SCIENTIFIC SERIALS.

Memoirs of the Kazan Society of Naturalists, vol. xxxii. 1, 2, 3.—The fauna of the Eocene deposits on the Volga between Saratov and Tsaritsyn, by A. Netschaev, with ten plates. These deposits were formerly described as Cretaceous. It was Prof. Sintsoff who determined their Palæocene age, and established their subdivisions, lately confirmed and further studied by Prof. Pavloff. The author describes 170 species from his own collections, out of which species no less than 80 are new, or are described as such. Three subdivisions of the deposits are established, corresponding to the following subdivisions previously described: (*a*) the sands Pg_1c of Sintsoff, or Lower Sarmatian, of Prof. Pavloff, which would correspond to the Suessonien of Western Europe, or to the Thanet Sands of Great Britain: (*b*) the Glauconite sandstones, Pg_1a' of Sintsoff, or Upper Syzrañ of Pavloff, and the Glauconite clays and sandstones, Pg_1a of Sintsoff, or Lower Syzrañ of Pavloff, the latter overlying and gradually passing into the Cretaceous strata. On the whole, these Eocene strata bear resemblance to the Anglo-Gaelic deposits of the same age, but totally differ from the Eocene deposits of South-west Russia. The Palæocene Volga Sea must have been a large sea extending northwards up the present lower Volga, and westwards as far as the meridian of Penza. In the East, it reached the foot of the Southern Urals. This sea was a remainder from a much larger Cretaceous sea, which covered a large part of European Russia. The Middle and Upper Eocene sea which covered South-west Russia must have been independent from the former.—Materials for the flora of the Buzuluk district of Samara, by D. Yanishevsky. A list of 644 phanerogam species is given.—On the deformed skulls found in the Siberian burial mounds (*Kurgans*), by S. Tschugunoff (with one plate). This is the ninth note of the author's "Materials for the Anthropology of Siberia," the first eight notes having been published in the *Proceedings* of the Tomsk University, parts vi., vii. and x. The author describes two macrocephalic deformed skulls which were found in the Kainsk district of Tomsk, as well as three others of the same type from the Crimea.

Bollettino della Società Sismologica Italiana, vol. iii., 1897, No. 5.—Obituary notice of M. S. de Rossi, by A. Cancani.—Principal eruptive phenomena in Sicily and the adjacent islands, January-June 1898, by S. Arcidiacono.—Elastic pendulum to act mechanically on the *Galli-Brassart* informer, by C. Guzzanti. The new arrangement consists of a pendulum, the movement of which, magnified by a lever, stops the clock of the informer.—The Turkestan earthquakes of August 15 and September 17, 1897, by G. Agamennone.—List of earthquakes observed in Greece during the year 1895 [first half], by S. A. Papavasiliou: a list of about 250 shocks, nearly one-half of which were felt in the island of Zante.—Notices of earthquakes recorded in Italy (September 21–October 2, 1897), by G. Agamennone, the most important being the Ancora earthquake of September 21.

Memoirs of the Society of Naturalists of St. Petersburg: Mineralogy and Geology, vol. xxiv.—Geological observations in the valleys of the Urukh, Ardon, Malka, and the neighbourhoods of Kislovodsk, by M. Karakash. The above valleys are occupied in their upper parts by granites and crystalline slates, followed by palæozoic clay slates. Granites crop out next, once more, and are covered with Lower and Upper Cretaceous deposits, followed further northwards by Tertiary deposits. Near Kislovodsk, Senonian, Albian, Aptian, and Lower Neocomian deposits were found.—The fauna of the Jurassic deposits of Mangyshlak and Tuar Kyr (Transcaspian region), by B. Semenoff, being a study of the fossils collected by Prof. Andrusov in that very little explored region (with plates). The fossils belong to the Callovian age. At Tuar Kyr two new species (*Macrocephalites Andrussowi* and *Peltoceras retrocostatum*) were discovered, as also two Himalayan species (*Cosmoceras Theodorii*, Opp., and *Peltoceras cf. Ruprechti*, Opp.) This discovery would seem to give support to Neumayr's idea as to the Jurassic basins of West Europe and Russia having been connected with the Himalayan sea through a Transcaspian basin.—On geological researches made in 1895 in the government of Baku and on the Eastern coast of the Caspian Sea, by N. Andrusov.—New data relative to the fauna of Jurassic deposits in Orenburg, by B. Semenoff. They are based on the collections kept at the St. Petersburg University. Twenty-eight supra-Jurassic Ammonites (26 *Perisphinctes* and 2 *Aspidoceras*) were studied; they belong to various ages, from the Upper Oxfordian to the Tithonian age.—All papers are fully summed up in French or in German.

Memoirs of the St. Petersburg Society of Naturalists: Botany, vol. xxvii. Parts 2 and 3.—These two Parts are almost entirely given to larger works relative to local floras: the flora of the Polyesié (the Woodlands of West Russia), by I. Pachossky, followed by a note on the Woodlands of Volhynia, by S. Fedoséeff; the flora of the government of Pskoff, by N. I. Puring (with map), followed by a note by E. Ispolatoff; and a paper on the flora of Novgorod, by A. I. Kolmovsky.—A note on the structure of the stem of *Gypsophila aretioides*, by V. Dobrovlyansky, with two very interesting photographs.

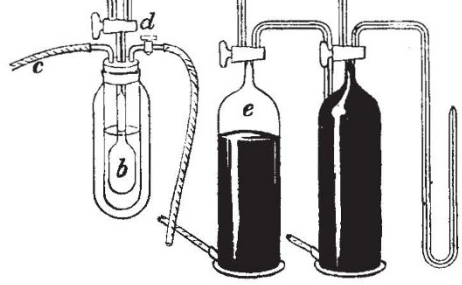
SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 15, 1898.—"The Preparation and some of the Properties of Pure Argon." By William Ramsay, F.R.S., and Morris W. Travers.

In order to prepare 15 litres of argon, it is necessary to deal with about 1500 litres of atmospheric air, of which approximately 1200 litres consist of a mixture of nitrogen and argon. To absorb the nitrogen contained in this quantity of gas by conversion into nitride, 4 kilograms of magnesium would be required theoretically; but, in order to cover loss through leakage and incomplete action, 5 kilograms of the metal were employed. The absorption of the oxygen and nitrogen was conducted in three stages. In the first, the oxygen was removed by means of metallic copper; in the second, the nitrogen was passed twice over metallic magnesium; and in the third, the gas, now rich in argon, was finally freed from nitrogen and hydrogen by passage over a mixture of anhydrous lime and magnesium powder heated to a red heat, and subsequently over red-hot copper oxide. The method of preparation is described in detail in the original paper.

This argon was then liquefied in an apparatus which is repre- in the figure. The argon entered through the tube *a* into the



bulb *b*, of some 25 c.c. capacity, surrounded by liquid air contained in a double-walled vacuum jacket. The air was made to boil under a low pressure of a few centimetres of mercury by means of a Fleuss pump attached to the tube *c*. The argon rapidly and completely liquefied to a colourless mobile liquid; it showed no absorption spectrum. Its volume was about 17·4 c.c. By turning the tap *d* it was placed in communication with the first of the series of mercury gasholders, *e*; the reservoir was then lowered so as to remove the lower-boiling portions of the liquid. During this distillation, which took place at constant temperature, the pressure on the boiling air was kept as low as possible. This gas subsequently turned out to be rich in neon, and to contain helium (*Roy. Soc. Proc.*, vol. lxiii. p. 437). The remainder of the argon boiled back into the main gasometer until the last few drops were left; the residue solidified, and finally gave a gas to which we gave the name metargon; it was collected in mercury gasholders (*loc. cit.*, p. 439). As will be subsequently shown, the krypton and xenon in this quantity of argon are too minute for detection. A similar operation for the purpose of separating the lighter as well as the heavier constituents was afterwards repeated three times, the middle portion of argon being always returned to the main gasholder. A fourth

liquefaction was carried out in which six mercury gasholders were filled with six separate fractions of argon, each taken after each successive fifth of the total argon had evaporated. These fractions were next purified from any nitrogen accidentally present by sparking with oxygen over caustic potash. After the removal of the oxygen the density was determined.

Density of Argon.

For a preliminary determination of the density of the various samples a bulb of about 33 c.c. capacity was employed. It is much easier to ensure the purity of a small sample of gas than of a large one; and it will be seen that very concordant determinations are obtainable with a small quantity. The limit of error is probably not greater than one part in a thousand. The results are expressed in terms of O = 16.

	Capacity of bulb. c.c.	Temp.	Pressure. mm.	Weight. gram.	Density.
(1)	32·762	19·05°	535·1	0·03786	19·65
(2)	,,	15·70	712·0	0·05265	19·95
(3)	,,	17·00	662·2	0·05012	19·95
(4)	,,	14·55	749·8	0·05460	19·91
(5)	,,	15·60	740·4	0·05389	19·97
(6)	,,	16·15	760·2	0·05501	19·95

The spectrum of No. 4, examined later, showed a trace of nitrogen; the density of No. 6 was confirmed by other two determinations, each made after further sparking.

No. 1 was the first portion boiled off, and therefore its density is lower than that of the other fractions, probably owing to its still containing some neon and helium. The rest of the samples have a constant density, approximately 19·95.

A larger quantity of No. 5 was then purified by long-continued sparking, and its density was determined in a bulb of greater capacity. To show the influence of such purification, results are given, obtained before it was complete. The gas under such conditions showed a trace of the nitrogen spectrum. The portion last weighed was spectroscopically pure.

Capacity of bulb. c.c.	Temp.	Pressure.	Weight.	Density.
163·19	15·47°	767·1	0·27235	19·935
,,	16·97	764·8	0·26985	19·914
,,	13·34	742·8	0·26591	19·952
,,	12·95	741·3	0·26586	19·961

After the first of these determinations the gas was passed over a mixture of red-hot magnesium and lime, and subsequently over red-hot copper oxide, in order to remove hydrogen. But after determining the density, the gas was examined spectroscopically, and was found to contain hydrogen. The gas was therefore again sparked, when the density 19·952 was found. This specimen was also examined spectroscopically, and was found to be absolutely free from all visible traces of impurity. The last weighing refers to the same sample of gas, and was made as a control experiment.

These results conclusively prove that the density of argon, purified from its companions, does not differ greatly from that obtained by Lord Rayleigh, viz. 19·94, nor by one of us, viz. 19·941. The true density may, we think, be safely taken as the mean of the last two determinations, viz. 19·957.

This corresponds with the mean of the four trustworthy determinations with the small bulb, viz. Nos. 2, 3, 5, and 6, which is 19·955.

Refractivity of Argon.

The refractivity of pure argon was next determined. The measurements were made according to the plan suggested by Lord Rayleigh (*Roy. Soc. Proc.*, vol. lix. p. 201). The samples investigated were Nos. 1, 2, 5, and 6. The comparison was made with air.

(1) 0·9620 Contains neon and helium.
(2) 0·9687
(5) 0·9647 Mean, 0·9665.
(6) 0·9660

The refractivity of a previous sample of argon, obtained from the middle of the 15 litres, during the second liquefaction, was 0·9679, a number differing only slightly from that given above.

The refractivity of argon containing krypton, which had a density 20·01, was much higher than the number given above for pure argon, for it reached 1·030 as a mean of two determinations. Evidently then the body possessing the high refractivity was not present in No. 6 in greater proportion than in No. 2, otherwise the refractivity of No. 6 would have shown an increase over that of No. 2.

The refractivity of pure argon differs somewhat from the value for crude argon found by Lord Rayleigh, viz. 0·961 (*Roy. Soc. Proc.*, vol. lix. p. 205), and also from that previously found by ourselves, 0·9596. The removal of neon, which appears to have a very low refractivity, and of helium, of which the refractivity is 0·1238, accounts for the increased refractivity of a sample from which they are absent. The gases which we have recently found in air and in crude argon will form the subject of a future communication. Suffice it to say that the amount of neon and helium is much more considerable than that of the others, and that their effect on crude argon is, therefore, much more marked on its density and refractivity.

The change in its physical constants, caused by the mixture of more recently discovered gases which it has been shown to contain, is therefore exceedingly small, and does not call for any serious alteration in the original paper on "Argon, a new Constituent of the Atmosphere."

The Density of Argon at the Boiling Point of Oxygen.

In an addendum to the original paper on argon (*Phil. Trans.*, A, 1895, p. 239), the expansion of argon by rise of temperature to 250°, as well as its contraction by fall of temperature to −88°, was determined. There is a considerable difference between the temperature at which nitrous oxide boils and that at which oxygen boils, and it was thought worth while to ascertain whether argon behaves as a normal gas down to the boiling point of oxygen. Olszewski (*loc. cit.*, p. 257) gives the boiling point of argon as −187°, and that of oxygen as −182·7°; at the latter temperature, therefore, argon would not be far removed from its own condensing point. The interesting question, of course, is the possible polymerisation of argon at such a low temperature.

No sign of any polymerisation has been observed, as is shown by the following data:—

Hydrogen Thermometer.

Temperature. °C.	Pressure. mm.	Volume.	R.
99·7	1091·5	1·0026	2·9362
0·0	803·2	1·0000	2·9421
−182·7	269·6	0·9953	2·9715

Argon Thermometer.

100·1	1414·9	1·0026	3·8095
0·0	1040·0	1·0000	3·8022
−182·7	353·2	0·9953	3·8930

No correction has been made for the unheated or uncooled stem of the thermometer; but it is obvious that although the lowest temperament lies close to the boiling point of argon, the ratio of the values of PV/T of hydrogen and argon at that temperature, as well as the others, is practically constant.

"On the Boiling Point of Liquid Hydrogen under Reduced Pressure." By James Dewar, F.R.S.

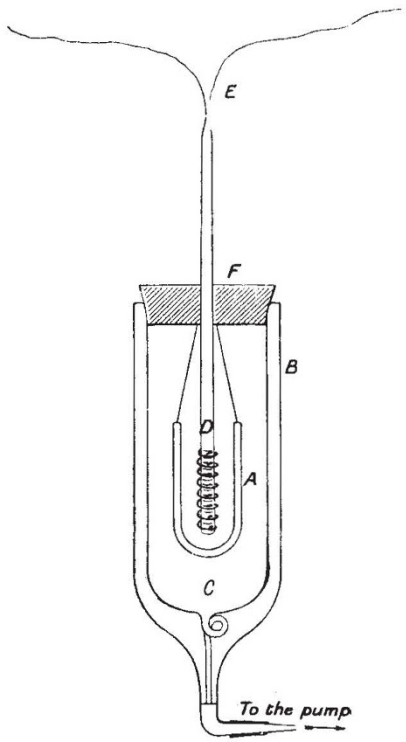
The June number of the *Proceedings* of the Chemical Society contains a paper by the author on "The Boiling Point and Density of Liquid Hydrogen." A resistance thermometer made of fine platinum wire, called No. 7 Thermometer, was used in the investigation. It had been carefully calibrated, and gave the following resistances at different temperatures:—

Temperature.	Resistance. Ohms.
+99·1° C.	7·337
+75·3	6·859
+51·4	6·388
+25·7	5·857
+0·7	5·338
−78·2	3·687
−182·6	1·398
−193·9	1·136
−214·0	0·690

These numbers suggest that with the resistance reduced to zero, the temperature registered by the thermometer ought to be −244° C. At the boiling point of hydrogen, therefore, if the law correlating resistance and temperature can be pressed to its limits, a lowering of the boiling point of hydrogen by 5° or 6° C. would produce a condition of affairs where the platinum would have no resistance, or become a perfect conductor. Now we have every reason to believe that hydrogen, like other liquids,

will boil at a lower temperature the lower the pressure under which it is volatilised. The question arises, how much lowering of temperature can we practically anticipate?

Calculations lead to the conclusion that, as the absolute boiling point under atmospheric pressure is 35°, ebullition under 25 mm. pressure ought to reduce the boiling point some 10° C. For some time experiments have been in progress with the object of determining the temperature of hydrogen boiling under about 25 mm. pressure, but the difficulties encountered have been so great, and repeated failures so exasperating, that a record of the results so far reached becomes advisable. The troubles arise from the conduction of heat by the leads; the small latent heat of hydrogen volume for volume as compared with liquid air; the inefficiency of heat isolation, and the strain on the thermometer brought about by solid air freezing on it and distorting the coil of wire. In many experiments the result has been that all the liquid hydrogen has evaporated before the pressure was reduced to 25 mm., or the thermometer was left imperfectly covered. The apparatus employed will be understood from the figure. The liquid hydrogen collected in the vacuum vessel A was suspended in a larger vessel of the same kind B, which is so constructed that a spiral tube joins the inner and outer test tubes of



which B is made, thereby making an opening into the interior at C. The resistance thermometer D and leads E pass through a rubber cork F, and the exhaustion takes place through C. In this way the cold vapours are drawn over the outside of the hydrogen vacuum vessel, and this helps to isolate the liquid from the connective currents of gas. To effect proper isolation the whole apparatus ought to have been immersed in liquid air under exhaustion. Arrangements of this kind add to the complication, so in the first instance the liquid was used as described. The liquid hydrogen evaporated quietly and steadily under a pressure of about 25 mm. of mercury without the least appearance of solidification or loss of mobility; still remaining clear and colourless to the eye. Naturally the liquid does not last long, so the resistance has to be taken quickly. Just before the reduction of pressure began, the resistance of the thermometer was 0·131 ohm. This result compares favourably with the former observation on the boiling point, which gave a resistance of 0·129 ohm. On reducing the pressure, the resistance diminished to 0·114 ohm, and kept steady for some time. The lowest reading of resistance was 0·112 ohm. This value corresponds to −239·1° C., or only one degree lower than the boiling point at atmospheric pressure, whereas the temperature ought to have been reduced some 10° C., or in any case 5° under the assumed exhaustion.

No blunder having been detected in the observations, for the present we must assume that the platinum resistance thermometer No. 7 acts in the manner described. It would be premature to discuss the inferences to be drawn from these results until they are confirmed on another variety of platinum wire made into a resistance thermometer. But as this will involve the use of considerable quantities of liquid hydrogen, it will take some time to complete the investigation.

The same kind of anomaly appears in the case of the use of a thermo-junction at these low temperatures; but this is a separate matter, and must be dealt with in a further communication.

Linnean Society, December 15, 1898.—Dr. A. Günther, F.R.S., President, in the chair.—On behalf of Captain John Marriott, two crustaceans were exhibited which had been procured by him on a recent journey to the Sinai Peninsula, and had been identified as *Grapsus maculatus* and *Panulirus penicillatus*. A brief account of the distribution and habits was given by Mr. Harting. The Rev. T. R. Stebbing referred to a well-known case of *P. penicillatus* in the Paris Museum, exhibiting the singular monstrosity of an eye-stalk developing a flagellum or lash-like termination, an observation which he thought had not been confirmed. Prof. Howes remarked that the ophthalmite if removed had been proved to regenerate as an antenniform appendage, by Herbst in *Palaemon* ("Archiv. f. Entwickelungsmechanik d. Org.," Bd. ii. p. 544), and by Hofer in *Astacus fluviatilis* ("Verh. Deutsch. Zool. Gesellsch.," 1894, p. 82).—Mr. Thomas Scott communicated a description of some marine and freshwater crustacea from Franz-Josef Land, collected by Mr. W. S. Bruce, of the Jackson-Harmsworth Expedition. The Rev. T. R. Stebbing, who gave the substance of the paper in the absence of the author, considered the collection an important one. The number of species amounted to 173, comprising Macrura 5 species, Schizopoda 2, Cumacea 5, Isopoda 5, Amphipoda 46, Ostracoda 34, Copepoda 66, and Cirripedia 2. Of these 173 species 12 were new.—Mr. H. J. Elwes, F.R.S., gave an account of the zoological and botanical results of a recent journey to the Altai Mountains. The journey commenced practically at Moscow in the middle of May, and extended from the Ural Mountains through Omsk to the River Obi, across a vast and unvarying steppe to Büsk, where his natural-history collecting began. After describing the general appearance of the country and the vegetation, Mr. Elwes stated that he had brought home about 180 species of butterflies out of a possible 200 (of which 141 had been collected by himself), and 80 species of moths. As regards plants, finding the flora pretty well known through the labours of Ledebour, Bunge, and Tchihatcheff, he thought it preferable to collect the plants of a small typical valley rather than attempt a general collection made at random. Unfortunately, owing to an accident when crossing a river, the greater part of that collection was lost. He was much struck with the extraordinary beauty and abundance of the alpine plants in certain marshy valleys from 6000 to 7500 feet in altitude. There was a remarkable absence of peat-plants, and hardly any ferns were seen in the Tchuja valley between the Katuna River and the upper Tchuja steppe, a plateau about 6000 feet above the sea, south of which the greater part of the observations were made. From this plateau he journeyed to the high mountains of the south in quest of the famous wild sheep, *Ovis ammon* of Pallas, of which he secured three specimens, which were now exhibited, one having a measurement of 62 inches round the curve of the horn, which is about the largest on record for this species. He mentioned the scarcity of game-birds in the Altai, though *Tetraogallus altaicus* was often seen at an elevation of 8000–9000 feet, accompanying the ibex (*Capra sibirica*) as in the Himalaya and Caucasus. He mentioned the breeding on the mountain lakes of *Oidemia Stejnegeri*, a North Pacific species allied to our velvet scoter. The great stag of the Altai, of which several heads were shown, was evidently an Asiatic form of the wapiti, the antlers having a remarkably long fourth tine, and the peculiar back tine at the top, characteristic of the American animal, and not observable in the European red deer. These were compared with four adult pairs of horns of the Mantchurian *Cervus Lühdorfi*, which had been kindly sent to him by the Duke of Bedford. Though much smaller than either the American or Altai stag, these horns showed the same typical wapiti character, and it appeared as though the races inhabiting the N.W. coast of America and

the N.E. coast-region of Asia more closely resembled each other than they did the other races of their own continent. He exhibited a series of heads of the Siberian roedeer, which were compared with typical heads of the European roedeer, from which it was considered specifically distinct. A discussion followed, in which Mr. J. G. Baker and Dr. O. Stapf criticised at some length the character of the flora of the Altai, Dr. W. T. Blanford and Colonel Godwin-Austen commented upon the mammalia collected by Mr. Elwes, and Sir George Hampson gave some statistics relating to the lepidoptera.

Mathematical Society, January 12.—Prof. Elliott, F.R.S., Vice-President, and subsequently Lieut.-Colonel Cunningham, R.E., Vice-President, and Dr. Hobson, F.R.S., in the chair.—The following papers were read, or communicated in abstract:—Linear transformation by inversions, Dr. G. G. Morrice.—The zeroes of the Bessel functions (No. ii.), by Mr. H. M. Macdonald.—A simple method of factorising large composite numbers of any unknown form, by Mr. Biddle.—On a determinant each of whose elements is the product of k factors, Prof. Metzler.—Properties of hyper-space, in relation to systems of forces, the kinematics of rigid bodies, and Clifford's parallels, Mr. A. N. Whitehead.—On the reduction of a linear substitution to its canonical form, Prof. Burnside, F.R.S.

EDINBURGH.

Royal Society, January 9.—Sir William Turner, Vice-President, in the chair.—Dr. Thomas Muir communicated a paper on the determination of a single term of a determinant.—In a paper on the energy of the Röntgen rays, the Rev. A. Moffat gave an account of some experiments recently made by him in Erlangen. The energy was determined by photometric comparison of the luminescence of the fluorescent screen with a standard candle, and the result was in fair agreement with that obtained by Dorn by a calorimetric method. The discharge was obtained from a Töppler influence machine—a fact which probably explains the shortness of duration of the Röntgen discharge (1/100,000 sec.) as compared with the duration obtained by Trouton, Roito, and other experimenters who used the induction coil.—Dr. R. Broom communicated a paper on the development and morphology of the marsupial shoulder-girdle, which contained an examination of the early stages of development in the common Phalanger, the Ring-tailed Phalanger, and the Rock-Wallaby. Among the conclusions arrived at were the following: (*a*) The well-developed coracoid in the fœtal marsupials, and consequently the coracoid process in the higher mammals, is the homologue of the posterior coracoidal element in the Monotremes and Theromorphs and of the coracoid in reptiles generally. (*b*) The epicoracoid in Monotremes and Theromorphs is the homologue of the precoracoid of the amphibia. (*c*) The only representative of the precoracoid remaining in the higher mammals is the coraco-clavicular ligament.—Prof. Tait, in a note on the hydrokinetic equations, pointed out how the introduction of unit volume of the fluid as a factor of the whole, led to a definite interpretation of each term separately. The interpretation took a curious form in the case of vortex motion.

PARIS.

Academy of Sciences, January 16.—M. van Tieghem in the chair.—The Centenary of the Imperial Military Academy of Medicine of St. Petersburg, by M. d'Arsonval.—On the general course of vegetation, by M. Berthelot. The amount of moisture was determined in different parts of the same plant (*Cynosurus cristatus*), grown in sunlight and in the shade. The plant developed in the shade contains the largest quantity of water.—On the anomalous dispersion of incandescent sodium vapour, and on some consequences of this phenomenon, by M. Henri Becquerel. Incandescent sodium vapour shows an abnormal dispersion for radiations near the lines D_1 and D_2. The index of refraction of the vapour can be clearly shown to be less than unity for radiations of wave-length near to D_1 and D_2. A confirmation is also given of the experiment of M. Voigt, who from theoretical considerations based upon the Zeeman effect concluded that a sodium flame, placed in a magnetic field and traversed by a polarised luminous bundle, ought to show double refraction analogous to a crystallised plate, and in a direction perpendicular to the magnetic field. The phenomenon results from a superposition of the Zeeman effect and abnormal dispersion.—On the treatment of tuberculous abscess, by M. Lannelongue. As an alternative to extirpation, a method of multiple injection is described, the active ingredient in the fluid injected being iodoform.—Results of meteorological observations made in the depression at the centre of Asia (Luktshoun), by M. Alexis de Tillo.—Solar observations made at the Observatory of Lyons, with the Brunner equatorial during the third quarter of 1898, by M. J. Guillaume.—On the variation of density in the interior of the earth, by M. du Ligondès.—On a new slide rule, by M. G. Gallice. This calculating rule is designed for the use of navigators, and by its use problems of nautical astronomy can be rapidly solved.—On the complete integrals of some partial differential equations, by M. N. Saltykow.—Loss of electricity by evaporation of electrified water. Application to atmospheric electricity, by M. H. Pellat. A surface of electrified water, having a surface density slightly greater than that of the earth, loses a portion of its charge on evaporation at the ordinary temperature, but this effect is not sufficient to explain the diurnal variation.—On the transmission of sounds by ultra-violet rays, by M. Dussaud. A modification of the ordinary selenium radiophone, in which ultra-violet rays act upon the selenium cell through a fluorescent substance.—On a physical method of deciding whether dispersion occurs in a vacuum or not, by M. L. Décombe. It is proposed to study the relative velocities of light wave and the electrical oscillations produced by a Hertz exciter.—On the optical properties of the invisible residual luminescence, by M. Gustave Le Bon. Ordinary solar light and the invisible light emitted by phosphorescent bodies possess absolutely identical properties. This residual luminescence completely disappears after a time.—On the source of energy in radio-active bodies, by Sir William Crookes. The suggestion is put forward that uranium and thorium, substances possessing heavy atoms, may have such a structure as to be able to abstract energy from the more rapidly moving air particles, without being affected by the slower air particles: a partial realisation, in fact, of Clerk Maxwell's "demon."—On the peroxidation of cerium dissolved in alkaline carbonates, by M. André Job. Cerium salts dissolved in alkaline carbonates may exist in three states of oxidation, corresponding to Ce_2O_3, CeO_2, and CeO_3.—Triacetylmorphine and the oxidation of morphine, by M. H. Causse. It is shown that a triacetyl-derivative can be obtained from morphine, and that one atom of oxygen is probably present in a ketonic group, CO.—On the ether-chlorides of dibasic acids, by M. E. E. Blaise.—The assimilation of carbohydrates and the elaboration of organic nitrogen in the higher plants, by M. Mazé.—On the Ordovician rocks of Crozon, Finisterre, by M. F. Kerforne.

AMSTERDAM.

Royal Academy of Sciences, December 24, 1898.—Prof. J. A. C. Oudemans in the chair.—Prof. Bakhuis Roozeboom communicated the results of Dr. Van Eyk's inquiries into mixture crystals of KNO_3 and $TlNO_3$. This is the first time that the progress of the solidification and the relation between the composition of a liquid mixture and a solid one has been studied with respect to all concentrations from 0 to 100 per cent. From 0 to 20 per cent. and from 50 to 100 per cent. the mixture crystals, subsiding from the melted substance, contain KNO_3. Between 20 and 50 per cent., a conglomerate of the two limiting mixture crystals is deposited. The transition of all these mixture crystals from the rhombohedrical to the rhombic form has also been studied. This transition is a very complicated process, though it has been found entirely to correspond with the theory lately given by the author. While in the case of $TlNO_3$ the transition takes place at 144°, and in the case of KNO_3 at 129° in the case of mixture crystals it is only completed at 108°. In the rhombic form, too, there is a hiatus in the mixing from 40 to 84 per cent. of KNO_3, which becomes still greater towards a lower temperature.—Prof. Van der Waals made a communication on volume contraction and pressure contraction (ii.), being a continuation of a communication made by himself at the previous meeting, and discussed the course of the magnitude Δ_1. The author demonstrated that even in those cases in which the magnitude was positive, if the mixing took place at low pressure, reversion of the sign was to be expected when the pressure, at which the mixture took place, was very great.—Prof. Kamerlingh Onnes presented (1) a paper by Dr. J. Verschaffelt on determinations concerning the course of the isotherms in the case of a mixture of carbonic acid and hydrogen, in the proximity of the plait point; (2) a paper by Dr. L. H. Siertsema, entitled "Measurements on the magnetic rotatory dispersion of gases." As a continuation of his communications on this subject (*cf. Proc.*, September 1896), the author gives some more details and plates of the apparatus, with a discussion of the results obtained.