the Eskimo in an exaggerated degree, so that there can be no doubt about their being derived from the same stock. It has also been shown that these special characteristics gradually increase from west to east, and are seen in their greatest perfection in the inhabitants of Greenland, at all events in those where no crossings with the Danes have taken place."

The Aleutians would thus help to bridge over the somewhat abrupt gap still undoubtedly separating the Eskimo and Japanese groups. At the same time this view suggests a primæval line of migration from Japan through the Kurile Islands and Kamchatka to the Aleutian chain and Alaska, which again presents other difficulties of a somewhat formidable character. In the first place, the Japanese appear to be themselves only comparatively recent intruders in Niphon, whose primitive inhabitants were the Ainos, a people of totally different physical type. Hence it is not easy to understand how they could have thrown off an easterly branch, which has had time to develop into the Eskimo, probably the most specialised of all existing races. In the second place, in his "Tales and Traditions of the Eskimo," Dr. Rink himself advances some solid reasons for bringing the Eskimo, not from Asia at all, or at least not in the first instance, but from the interior of the North American continent. He holds in fact, with some other ethnologists, that they were originally inlanders, who, under pressure from the American Indians, gradually advanced along the course of the Yukon, Mackenzie, and other great rivers, to their present homes on the Bering Sea and Frozen Ocean. But a discussion of these contradictory theories, for which a solution may yet be found, must be deferred to another occasion. Meantime enough has probably been said to show the highly suggestive character of the paper under review.

A. H. KEANE

SCIENTIFIC SERIALS

L'Astronomie: Revue mensuelle d'Astronomie populaire, de Météorologie, et de Physique du Globe, January 1887.—We have received the January number of the above periodical, edited by Camille Flammarion. M. Flammarion has done a great work in popularising astronomy in France, and the success which has attended this review—for it is entering on its sixth year—proves how widespread an interest is now taken in the science in that country. The present number contains an "Annuaire astronomique pour 1887," by the editor, a series of descriptive notes of a general character on the principal objects of astronomical observation for the current year, the sun, moon, eclipses, occultations, and the planets. M. Daubrée follows with a paper on some recent meteorites. M. Flammarion gives an account of the storms of October 16 and December 8, and of the general principles of weather prophecy. The notes chiefly relate to the two comets of the season, those of Barnard and Finlay, three diagrams being given of the first, showing the position and character of the two tails, and one of the second. A sort of general observing ephemeris for the month January 15 to February 15, of a popular rather than of a scientific character, concludes the number. M. Flammarion and his co-workers frequently affect a somewhat magniloquent and sensational style, and deal principally with the more popular, easy, and interesting aspects of astronomy; the wonders of our own globe, earthquakes, volcanoes, &c., receive much attention, so that the field embraced is not confined to pure astronomy alone. But after every allowance is made and every drawback admitted, *L'Astronomie* has done much good in circulating astronomical information and in arousing and fostering scientific tastes, and it must be confessed that for an astronomical journal containing forty well-printed imperial octavo pages and, as in this case, more than thirty illustrations, to command a remunerative circulation at the price of a franc a number is highly creditable alike to editor, to publishers, and to the public which supports it. It may well be doubted whether such an enterprise would meet with the same success either here or in America.

Bulletin de l'Académie des Sciences de St. Pétersbourg, tome xxx., No. 4.—The appearance of Encke's comet in 1885 compared with its previous appearances, by O. Backlund. The paper is the first of a series, and contains, besides the numerical data of the observations made in 1885, an inquiry into the disturbances due to the attraction of the earth. The summer parallax of the earth is taken to be 8″·80, and the elements of the comet are determined accordingly.—On the formation of buds among the Phanerogams, by A. Famintzin.—The period of the rotation of the sun, according to the magnetic disturbances, as observed at Pawlowsk, by P. A. Müller. The average value of 25·66 is deduced from observations made from August 1, 1882, to August 31, 1883.—Photography applied to astronomy; abstract of a lecture by Otto Struve.—On several new Trilobites and kindred forms from East Siberia, by Fr. Schmidt. The following species (nearly all new) are described, with plates:—From the Cambrian, on the Vilui River, *Anomocare pawlowskii* and *Liostracus* (?) *maydeli*; from the Cambrian on the Olenek, *Agnostus czekanowskii*; from the Lower Silurian of the Middle Tunguska, *Phacops lopatini* and *P. sibiricus*; from the Devonian limestone at Krasnoyarsk, *Proëtus slatkowskii*, *Cyphaspis sibirica*; *Eurypterus* (?) *czekanowskii*, and *E. punctatus* from the Devonian on the Angara at Padun.—A new form of *Opalina* (*spiculata*), by Warpachowsky.—On a new *Otomela* (*bogdanowi*), by V. Bianchi.—Remarkable hail at Bobruisk, by H. Wild (with plates). On November 28, 1885, with an absolutely clear sky, not a cloud being visible, hail fell for five minutes. The fall was quite local, and did not extend farther than five miles from Bobruisk. Many pieces were like broken pieces of ice, others apple-shaped, with conical depressions at the poles.—On the electromotory difference and the polarisation of electrodes on telegraphic lines, by P. Müller.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 13.—"On the Crimson Line of Phosphorescent Alumina." By William Crookes, F.R.S., V.P.C.S

In a paper which I had the honour of communicating to the Royal Society in March 1879 (Phil. Trans., Part 2, 1879, pp. 660, 661), I described the phosphorescence of alumina and its various forms when under the influence of the electrical discharge *in vacuo*, in the following words:—"Next to the diamond, alumina in the form of ruby is perhaps the most strikingly phosphorescent stone I have examined. It glows with a rich full red; and a remarkable feature is that it is of little consequence what degree of colour the earth or stone possesses naturally, the colour of the phosphorescence is nearly the same in all cases; chemically precipitated amorphous alumina, rubies of a pale reddish yellow, and gems of the prized 'pigeon's blood' colour, glowing alike in the vacuum, thus corroborating E. Becquerel's (*Annales de Chimie et de Physique*, vol. lvii. 1859, p. 50) results on the action of light on alumina and its compounds in the phosphoroscope. . . . The appearance of the alumina glow in the spectroscope is remarkable. There is a faint continuous spectrum ending in the red somewhere near the line B; then a black space, and next an intensely brilliant and sharp red line to which nearly the whole of the intensity of the coloured glow is due. . . . This line coincides with the one described by E. Becquerel as being the most brilliant of the lines in the spectrum of the light of alumina, in its various forms, when glowing in the phosphoroscope."

In the *Comptes rendus* for December 6 last (vol. cii. p. 1107) appears a brief note by M. de Boisbaudran, in which he announces, "to that date, that alumina, calcined and submitted to the electrical discharge in a vacuum, has not given him a trace of red fluorescence." This fluorescence, as well as its special spectrum, shows itself brilliantly when the alumina contains 1/100 and even 1/1100 of Cr_2O_3. With the 1/10,000 part of Cr_2O_3 we still obtain very visible rose colour. . . . From these observations the presence of chromium appears to be indispensable to the production of the red fluorescence of alumina."

This statement being opposed to all my experience, I immediately instituted experiments with a view, if possible, to clear up the mystery. I started with aluminium sulphate which I knew to be tolerably pure, and in which ordinary tests failed to detect chromium. On ignition and testing in the usual manner in a radiant-matter tube the alumina line was brightly visible in the spectrum of the emitted light. Different portions of this aluminium sulphate were now purified by various processes for the separation of chromium. All gave as a result the absence of this impurity. The most trustworthy process being that devised by Wöhler ("Select Methods in Chemical Analysis," second edition, p. 124), I used it to purify the bulk. The salt was dissolved in water, and excess of caustic potash added till the precipitate first formed re-dissolved. Chlorine was now passed through till no

more precipitate fell down and the liquid retained a strong odour of chlorine. The whole of the chromium would now be in solution, whilst the alumina would be in the precipitate. The alumina was filtered off, well washed, and a portion tested in the radiant-matter tube. It gave as good an alumina spectrum as did the original sulphate; the crimson line being very prominent.

The alumina thus purified was a second time dissolved in caustic potash and submitted to the chlorine purification. Again in the radiant-matter tube the alumina gave its characteristic crimson line spectrum.

Many other experiments are given, and the paper concludes as follows:—

These experiments are perhaps too few to permit any important inference being drawn from them. There seems, however, to be four possible explanations of the phenomena observed:—

(1) The crimson line is due to alumina, but it is capable of being suppressed by an accompanying earth which concentrates towards one end of the fractionations.

(2) The crimson line is not due to alumina, but is due to the presence of an accompanying earth concentrating towards the other end of the fractionations.

(3) The crimson line belongs to alumina, but its full development requires certain precautions to be observed in the time and intensity of ignition, degree of exhaustion, or its absolute freedom from alkaline and other bodies carried down by precipitated alumina, and difficult to remove by washing; experience not having yet shown which of these precautions are essential to the full development of the crimson line and which are unessential.

(4) The earth alumina is a compound molecule, one of its constituent molecules giving the crimson line. According to this hypothesis alumina would be analogous to yttria.

Zoological Society, January 18.—Prof. W. H. Flower, F.R.S., 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 December 1886, and called attention to a young male of the true Zebra (*Equus zebra*), purchased December 11; and to a young male Indian Rhinoceros, presented by H.H. the Maharajah of Cooch Behar, through the kind intervention of Dr. B. Simpson, and received December 25.—Mr. F. W. Styan exhibited and made remarks on a series of Chinese birds' eggs which he had collected at Kiukiang and Shanghai.—Mr. Howard Saunders exhibited and read some notes on a skin of the Mediterranean Black-headed Gull (*Larus melanocephalus*), killed on Breydon Water, near Great Yarmouth, and sent for exhibition by Mr. G. Smith, of that town. This was stated to be the first absolutely authentic occurrence of this southern species on the British coasts.—Mr. Sclater exhibited and made some remarks on an example of a rare Amazon Parrot (*Chrysotis bodini*) from British Guiana.—Various other specimens were exhibited, and papers read.

EDINBURGH

Royal Society, January 17.—Sheriff Irvine, Vice-President, in the chair.—Mr. John Murray read a paper on the total rainfall of the globe, and its relation to the discharge of rivers. 2243 cubic miles of rain fall annually on areas with inland drainage. Such areas extend to 11,486,350 square miles. The land draining directly to the ocean has an area of 44,211,000 square miles. If from this quantity we subtract all areas having less than 10 inches of annual rainfall, we get 38,829,750 square miles. The mean discharge from this area into the ocean is 6569 cubic miles annually. The total weight of substances carried by this means to the ocean is rather more than 5,000,000,000 tons each year.—Mr. W. Durham read a paper on chemical affinity and solution.—The fourth part of a paper on thermometer-screens was communicated by Mr. John Aitken.—Prof. Armstrong read a paper by Mr. A. C. Elliot, containing an extension and improvement of Rankine's formula for the pressure of earth on a retaining wall.—Prof. Tait communicated the third part of his paper on the foundations of the kinetic theory of gases. In the first division of this part the author discusses the modifications which are introduced into his previous formulæ by the consideration of the effects of molecular attraction of small range, but great intensity, on the behaviour of a group of hard, smooth, impinging spheres. In the second division he makes the assumption that the spheres are not perfectly hard, but possess a definite coefficient of restitution. He then endeavours to make an approximation to the conditions of the liquid state by considering the action of spheres whose relative speed of approach is such that, after impact, they are unable to pass out of the range of molecular attraction in consequence of the loss of translational energy by impact.

DUBLIN

Royal Society, December 15, 1886.—The physical properties of manganese steel, by Prof. W. F. Barrett. The author pointed out that Mr. J. T. Bottomley had sent a brief note on the feebly-magnetic character of manganese steel to the Aberdeen meeting of the British Association, and had kindly furnished him with a specimen of this steel, and the name of the makers and patentees, Messrs. Hadfield and Co., of Sheffield. The steel contains 12 to 14 per cent. of manganese. Through Messrs. Hadfield, the author had obtained wire drawn from manganese steel, a process that first presented great difficulties, but was ultimately accomplished with ease by heating the steel to whiteness, and quenching in cold water after a reduction through every two sizes had been drawn. Sudden cooling softens this steel; slow cooling hardens it. A No. 19 S.W.G. wire (diameter 0·98 millimetre) was thus obtained of two kinds—hard and soft; the density was 7·808. The *electric conductivity* was found by Prof. Barrett to be very low. The No. 19 wire had a resistance of about an ohm per metre, the exact specific resistance in C.G.S. units being 77,000 for 1 cubic centimetre; ordinary iron is only 9800, and German silver 21,170 in the same units; so that some use might be made of manganese steel wire for resistance-coils in electric lighting. The variation of resistance with temperature is now being examined. The *magnetic character* of this steel was then carefully tested by the author. Mr. Bottomley found the intensity of magnetisation of this steel, after submitting it to the most powerful magnetising force, was 2·55 in C.G.S. units, or the magnetisation per gramme was 0·013 in C.G.S. Ordinary steel gives a number varying from 40 to 90, and even 100, C.G.S. units per gramme. So that, if ordinary steel of average quality be 100,000, manganese steel is 20. This represents the permanent magnetism. Prof. Barrett, by different methods, has determined the susceptibility—that is, the induced magnetisation—in a uniform field. Compared with iron as 100,000, manganese steel was found to be 300. In fact, it is very wonderful, judging by muscular sense, to find no sensible force required to move this steel, even in the most powerful magnetic field that could be obtained. Hence, as the author suggests, the use of manganese steel for the bed plates of dynamos and the plating of iron vessels is obvious. Ships built of such steel would have no sensible deviation of the compass. As excellent castings can be obtained from this steel, it ought to have many applications from its extreme hardness, enormous tenacity, and feebly-magnetic character. Dr. Hopkinson's important memoir on the magnetisation of iron contains a measurement of the magnetic susceptibility of manganese steel, of which Prof. Barrett was unaware until his paper had been written. Though Dr. Hopkinson's method of determination was wholly different, the ratio of the susceptibility of iron to manganese steel which he obtained is fairly accordant with the number obtained by the author, the composition of the specimen being the same in both cases. As regards the *tenacity* of manganese steel, the author had found the hard wire had the extraordinary tenacity of 110 tons per square inch, or 173·5 kilogrammes per square millimetre—a number confirmed by independent tests which the chief engineer of the Irish Great Southern and Western Railway Works had kindly made for Prof. Barrett. The tenacity of ordinary steel wire is from 80 to 100 kilogrammes per square millimetre, the best pianoforte steel wire alone showing a higher tenacity than the manganese steel wire. The soft manganese steel wire had a tenacity of only 48 tons per square inch, with an elongation of nearly 20 per cent. The *modulus of elasticity* was also determined by the author by direct stretching. It was found to be lower than wrought iron, the mean number for the hard manganese wire being 16,800 kilogrammes per square millimetre, the soft manganese wire having a still lower modulus. The modulus for ordinary steel wire is 18,810, and for iron wire 18,610 kilogrammes per square millimetre; so that, though hard manganese steel has an enormous tenacity, it "gives" more than steel under sudden stress, recovering itself, of course, if the limits of elasticity are not passed. Obviously this is a most useful property for many purposes to which the steel may be applied. Further experiments on this interesting material are in progress in the Physical Laboratory of the Royal College of Science.

PARIS

Academy of Sciences, January 17.—M. Gosselin, President, in the chair.—Obituary notices of M. Paul Bert on the occasion of his obsequies at Auxerre, by M. Janssen in the name of the Academy of Sciences, and by M. A. Chauveau on behalf of the Biological Society.—Observations of the minor planets made with the large meridian instrument of the Paris Observatory during the third quarter of the year 1886, communicated by M. Mouchez. Comparative observations are here tabulated for Electra, Aletheia, Olympia, Juno, Pallas, Ceres, and several other minor planets. Those for the three last mentioned are referred to the ephemerides of the "Nautical Almanac," all the others to those of the "Berliner Jahrbuch." The observations were taken by MM. F. Boquet, O. Callandreau, and P. Puiseux.—Study of the horizontal flexion of the telescope of the Bischoffsheim meridian-circle of the Paris Observatory, by MM. Lœwy, Leveau, and Henri Renan.—On the solar statistics of the year 1886, by M. R. Wolf.—Letter addressed to the Academy by M. Em. Barbier, thanking it for the Francœur Prize recently awarded to him, and submitting a means by which he has succeeded in converting an ordinary watch into a repeater. A process is also explained by which a person both deaf and blind may tell the time by this repeater.—On the accelerations of the points of an invariable system in motion, by M. Ph. Gilbert. Two cases are considered: (1) that of a solid revolving round a fixed point, O; (2) that of a free solid body.—On the laws determining the absorption of light in crystals, and on a new method enabling the observer to distinguish in a crystal certain absorption-bands belonging to different bodies, by M. Henri Becquerel. His researches in this branch of physics have led the author to several important conclusions here specified on the absorption of light in crystals. He finds generally that in different crystals the characters of the phenomena of absorption differ considerably from those that one might expect to observe, regard being had to the optical properties of the crystal.—Heat of formation of some alcoholates of soda, by M. de Forcrand. Having already determined the heat of formation of the methylate and ethylate of soda, the author passes here to the study of the alcoholates of soda formed by the propylic, isobutylic, and amylic alcohols.—On some combinations of the bioxide of tin, by M. A. Ditte. Sulphuric acid is known to readily dissolve the hydrates of the bioxide of tin derived from various sources, yielding a liquor soluble in water and alcohol. Here the author studies the products of this reaction, which have not yet attracted the attention of chemists.—Action of some metalloids on the nitrates of silver and copper in solution, by M. J. B. Senderens. The author deals here with powdered selenium, tellurium, sulphur, arsenic, phosphorus, and bromium.—Note on the composition of the grain of starch, by M. Em. Bourquelot. From his researches the author concludes that the grain of starch is formed neither of one nor of two chemical species (granulose and amylose) as has been hitherto supposed, but of a larger number of hydrates of carbon.—On the plastidogene body, or pretended heart of the Echinoderms, by M. Edmond Perrier.—On some new parasites of the Daphnidæ, by M. R. Moniez.—On some Crustaceæ, parasites of the Phallusiæ, by M. Paul Gourret.—On the removal of Lamarck's Herbarium to the Museum of Natural History, by M. Ed. Bureau. After remaining for some fifty years in the University of Rostock, this famous historical collection, containing over 10,000 specimens in good condition, has just been purchased and transferred to the Paris Natural History Museum. The tickets, descriptions, and other accompanying documents are all in the handwriting of the illustrious naturalist.—On the genus *Plesiadapis*, a fossil mammal of the Lower Eocene from the neighbourhood of Rheims, by M. Lemoine. Various remains are described by means of which the author determines two sub-genera of the genus *Plesiadapis* (Gervais), presenting lemurian characters with a marsupial facies.—Note on giovannite, a new cosmic rock, by M. Stanislas Meunier.—On the deterioration of vaccine, by M. P. Pourquier. An experiment is described showing the deterioration of this virus, with suggestions on a means of preventing its attenuation.—Note on the copper detected in wines from vineyards treated with the sulphate of copper against mildew, by M. A. Andouard. An analysis of several samples shows that the quantity of copper detected in such wines is infinitesimal, and in no way injurious to health.

STOCKHOLM

Royal Academy of Sciences, January 12.—Prof. S. Lovén gave an account of the researches effected at the zoological station of the Academy at Christineberg, in the province of Bohus, during last summer.—Prof. Rubenson gave an account of a posthumous memoir by the late Col.-Lieut. Klercker on the so-called anomalous dispersion.—Determination of some physical constants of germanium and titanium, by Profs. Nilsson and Petterson.—On experiments on the electrical conducting power of the air, by Prof. Edlund.—On bryological researches in the province of Småland, by Herr R. Tolf.—Annotations on the vegetation in the west of Herjeadalen, particularly as to the occurrence of the Hymenomycetæ within different formations of the vegetation, by Dr. E. Henning.—A comparative research on the monosulphon-combinations of benzol and toluol, by Dr. Weibull.—Construction of the curves of the fourth order and second kind by means of rules and compasses, by Prof. Björling.—On the pleochroism and light-absorption in epidote from Sulzbachthal, by Herr W. Ramsay.—On the amido-naphthaline-sulphon acid, by Herr S. Forsling.—On the sponges of the province of Bohus, by Dr. Fristedt.

BOOKS AND PAMPHLETS RECEIVED

Travaux et Mémoires du Bureau International des Poids et Mesures, tome v. (Gauthier-Villars, Paris).—Lease and Release, by Sea Verdure (Chiswick Press).—Folk-Lore Journal, vol. v. part 1 (E. Stock).—Notes from the Leyden Museum, vol. ix. No. 1 (Brill, Leyden).—The Auk, vol. iv. No. 1 (New York).—Palæolithic Man in North-West Middlesex: J. A. Brown (Macmillan).—Zeitschrift für Wissenschaftliche Zoologie, 44 Band. 1 Heft (Engelmann, Leipzig).—Proceedings of the Biological Society of Washington, vol. iii. (Washington).—Spolia Atlantica, 1885-86 (Dreyer, Copenhagen).—Botanische Jahrbücher für Systematik, Pflanzengeschichte, und Pflanzengeographie, Achter Band, ii. Heft (Engelmann, Leipzig).—Revue d'Anthropologie, 1887, No. 1.—Supplementary Catalogue to the Newcastle-on-Tyne Public Libraries: W. J. Haggerston.—Report of the Superintendent of the U.S. Naval Observatory for the Year ending June 30, 1886 (Washington).—Sulla Velocitá del Suona nei Liquidi: Prof. T. Martini (Venezia).—Systematic Catalogue of Species of Vertebrata: E. D. Cope.—The Phylogeny of the Camelidæ: E. D. Cope.—Vertebrata of the Swift Current Creek Region of the Cypress Hills: E. D. Cope.—Monthly Weather Report, July and August 1886.—Economic Problem of the Unemployed: W. Westgarth (Mathieson).

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