Geese (*Bernicla magellanica* ♂ ♀), two Ruddy-headed Geese (*Bernicla rubidiceps*) from the Falkland Islands, presented by Mr. R. C. Packe; three Common Pheasants (*Phasianus colchicus* ♂ ♀ ♀), British, presented by Mr. H. T. Bowes; an Indian Python (*Python molurus*) from India, presented by Mr. G. E. Shute; a Sykes's Monkey (*Cercopithecus albigularis*), a Philantomba Antelope (*Cephalophus maxwelli* ♀), an Elate Hornbill (*Buceros elatus*), a Jardine's Parrot (*Pæocephalus gulielmi*) from West Africa, an Indian Civet (*Viverricula indica*), two Wandering Tree Pies (*Dendrocitta vagabunda*), from India, a Red-sided Eclectus (*Eclectus polychlorus*) from New Guinea, five Red-bellied Conures (*Conurus vittatus*), a Giant Toad (*Bufo agua*) from Brazil, a Horned Lizard (*Phrynosoma cornutum*) from Texas, four Cornish Choughs (*Fregilus graculus*), British, purchased; a Common Rhea (*Rhea americana*) from South America, received in exchange; two Indian Pythons (*Python molurus*) from India, received on approval; a Japanese Deer (*Cervus sika* ♂), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE PARIS GENERAL CATALOGUE OF STARS.—In the last Annual Report issued by Admiral Mouchez we find particulars of the progress of formation of this extensive and important catalogue. It is intended to contain all the stars observed at Paris during the forty-five years 1837 to 1881 inclusive, about 40,000, but it is mainly the result of the revision of Lalande's stars in the *Histoire Céleste*; indeed, for several years past, the meridian instruments have been almost wholly occupied upon this work, and upwards of 27,000 observations were made during 1882, the year to which the Report refers. The entire number of observations upon which the Paris General Catalogue will be founded is about 350,000. The positions are referred to three principal epochs; 1845·0 for the years 1837-53, 1860·0 for the years 1854-67, and 1875·0 for the years 1868-82. A specimen of the form in which it is intended to print the catalogue is appended to the Report. The right ascensions and declinations are given for each principal epoch, with the number and mean year of the observations. The precessions are reckoned from the year 1875, with the term depending upon the square of the time. The magnitudes and the differences from the positions of the *Histoire Céleste* are annexed, and where a star has not been observed by Lalande a synonym in some other catalogue is given. In the first column we have the ordinal number, and in the second the star's number in the reduced catalogue of the *Histoire Céleste*. It is mentioned in the Report that M. Bossert had undertaken a new determination of the places of the stars in that work, making use of the reduction-tables of the late Doctor von Asten, which are more exact than the tables of Hansen and Nissen, employed for the catalogue published in 1847. M. Bossert has already effected the reduction of 2,300 stars, a voluntary labour which has occupied his leisure hours. It would add to the value of the columns showing the differences between the new Paris positions and those of Lalande, if the comparisons could be made with places resulting from the application of von Asten's tables, though it might be necessary to supplement M. Bossert's laudable efforts. In the last Greenwich Catalogue (1872) the precessions are given to four places of decimals in right ascension (time), and to three places in north polar distance; the Paris Catalogue gives these quantities with a figure less, which we are inclined to regard as a retrograde step.

This General Catalogue of the Observatory of Paris is to comprise two parts, which will be published simultaneously; the first part forming the catalogue proper, and the second containing details of the observations upon which the mean positions are founded. Each part will be composed of four volumes; the first volume of each is intended to appear during the year 1884.

ENCKE'S COMET IN THE YEARS 1871–1881.—At the sitting of the Paris Academy of Sciences on June 11, M. Tisserand communicated a note by Dr. Backlund, of the Observatory of Pulkowa, relative to the motion of Encke's Comet in the interval 1871–1881. To complete the theory of this comet, it has been necessary to introduce an empirical to the mean motion of the form $\mu'\left(\frac{t}{1200}\right)$. The quantity μ', which was found to be nearly constant during the period 1819–1868, appears to have undergone a considerable variation about the latter epoch. Dr. Backlund bases his calculations upon osculating elements for October 27, 1874, which he considered exact enough for his purpose: they give—

$$\mu = 1079''\cdot33355 + \mu'\tau \left(\text{where } \tau = \frac{t}{1200}\right)$$
$$\mu' = + 0\cdot051731$$

After having carefully reviewed the computation of perturbations by Asten, and calculated by two different methods the perturbations during the revolution 1878–1881, Dr. Backlund compared the elements with the observations made in the years 1871, 1875, 1878, and 1881. By means of this comparison, he obtains corrections to the elements, and, observing that if there exists a tangential force, which varies the dimensions of the comet's orbit, its effect is not only secular, but also periodic, the periodic terms being always very small, except in the expression for the mean anomaly. This he takes into account, and finally deduces for the corrections of the two quantities above—

$$\Delta\mu = + 0''\cdot004745$$
$$\Delta\mu' = - 0\cdot0059867$$

Hence, he says, his investigation proves that the acceleration of the mean motion in the period 1871–1881 was less than half the value found by Encke and Asten for the period 1819–1865. Aten's value is + 0·104418.

CHEMICAL NOTES

INTERESTING experiments on the luminosity of gases are described by W. Siemens in *Ann. Phys. Chim.* [(ii.) 18, 311], and by E. Wiedemann [*ib.* 509]. Gases free from solid particles do not become luminous at high temperatures, nor is the luminosity of a flame due to incandescence of the products of combustion; if the gases are strongly heated before being burnt, the flame becomes hotter and shorter than it is when the preliminary heating is omitted, and the luminous flame is seen to be distinctly separated from the non-luminous products of combustion. Siemens seems inclined to regard the chemical action which proceeds as the cause of luminosity: if the existence of an envelope of ether around the molecules is assumed, then the reaction of one molecule on another may be regarded as starting vibrations in this envelope, which vibrations give rise to heat and light rays. Wiedemann especially considers the luminosity of gases under the influence of electric discharges: he thinks that in the process of charging the electrodes the ethereal envelopes of some of the gas molecules are distorted; when discharge occurs these envelopes are set into motion, and hence the luminous effects.

SOME time ago Ostwald deduced the relative affinities of various acids in terms of nitric acid taken as 100; by relative affinity is meant the proportion in which two acids divide themselves between one base, all the reacting substances being in solution. Ostwald has recently investigated this subject by a method different from that formerly employed; he has studied the rates of action of various acids on acetamide, and from the results he has deduced the relative velocities of action, and hence the relative affinities. The following table contains the results. In column II. are placed figures representing the results of his former experiments—

	I.	II.
Hydrochloric acid ...	100 ...	98·0
Nitric ,, ...	98 ...	100
Hydrobromic ,, ...	98 ...	95
Trichloracetic ,, ...	80 ...	80
Dichloracetic ,, ...	40·8 ...	33
Monochloracetic ,, ...	13·0 ...	7
Formic ,, ...	5·2 ...	3·9
Lactic ,, ...	5·2 ...	3·3
Acetic ,, ...	2·3 ...	1·2
Sulphuric ,, ...	65·4 ...	66·7
Oxalic ,, ...	22·6 ...	—
Tartaric ,, ...	7·5 ...	5·2
Malic ,, ...	4·7 ...	2·9
Succinic ,, ..	2·5 ...	1·5
Citric ,, ...	4·0 ...	—
Phosphoric ,, ...	3·6 ...	—
Arsenic ,, ...	3·5 ...	—

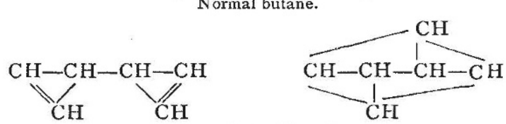
M. SPRING continues his researches into the influence of great pressure upon chemical reactions: at a pressure of about

6500 atmospheres he finds that sulphur combines with magnesium, zinc, iron, cadmium, bismuth, lead, copper, silver, tin, and antimony. Sulphur and phosphorus do not combine when compressed together (*Berichte*, xvi. 999).

BENZENE is perhaps the most important body in the whole range of chemistry, not on account of any intrinsic interest in the substance itself, but because of the immense number of its derivatives. The constitution of these derivatives must depend upon the structure of the benzene molecule itself, and this problem is therefore one of the most interesting that presents itself to the chemist. Any idea that can throw light upon this subject is worthy of attention, and the more so as long as the least doubt exists as to whether benzene can yield more than three di, tri, or tetra derivatives, or more than one mono or penta derivative, the substituting groups being the same. Again, it is possible that benzene may exist in two or more isomeric modifications (disregarding dipropargyl), and the difference found by V. Meyer (*Ber.* xv. 2893) between two samples of benzene, both presumably pure, would seem to point in this direction. The mere fact, therefore, that one formula is good and useful is no condemnation of any other formula that may be proposed. M. Mendeléeff has suggested that benzene may be regarded as a normal butane, in which six hydrogen atoms are replaced by two triad groups, CH. If we allow that benzene is best represented as containing six CH groups, and there seems as yet no reason for departing from this supposition, then this replacement may take place in two ways, as shown by the following formulæ:—

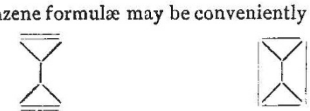
$$CH_3—CH_2—CH_2—CH_3$$

Normal butane.



Benzenes derived therefrom.

These two benzene formulæ may be conveniently written thus:—



and these expressions show at a glance the difference between them. The second is identical with Ladenburg's prism formula, the advantages of which do not need recounting. The first, so far as double and single linkings are concerned, is intermediate between the prism formula and Kekulé's. It lends itself in a particularly ready way to the expression of more complex formulæ, as of naphthaline, &c., but does not show the hexad nature of the benzene molecule. Moreover, it shows possible two mono or penta derivatives, and five each di, tri, and tetra derivatives, a capability that is not yet needed; and a formula should be a concise expression of facts, and should as far as possible show the limits of those facts. Thus, however valuable the suggestion of M. Mendeléeff may be as showing a possible method of synthesising benzene, it does not appear to be practically useful as indicating its constitution, though the future chemistry of benzene may require such a formula as the one referred to above.

PROF. MENDELÉEFF, to avoid the superheating which takes place during ordinary fractional distillation with a dephlegmator tube, has devised a modified method for the oils from Baku petroleums boiling between 15° and 150°, which consists in passing the vapours from the distilling flask by means of the dephlegmator, or delivery tube, to the bottom of a second similar flask, and from this to a third, and so on; the heated vapours from the one providing the necessary heat for the distillation of the next, &c. In this manner a great number of fractions at intervals of two degrees were obtained. By comparing boiling points and specific gravities of products the author concludes that Baku oils contain similar hydrocarbons to American petroleum, and in addition a hydrocarbon boiling at 55° and same specific gravity as hexan with the properties of an unsaturated compound. The great bulk of the Caspian petroleums appears to consist, in addition to derivatives of marsh gas, of C_nH_{2n} hydrocarbons, and also some members of the C_nH_n or acetylene series.

SOME interesting results have been obtained by Spring (*Ber. Ber.*) by washing precipitated sulphide of copper for several weeks until all traces of salts were removed. It was then found that the sulphide dissolved to a black liquid, with slight green fluorescence, in water. The solution might be boiled and evaporated without change; slight traces of salts caused precipitation. The author has also obtained sulphide of tin and oxides of antimony and manganese in a condition perfectly soluble in water. Sulphide of tin on evaporation of its solution in vacuo forms a transparent red glass.

GEOGRAPHICAL NOTES

ON June 6 Baron Nordenskjöld's Greenland expedition arrived at Reykjavik in the steamer *Sophia*. The *Sophia* lay at Reykjavik for a few days, and in the meantime Baron Nordenskjöld and the geologists of the party examined the coal deposits which occur in Bergarfiord. Dr. Arpi, a Swedish philologist, who has resided some time in Iceland and acquired a thorough knowledge of the language, accompanied the expedition thither, and will, along with two other men of science, remain in Iceland after the *Sophia* has left.

WE learn from *Science* that a party for the relief of the observers under Lieut. Greely at Lady Franklin Bay was to leave St. John's, Newfoundland, on one of the steam sealing-vessels belonging to that port, about June 15, probably accompanied by a naval vessel as tender. It will be commanded by Lieut. E. A. Garlington, U.S.A., and composed of twelve men, of whom ten are stated to be old sailors and accustomed to the use of boats. Twenty dogs, native drivers, and a supply of fur clothing, have been secured at Godhavn, Greenland. The party at Lady Franklin Bay will be reached and withdrawn if the state of the ice permits. If not, the relief party is to be landed on Littleton Island, and while part of them are engaged in preparing winter quarters, Lieut. Garlington will endeavour to open communication by sledges with Greely's people. In the failure of the first attempt, another will be made in the spring of 1884. It is to be hoped, if Greely is not reached, that an attempt will be made to leave at Cape Hawkes or Cape Sabine, if not the relief party as a whole, which would be best, at least a boat by which the open water to be anticipated between those points and Littleton Island next year (1884) may be passed by a retreating party, which might well find their own boat unseaworthy after dragging it over many miles of hummocky ice, if, indeed, they did not find themselves obliged to abandon it. Further, the schooner *Leo* is on the point of sailing for Point Barrow to withdraw the signal-service observing party under Lieut. Ray, in compliance with the act passed by the last Congress. To utilise the opportunity, Mr. Marr, of the U.S. Coast-Survey, will accompany the vessel with the design of making absolute magnetic determinations, of fixing the astronomical position of the station, and of making pendulum observations.

IN a communication from the Russian Geographical Society we are informed that Col. Prejevalsky is about to start on his fourth journey to Central Asia, accompanied by two officers and seventeen men. The Emperor has granted to the Society 43,000 roubles for the purpose of Col. Prejevalsky's journey. The Society is also sending out a new expedition under M. Potanin, who is now completing the publication of the two last volumes on his journey of 1879–80. He will start in July for South-East Mongolia and the adjacent parts of China; he will be accompanied by a naturalist and M. Skassi, the companion of Severtzov in his exploration of the Pamir. The funds are being supplied partly by the Society and partly by M. Sookachef, a Siberian merchant.

IN the same communication we are informed that the average temperature of January and February at the Russian Polar station at Sagastyr, on the mouth of the Lena, was about −50° C. Thanks to the Governor-General of Eastern Siberia there has been organised a special postal service between Jakutsk and Sagastyr once a month. The observing party will most probably remain at the station up to the end of October, *i.e.* until the river is frozen.

THE last number of the *Zeitschrift der Gesellschaft fur Erdkunde zu Berlin* (Bd. 18, Heft 2) contains a paper by Herr van Langegg, entitled "Nara eine alte Kaiserstadt," describing the town of Nara, not far from Kioto, in Japan, at one time the capital of the country, and still much renowned for its temples The celebrated colossal statue of Buddha there is fully described. The following figures give some notion of its dimensions:—Its weight is 500,000 kilog.; 3,000,000 kilog. of wood were con-