida, by Prof. Pavesi.

Fasc. 5.—Materials to serve for the study of *Peronospora viticola*, by Count Trevisan.—On primary and secondary psoïtis, by Prof. Sangalli.—The sanitary administration in Spain, by Dr. Quechi.—Determination of the maximum moments due to weights linked on a supported beam, by Prof. Clericetti.—On an abnormal case of fructification in Florideæ, by S. Ardissone.

Revue Internationale des Sciences, February, 1881.—Prof. Vulpian, physiological study of poisons, vii. Curare (end).—Prof. R. Lankester, embryology and classification of animals.—Fernand Lataste, a few more words on the fecundation of the urodele batrachians.—Notices of learned societies.—Belgian Academy (abstract of Van Bambeke's paper on the formation of the embryonic lamellæ and the notochord in the urodela).—Paris Academy: on the appointment of M. Bouley to the Chair of Comparative Pathology at the Natural History Museum, Paris.

Journal de Physique, March.—On the division of instantaneous currents (continued), by M. Brillouin.—On the psychrometer, by M. Angot.—New tourmaline pincer, by M. Bertin.—Constitution of the flame of the Bunsen lamp, and some modifications in the construction of this lamp, by M. Terquem.—On some experiments in acoustics, by M. Neyreneuf.

Atti della R. Accademia dei Lincei, vol. v. fasc. 7 (March 6).—On solar observations at the Royal Observatory of the Roman College in 1880, by P. Tacchini.—Observations of comets and planets at the same college with the Merz equatorial, during 1880, by the same.—M. Janssen's solar photographs taken at Meudon Observatory, by the same.—Thermal laws of the exciting spark of condensers, by E. Villari.—On sodio-ammoniacal trimolybdate, by F. Mauro.—Studies on rotatory power, by R. Inasinio.—On some compounds of the pyrolic series, by L. G. Ciamician.—On the electrophorus, by G. Govi.—On pathological bases, by F. Selmi.—On the causes of distinctness in solar photographs, by S. Respighi.—On experiments made at the Observatory of Campidoglio for determination of gravity, by the same.

Sitzungsberichte der naturwissenschaftlichen Gesellschaft Isis in Dresden (1880).—A modern investigation of the flora of Saxony, by Prof. Drude.—On the Pycnodontidæ, especially the genus Gyrodus, by Prof. Vetter.—The Nudibranchia of the sea, by Herr Blaschka.—On the determination of fixed points of normal mercury thermometers and the measurement of temperatures, by Prof. Neubert.—On various finds in the neighbourhood of Dresden, by Dr. Caro.—Hydroid medusæ or Craspedotes, by Herr Blaschka.—Progress of geological researches in North America, by Dr. Geinitz.—On plant-remains from the Tertiary formations of Liebolitz and Putschein, by Herr Engelhardt.—Observations on the growth of the leaf of *Victoria regia*, Lindl., in the Dresden Botanical Gardens in 1880, by Prof. Drude.—The Slav and German immigration into Saxony, by Prof. Meitzen.—The urn-field of Persia, by Herr Wiechel.

Archives des Sciences Physiques et Naturelles, No. 3, March 15. Swiss geological review for 1880 (continued) by M. Favre.—Considerations on the study of phyllotaxy, by M. de Candolle.—Notice of researches by Drs. Tenchini and Staurenghi, on the anatomy of the human cerebellum.

Rivista Scientifico-Industriale, No. 5, March 15.—On Reese's fusing disk, by Prof. Bombicci.—Volta's pile rendered constant and depolarised, by Count Mocenigo.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 31.—On the coefficients of expansion of the iodide of lead, and of an alloy of iodide of lead with iodide of silver, by G. F. Rodwell, Science Master in Marlborough College.

The iodide of lead was examined by the special means described by the author in former communications to the Society, and was found to possess three coefficients of expansion. Between 0° and 205° C. the coefficient of cubical expansion for 1° C. is ·00007614, increasing to ·00008307 between 205° and 253° C.

Between 253° and 265° C. the mass expanded very rapidly, with a coefficient nearly eight times greater than the preceding, viz. ·0006378. After the subsidence of this rapid expansion the coefficient became ·000180. The volumes of the iodide between 0° and the fusing point (383° C.) are given, and are shown in a curve-table.

Iodide of lead was fused with iodide of silver in such proportions as to form an alloy containing one molecule of each constituent, viz. PbI_2, AgI. This contains 66·20 per cent. of iodide of lead, and 33·80 per cent. of iodide of silver. The melting-point of the alloy was found to be 350° C., the specific gravity 5·912. On heating it was found to expand under a very low coefficient between 0° and 118° C.; then it neither expanded nor contracted while heated through 6° C.; at 124° C. it commenced to contract, and underwent between 124° and 139° C. as much contraction as iodide of silver itself; again it was stationary for 5° C., and at 144° C. it began to expand again, with a much higher coefficient than it possessed between 0° and 118° C.

The following are some noticeable points about the alloy :—

1. It possesses similar densities at three different temperatures.

2. Although it contains only 33·8 per cent. of iodide of silver it contracts as much during heating as the iodide of silver itself.

3. While the iodide of silver commences to contract at 142° C., and terminates at 145°·5 C., the alloy commences to contract 18° C. lower, and terminates its contraction 6°·5 C. lower.

4. The harsh sounds emitted during the cooling of the alloy, and the tremors simultaneously propagated through its mass, prove that violent molecular agitation is taking place while the iodide of silver is passing from the amorphous plastic condition, into the brittle crystalline condition within the mass of, or surrounded by the molecules of, the iodide of lead.

5. The fusing-point of the alloy is 33° lower than that of the iodide of lead, which constitutes two-thirds of its weight, and 177° lower than that of the iodide of silver, which constitutes one-third of its weight.

6. And if this is due to the fact that similar particles of matter attract each other more powerfully than dissimilar, and hence that when the particles of two bodies are mutually diffused the attraction becomes less than that of the molecules of either one of them singly, and the molecular motion is hence more easily assimilated, the same cause may explain the commencement of the phase of contraction on heating the alloy at a temperature 18° C. lower than that of the iodide of silver to which it owes this property.

7. If we compare one of the chlorobromiodides of silver, before described by the author (*Proc.* Roy. Soc., vol. xxv. p. 295) with the lead-silver iodide alloy, some curious anomalies present themselves. The alloy, AgI, AgBr, AgCl (lately also discovered as a mineral), contains 41·484 per cent. of iodide of silver, and 58·516 per cent. of the chloride and bromide of silver (which from an expansion point of view may be regarded as the same substance, because their co-efficients are practically the same). But although the mean coefficients of expansion of the chloride and bromide scarcely exceed those of the iodide of lead, and although the chlorobromiodide contains 8 per cent. more iodide of silver than the lead-silver iodide alloy, the amount of *contraction* by heat of the latter is more than twenty times greater than that of the former, although we must believe this effect to be solely due in each case to the presence of the iodide of silver.

Mathematical Society, April 14.—S. Roberts, F.R.S., president, in the chair.—The chairman briefly, but feelingly, alluded to the loss the Society had sustained by the recent death of Mr. T. Cotterill, M.A., formerly Fellow of St. John's College, Cambridge, who was for many years a member of the Council, and had always taken a warm interest in the Society.

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—The following communications were made :—On the geodesic curvature of a curve on a surface, Prof. Cayley, F.R.S.—On operative symbols in the differential calculus, Prof. Crofton, F.R.S.—Note on the resolution in factors of numbers differing but slightly from π, Mr. J. W. L. Glaisher, F.R.S.—On the nature of the quadric represented by the general equation of the second degree in tetrahedral co-ordinates, and on the five focal quadrics of a cyclide, Mr. H. Hart, M.A.—The discrimination of the maximum or minimum path of a ray of light reflected at a given curve, Mr. H. M. Taylor, M.A.—On certain tetrahedra specially related to four spheres meeting in a point, and historical note on Dr. Graves's theorem on confocal conics, the President.

Physical Society, April 9.—Prof. W. G. Adams in the chair.—Prof. Helmholtz was elected an honorary member of the Society, and Dr. James Moser an ordinary member.—Dr. J. H. Gladstone read a note on thermal electrolysis, by himself and Mr. Alfred Tribe. The authors found that when sheet-silver was plunged into fused silver chloride or iodide of silver crystals of silver formed on the sheet. When copper was immersed in fused cuprous chloride copper crystals deposited on it, and when zinc was placed in melted zinc chloride or iron in melted ferrous chloride, these two metals crystallised on the plates. They found this to be due not to a difference in the physical condition of the rolled metals, but to the unequal heating of the different parts of the immersed metals. By the contact theory of voltaism there will be a difference of potential between the metal and the liquid chloride in contact with it, and this difference of potential will vary with temperature. Since all parts of the immersed metal cannot be supposed at the same temperature always, there is the possibility of a current being set up and consequent electrolysis of the salt. This view was corroborated by heating the metal unequally, when a crop of crystals appeared in the cooler part of the liquid. Again, two silver rods connected together were plunged, the one in a hotter, the other in a cooler part of fused silver chloride, and at the end of fifteen minutes the latter was studded with crystals of silver, whilst the former was clean. A galvanometer showed a stronger current between the rods, the greater the difference of temperature between the parts of the fluid in which they were placed, and transposing the rods reversed this current. These experiments bear on the nature of voltaic action, and form a lecture-illustration of the conversion of heat into electricity and chemical force. Mr. W. H. Walenn stated that he had found when zinc is immersed in an electro-brassing solution, crystals of brass (*i.e.*, zinc and copper) were deposited on it.—Capt. Abney exhibited a number of photographic negatives taken by himself and Col. Festing, by radiation through thin sheets of ebonite. The light from the positive pole of an electric lamp was sent through a thin sheet of ebonite $\frac{1}{64}$ inch thick, and photographs taken showed the radiation to have a low wave-length, from 8000 to 14,000. The carbon points of the lamp could be photographed through the sheet, and Col. Festing observed the sun's disk through it. The ebonite showed a grained structure, and different samples of ebonite gave different results, but all gave some result in course of time at least; old ebonite, like that used in some of Mr. Preece's experiments, scattering the light more than new ebonite.—Dr. Moser exhibited the passage of the rays through the ebonite to the audience by means of a galvanometer. Prof. Guthrie observed that Capt. Abney had proved that light as well as heat traversed the ebonite, and Dr. Coffin stated that the composition of ebonite apparently the same might vary considerably, and hence its radiant transparency might vary too.—Prof. Helmholtz addressed the meeting on the localisation of objects by the eyes. We estimate distance with one eye by the outlines of the more distant objects being covered by the nearer ones where they meet, and by the shadows thrown by the anterior objects. These conditions are very rarely overpowered by others, as, for instance, binocular vision. This is shown by Dove's pseudoscope and the fact that closing or blinding one eye makes little difference to the power of judging distance, especially when not very close to the eye. The relative shifting of objects, as the eye is moved from side to side, or to and fro, or up and down, which may be called the parallax of motion of the head, is also a strong factor in estimating distance. The author had concluded from a study of the stereoscope that the perception of the absolute convergence of our eyes is very indistinct, and that only differences of convergence related to apparently near or distant objects produce the stereoscopic effect. Recent observations of his show that the incongruity between the degree of convergence and the parallax of motion is perceived with great accuracy. Dr. Stone remarked that a person suddenly blinded in one eye acquires a new judgment of distance by moving the head (a habit seen in nocturnal birds), and in taking certain French stereoscopic pictures the camera is shifted to another point, so that the combined images produce an impression of smallness in the object. These facts corroborated Prof. Helmholtz's view; and Mr. Lewis Wright pointed out that santonin, which changes the sense of colour, also appears to change the sense of distance, perhaps by relaxing the muscular sense.

Geological Society, April 6.—J. W. Hulke, F.R.S., vice-president, in the chair.—Edward F. Boyd, Lieut. Herbert de Haga Haig, R.E.; J. C. Margetson, Edward David Price, and James Tonge were elected Fellows of the Society.—The following communications were read :—The microscopic characters of the vitreous rocks of Montana, U.S., by F. Rutley, F.G.S., with an appendix by James Eccles, F.G.S.—On the microscopic structure of devitrified rocks from Beddgelert, Snowdon, and Skomer Island, by F. Rutley, F.G.S.—The date of the last change of level in Lancashire, by T. Mellard Reade, C.E., F.G.S. The author described some observations made by him at Blundellsands, on the coast of Lancashire, near Liverpool, according to which, judging from the position of high-water mark, the land had gained considerably upon the sea between 1866 and 1874. The author adduced evidence in support of his view, and concluded that if the last change of level in South-West Lancashire was a downward one it could not have taken place within 2500 years.

Institution of Civil Engineers, April 5.—Mr. Brunlees, F.R.S.E., vice-president, in the chair.—The paper read was on the actual lateral pressure of earthwork, by Mr. B. Baker, M. Inst. C.E.

EDINBURGH

Royal Society, April 4.—Prof. Balfour in the chair.—Prof. Tait communicated the results of his experiments on the pressure errors of the *Challenger* thermometers, the correction for which, as originally furnished to the expedition, was 0°·5 F. per mile of depth. The mode of experimenting was to subject the thermometers to considerable pressure in a hydraulic press, which was essentially a strong steel cylinder that was warranted to stand a pressure of 25 tons weight on the square inch. It was supported in an upright position upon a strong tripod stand. Water was filled in from above; and into the upper end of the cylinder there was lowered a tight-fitting plug which was fixed in position by a transverse steel bolt. The lower end of the cylinder was connected through a narrow copper tube to a hydraulic pump, which, by pumping in water to the cylinder, raised the pressure to the required amount. At three tons pressure an average effect of 1°·5 F. was produced upon the inclosed thermometers. Before drawing any conclusions as to the correction to be applied in deep-sea sounding, it was necessary to consider how far this effect could be explained as resulting from the peculiar conditions under which the experiments were made. From the known compressibility of glass it was calculated that the volume of the bore of a thermometer tube, closed at both ends, would be diminished by only one-thousandth part for an increase of pressure of one ton weight on the square inch; and from a direct experiment made with a metre-long tube this was proved to represent very approximately the real effect. Hence it was quite out of the question that this could have any appreciable effect on such comparatively short thermometers as those of the *Challenger*, which were besides subject to much graver errors, such as those arising from the shifting of the indices during the ascent from the depths, or even from the effect of parallax when taking the reading. The direct action of pressure may then be disregarded, and the effect produced upon the thermometers in the compression apparatus must be due to secondary effects of pressure, such as evolution of heat. The various sources of heat were four: 1. Heating of the water by compression. This depends greatly on the original temperature of the water, being *nil* at the point of maximum density (40° F.), and larger for higher temperatures. One-fourth of the total effect is due to this. 2. Heating of the water due to pumping in through the narrow tube. This accounts for three-twentieths of the effect. 3. Heating of the vulcanite frame by compression. This explains another fifth. 4. Heating due to the effect upon the protecting bulb. This probably explains the remaining two-fifths of the effect. In this last case however there is not only compression, but distortion; and of the thermal effects of such a strain no one yet knows anything. These four sources of error

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cannot be supposed to exist under the conditions in which deep-sea temperatures are taken; and the only other possible source, that namely due to the direct effect of pressure, gives rise to an error which requires a correction of only 0°·04 F. per mile of depth. In the course of the description of experiments Prof. Tait had occasion to describe the various kinds of pressure-gauges which he had found it necessary to devise, the ordinary forms of gauge being altogether useless for scientific work.—Mr. W. W. J. Nicol read a paper on the action of heat on thioformanilide, being an account of experiments he had made in Prof. Hoffman's laboratory at Berlin during the preceding winter.—Mr. Patrick Geddes read the second instalment of his scheme for the classification of statistics. In it he discussed the arrangement of statistics relating directly to the organisms of the society. Three great parallel classes, A, B, C, were formed: A being concerned with the *source* of the organisms forming a community as arising from survival, immigration, and birth; C with the *loss*, from emigration and death; while B contained the biological and social characteristics of the individuals forming a community at any given instant of time. Classes A and B formed the one side and C the other side of the social balance sheet. In treating of occupations the same three classes appeared again: A dealing with operations on matter and energy, B with services rendered to society (including education, government, &c.), and C forming the class of the essentially unproductive, *e.g.* the unemployed, the disabled, the destructive, &c. The question of partition, both mediate and ultimate, amongst the organisms of matter and energy fell next for discussion; and this led on to the final classification of uses made after partition, in all of which it was shown that the classification fitted naturally into the three original classes, A, B, and C, indicated above. In a future paper Mr. Geddes hoped to demonstrate the *practical* value of his system.

VIENNA

Imperial Academy of Sciences, April 7.—L. Fitzinger in the chair.—The following papers were read:—Dr. G. Becka, on the orbit of the "Ino" planet (No. 173).—Dr. E. Ludwig, on a new method for the quantitative determination of uric acid.—Dr. D. Dublier, on the influence of continual use of carbonate of soda on the composition of the blood.—Dr. James Moser, electrostatic investigations especially into the ramification of induction on the differential inductometer and electrophorus.—Dr. Moritz Holl, on the blood-vessels of the placenta of man.—L. Haitinger, on nitro-olefines.

Imperial Institute of Geology, March 15.—E. Kittl, on a recent find of Listriodon (found at Nussdorf, near Vienna, in 1879).—Dr. E. Mojssisowics, on the cephalopod-fauna of the Triassic formations at Mora d'Ebro, in Spain.—K. M. Paul, on the occurrence of ozokerite and petroleum at Boryslaw (Gallicia).

April 5.—E. Kittl, on Bohemian spas.—Baron H. Fullon, observations on crystallisation.—Dr. V. Hilber, on the terminal stratifications of gypsum in Eastern Gallicia.

PARIS

Academy of Sciences, April 11.—M. Wurtz in the chair.—The following papers were read:—On peroxide of ethyl, by M. Berthelot. This may be prepared by sending through anhydrous ether, for several hours, a slow current of quite dry and strongly ozonised oxygen. The formation of oxygenated water by action of ozone on ether is not immediate, but by destruction of a first compound, viz. peroxide of ethyl. This substance is a sesquioxide $C_{16}H_{20}O_6$.—On the Eulerian integral of the second species, by M. Gyldén.—Researches on the liquefaction of gaseous mixtures, by MM. Cailletet and Hautefeuille. Operating with a gas easily liquefiable and a so-called permanent gas, in capillary tubes, total liquefaction (yielding a homogeneous liquid) is obtained by first compressing the mixture at a temperature so high that the strongest pressures prove powerless to abolish the gaseous state, then lowering the temperature regularly, so that all points of the tube pass at the same time through the temperature at which is produced a change of state. The authors thus obtained condensed carbonic acid, holding a large proportion of oxygen, hydrogen, or nitrogen, these latter substances concurring to form the liquid, though the temperature was too high for them to exist separately in that state. The results of experiment with cyanogen and carbonic acid are analysed. The assimilation (generally very imperfect) of solution of a gas to its liquefaction probably here applies. The mixture retains its characters at temperatures considerably above that corresponding to the critical point of its less easily liquefied element.—On the lines of iron in the sun, by Mr. N. Lockyer. He shows reason for believing that iron does not exist in the heart of the sun, but only its constituents, and these exist at different levels in the sun's atmosphere and produce more complex forms by condensation.—On pucerons attacked by a champignon, by MM. Cornu and Brongniart. The insect belongs to the cycle of development of *Tetraneura rubra*, which produces the red galls of elm. The fungus is a *Pleospora*; it attacks the dead puceron. It is probably incapable of affecting much the multiplication of phylloxera.—On the integration of linear equations by means of Abelian functions, by M. Poincaré.—On formulæ of representation of functions, by M. du Bois-Reymond.—Study of the vapour of bisulphydrate of ammonia, by M. Isambert. The substance is less volatile in presence of its elements than *in vacuo*, or in an inert gas such as hydrogen.—On chlorides, bromides, and iodides of sulphur, by M. Ogier. A thermo-chemical study.—On the development of *Tricuspidaria nodulosa* or *Triænophorus nodulosus* of Rudolph, and on its cysticercus, by M. Megnin. The perches of the Seine are greatly affected by this parasite at present.—Studies on some points of the anatomy of *Sternaspis scutata*, by M. Rietsch.—On the different species of bears whose remains are buried in the cavern of Lherm (Ariège), by M. Filhol. Remains of an enormous *Ursus arctos* (apparently) have been found among about 100 bones of *Ursus spelæus*. M. Filhol doubts the descent of the former bear from the latter. He supposes that *Ursus arctos*, appearing in distant regions (perhaps North America), gradually advanced and was substituted in our countries for *Ursus spelæus*. Bone fragments of a new type of bear have been found in this cave. The author names it *Ursus Gaudryi*. The fossil femur of an enormous lion has also been found.—Production of a hydrated silicate of baryta in crystals, by M. Le Chatelier. This appears on the inner surface of vessels of baryta water left standing uncleaned a long time.—On the production of a crystalline phosphide of iron and of anorthite felspar in the fires of the Commentry coal pits, by M. Mallard.—On the swelling of the Seine during the winter of 1881, by M. Lemoine. The Seine at Paris has been pretty high from the middle of January to the middle of March. Usually (as M. Belgrand has shown) the maximum of flood at Paris is due to the waters of small torrential rivers mostly in the upper part of the valley and issuing from impermeable strata. But last winter, it is chiefly the rivers nearest Paris, those of Brie, that, by their quite unusual swelling, have brought on the maximum (which has therefore come with great rapidity). The subsoil of La Brie is like a sponge, and when it is gorged with water the least rain causes important floods.

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