

A COMPREHENSIVE study of the nature of the dissociation of hydriodic acid gas by heat, the conditions of equilibrium of the dissociated constituents, and the circumstances under which recombination occurs, has been made by Prof. Victor Meyer and Herr Bodenstein, and their results are contributed to the current number of the *Berichte*. The investigation was conducted upon similar lines to Prof. Meyer's recent experiments upon gaseous mixtures of hydrogen and oxygen, a series of a large number of equal-sized bulbs connected by capillary tubes being simultaneously filled with the pure gas and subsequently sealed and separated by fusion of the capillaries. In commencing the experiments Prof. Meyer was surprised to observe the comparative readiness with which gaseous iodine and hydrogen unite without the aid of platinum sponge or other condensing agents. If a glass tube containing a little iodine is filled with hydrogen, sealed, heated in a bath of the vapour of boiling sulphur, and after cooling opened under water, a considerable escape of pent-up hydriodic acid gas occurs, and the water immediately afterwards ascends in the tube owing to the absorption of the remainder. The hydriodic acid for the purpose of the experiments was all prepared by the direct union of the pure elements, inasmuch as the gas prepared by the usual method from iodide of phosphorus was always found to contain admixed volatile phosphorus compounds. The preparation was conducted by leading the mixture of iodine vapour and hydrogen over heated platinised asbestos, when it was found that 86 per cent. of the iodine entered into combination. The product, after passing through a suitable vessel in which the uncombined iodine was condensed, was received in cooled water, the gas regenerated by warming the fuming aqueous solution, and finally freed from moisture by leading it over phosphoric anhydride and from the last traces of free iodine by passing it over red phosphorus free from yellow phosphorus and lower oxides of phosphorus. The hydriodic acid gas thus obtained proved to contain no perceptible trace of impurity. Before proceeding to fill the bulbs the air was expelled from them by means of a current of pure hydrogen, which was allowed to pass through them for 24 hours, with occasional heating to near the softening point of the glass in order to remove the film of condensed air adhering to the surface of the glass. The hydrogen was finally displaced by pure hydriodic acid and the bulbs sealed. These extreme precautions, which were adopted in order to secure a number of specimens of pure hydriodic acid, afford a striking example of the infinite pains which are required to effect the final settlement of many of the apparently simple problems of elementary chemistry.

PROF. MEYER has definitely decided the question of the action of light upon pure hydriodic acid gas. Bulbs exposed upon the roof of the Heidelberg laboratory during the summer months became filled in a few days with large brilliant crystals of iodine. After ten days' exposure 58 per cent. of the gas had been dissociated, and at the end of the summer 99 per cent., or practically all. The fact that the waves of light are so active in effecting dissociation rendered it imperative that the thermal experiments should be conducted in the dark. The whole of the above experiments in connection with the preparation of the gas and the filling of the bulbs were therefore conducted in a dark room. The thermal results may be very briefly summarised. The statement in text-books that hydriodic acid commences to dissociate at 180° is incorrect. It is only in presence of admixed air that this occurs. At 310° the decomposition of the pure gas is so slight that it would take 2,000 hours to attain the point of maximum dissociation at which equilibrium is established. This point was determined indirectly to be attained when 0.1669 of the original quantity of gas was dissociated. At the temperature of the vapour of boiling mercury (350°) equilibrium was found directly to be estab-

lished when 0.1731 was decomposed. At 394° (boiling retene) 0.1957 was dissociated, and at the temperature (448°) of boiling sulphur 0.2150. It is of particular interest to learn that Prof. Meyer has further proved by direct experiment that the formation of hydriodic acid from gaseous hydrogen and iodine proceeds at any temperature until exactly the same condition of equilibrium is attained as in the corresponding dissociation experiment. Thus when the synthesis of hydriodic acid was conducted at the temperature of sulphur vapour the reaction proceeded until only 0.21 of the elementary gases remained uncombined, the same amount as was dissociated when starting with the compound gas. Perhaps the most interesting result of the investigation is that concerning the rapidity of the dissociation. It has been found that whenever two bulbs of equal size are heated for equal lengths of time precisely the same amount of decomposition or of formation occurs. The reaction is thus found to proceed with strict regularity, the amount of dissociation or of synthesis at any fixed temperature being a direct function of the time, and capable of expression by a simple mathematical formula which is given in the memoir and which is amply verified by a large number of experiments.

NOTES from the Marine Biological Station, Plymouth.—Last week's captures include the Mollusca *Eulima distorta* and *Rostanga coecinea*, the Isopoda *Anthurus gracilis* and *Munna Kröyeri*, and the Brachyura *Eurynome aspera* and *Portunus marmoreus*. The gelatinous alga, which has been so abundant in the townettings since the beginning of April, has at length almost completely disappeared. Swarms of the Leptomedusæ *Irene fellucida* (half-grown) and *Obelia lucifera* (full-grown and mature) have repeatedly been taken; but for some weeks past an occasional specimen of *Corymorpha nutans* has been the only representative of the Anthomedusæ. A single large *Bipinnaria* larva has been observed. On the shore young individuals of this year's growth of the Nemertines *Amphiporus lactifloreus* and *Lineus obscurus* (= *gesserensis*), and of the Crustacean *Carcinus maenas* are now plentiful. The following animals are now breeding:—Several *Terebellide*, the Opisthobranch *Philine aperta*; the Crustacea *Virbius varians*, *Portunus marmoreus*, *Stenorhynchus phalangium* and *tenuirostris*.

THE additions to the Zoological Society's Gardens during the past week include a Common Hedgehog (*Erinaceus europæus*, white var.) from Berkshire, presented by Mr. R. T. Hermon-Hodge; a Ruddy Ichneumon (*Herpestes smithi*) from India, presented by Mr. Maurice Welsh; a Guillemot (*Lomvia troile*) British, presented by Mr. H. B. Hewetson, F.Z.S.; two Ringhals Snakes (*Sepedon hamachetes*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; an Aurora Snake (*Lamprophis aurora*) from South Africa, presented by Mr. T. E. Goodall; a Levaillant's Amazon (*Chrysotis levaillantii*) from Mexico, a Grey Parrot (*Psittacus erithacus*) from West Africa, a Cardinal Grosbeak (*Cardinalis virginianus*), a Rose-breasted Grosbeak (*Hedymeles ludovicianus*) from North America, deposited; a Jaguar (*Felis onca*, ♀) from South America, two Striped Hyænas (*Hynna striata*, ♂ ♀) from North Africa, a Black-necked Swan (*Cygnus nigricollis*, ♂) from Antarctic America, twelve Green Lizards (*Lacerta viridis*) South European, purchased.

OUR ASTRONOMICAL COLUMN.

THE ECLIPSE OF APRIL, 1893.—M. Bigourdan communicates to *Comptes Rendus* for May 23 (No. 21) a brief preliminary account of his observations made during this total eclipse of the sun. The station he occupied was Joal (approximately Longitude 1h. 16m. 38s. E. of Paris, and Latitude 14° 9' 25" N.)

and the observations were made from the Observatory erected by the Expedition of the Bureau des Longitudes. With an eyepiece magnifying 190 times he observed several occultations of solar spots by the moon, and in about fifteen cases he noticed the phenomenon that is equivalent to that seen in observations of the Transit of Venus and known as the black drop. It was produced, he says, not only at the contact of large spots, but at the point of contact of small ones, and even of the simple filaments forming the penumbrae of spots. M. Bigourdan also made a special look for the phenomena known as Baily's beads, sometimes seen when the sun has been reduced to a very fine crescent by the advance of the lunar disc, but from all accounts he seems to have been unable to see any trace of them. A search round the sun for an intra-Mercurial planet, with a telescope giving a field of 25', was also made, but with no satisfactory result, since he says that his instrument was not suited for that purpose: the negative result thus obtained affords no argument against the existence of such a body. The duration of totality lasted exactly 4m. 1s.

FINLAY'S COMET (1886, VII.).—The following is the current ephemeris of this periodic comet, as given in *Astronomische Nachrichten*, No. 3164:—

		12h. M. T. Paris.			
		R. A. (app.)		Decl. (app.)	
		h.	m. s.		
1893.	June 1	...	0 40 53	...	+1 15'6
	2	...	45 24	...	1 44'6
	3	...	49 55	...	2 13'9
	4	...	54 29	...	2 43'2
	5	...	0 59 4	...	3 12'5
	6	...	1 3 41	...	3 41'9
	7	...	8 18	...	4 11'3
	8	...	1 12 56	...	4 40'6

AURORA OBSERVATIONS.—In the event of Lieut. Peary's expedition to a high station in North Greenland (about Lat. 77° 30' N. and Long. 70° 15' W.), where regular observations of the aurora will be undertaken, it is hoped that everyone, wherever he may be, will help to supplement these observations by noting himself the times of absence and presence of this phenomenon. With so many workers in so many lands, it is needless to say that a systematic method of recording what is seen should be followed. With the intention of supplying this demand, Mr. M. A. Veeder has issued a set of blanks similar to those that will be used in the expedition, so that when properly filled up comparisons can be made in detail. In addition to the investigation of the local distribution of the aurora, it is hoped that the electro-magnetic conditions of solar origin may be more inquired into, and it is on this account that these circulars have been sent to both solar and magnetical observatories as well as to individual observers. As for the Arctic records, they will be continuous whenever observation is possible, relays of observers connected with the expedition relieving each other. In making such observations it is emphasised here that minute descriptions of the formation of arches, streamers, prismatic colours, and the like, accompanying such variations in the extent of displays, are of interest, but are far less important than that the times should be noted as accurately as possible. Any one desiring these blanks can be supplied directly by applying to M. A. Veeder, New York.

THE CONSTANT OF ABERRATION.—Prof. Chandler, in the *Astronomical Journal* (No. 296), gives the third of his most important papers relating to the constant of aberration, treating in this article specially of Struve's Prime-Vertical Observations, 1840-55, from the new point of view with respect to the variation of latitude. In this discussion, in addition to a direct solution for all the unknowns, he has made an indeterminate one, employing the constants pertaining to the 427-day term, and expressing the unknowns in terms of y and z . As regards the former solution, employing the observations of the seven stars from the years 1840-42, the value of the observations obtained is 20'' 533, Struve's value from the same material being 20'' 445, and for the whole data from 1840-55 the aberration is 20'' 514. This last-mentioned value would be the "definite value from Struve's Prime-Vertical Observations, if we accept the direct solution as the best," but he says the *indeterminate* solution throws doubt upon this point. The definite value, as given by this solution, gives 20'' 481 + 0'' 111 y + 0'' 230 z ; and, since as yet the most probable values of these constants are not known,

those of the 427-day period applied to the special case of Polaris, which were independent of the aberration, give, on this assumption, 20'' 474, a value, as will be noticed, smaller than that by the direct solution. The value 20'' 500 for the aberration constant is, according to Prof. Chandler, too great, as inferred from the discussion here given. As a "matter of interest" he gives the values of the aberrations deduced from the observations of the several stars made in 1840-42.

THE ASTRONOMICAL DAY.—"Is it desirable, all interests considered, that on and after January 1, 1901, the astronomical day should everywhere begin at mean midnight?" This is the question that has been put forward by a joint committee of the Canadian Institute and the Astronomical and Physical Society of Toronto, and printed in a circular-letter addressed to astronomers of all nations. Many of our readers may remember that as far back as 1884 the Washington International Conference carried unanimously the following resolution, there being representatives of twenty-five nations, "counting among them several astronomers of world-wide fame," that "the conference expresses the hope that as soon as may be practicable, the astronomical and nautical days will be arranged everywhere to begin at mean midnight." That the astronomical and civil day should start together at the same moment seems without doubt the right method of procedure, for what is gained really by reckoning the astronomical time from noon and the civil from the preceding midnight? It is true that changes will have to be made in the *Nautical Almanac*, and all such-like year-books, both astronomical and nautical; but on the assumption that the change is made simultaneously by all nations, and taking into account that such a change cannot come into vogue for five or six years on account of the fact that these books are printed a few years in advance, there seems really no difficulty ahead. The suggestion that the change, if made, should take place with the change of the century seems to be an excellent epoch for such a transition, for besides giving time for a thorough discussion of so important a question, it will, as Otto Struve says, "stamp itself on the memory of all who hereafter would be busied in the investigations in which exact chronology plays a part."

ROYAL OBSERVATORY, GREENWICH.—The Annual Visitation of the Royal Observatory at Greenwich by the Board of Visitors takes place on Saturday, June 3 next. The Observatory will be open for inspection at 3 p.m.

GEOGRAPHICAL NOTES.

DR. NANSEN writes confirming the statement made in this column as to the baselessness of the assertions regarding the failure of his expedition. He is making rapid progress with his preparations, and expects to sail in the *Fram* on his great venture on June 20.

THE most recent change of name in Africa is the adoption of the official title Niger Coast Protectorate for what was previously known as the Oil Rivers Protectorate, comprising the coastward part of the Niger delta.

NATAL, which has been a British colony for fifty years, has entered upon the final stage of colonial independence by the adoption of responsible government. It is expected that this step will lead to a rapid development of the resources of the country, and a considerable extension of its railways.

THE Antarctic whaler *Balena* put into Portland Roads for coal on May 25, and reached Dundee on May 30, being the first to return. Mr. W. S. Bruce, who was on board as surgeon and in charge of scientific observations, reports that the homeward trip was favoured by very fine weather. He confirms our fear that opportunities for scientific work had often to be lost on account of the purely commercial character of the trip, and the rigid interpretation of his instructions by the captain. An account of the voyage and its results will probably be given to the meeting of the British Association at Nottingham. On the return journey a series of floats was thrown overboard from the Antarctic ice-margin to the equator, in order to endeavour to get light on the direction and speed of the currents. The lowest air temperature experienced amongst the ice was 21° F.

THE new number of the *Geographical Journal* publishes an old minute of a committee of the Royal Geographical Society held in 1845 to consider the nomenclature of the oceans. At