"At a few minutes past seven o'clock a bright cone of light was seen springing up from the horizon at about east by north, this was followed by detached cloud-like streamers, which gradually joined into one vast, wide arch of brilliant light, extending, for a short time, completely across the heavens, slightly to the south of the zenith, to the south-west by south horizon. Other luminous patches also appeared on either side of this arch, one covered the space around Jupiter, others the constellations of Orion, Ursa Major, and Leo. Sometimes the rays or streamers gradually brightened, at other times they suddenly flashed into brightness; the effect of this pulsating light was very beautiful. The light was white, fading away at the edges of the rays, and was very similar to a strong, distant light seen through a haze or fog, which diffused the light, and softened its outlines. At half-past eight o'clock the rays had disappeared, and were followed by an arch of glowing light, which was centred at about the north-north-west, rising about fifty degrees towards the zenith."

Mr. Fowler, and other observers at the Astrophysical Laboratory, South Kensington, noticed a number of peculiarly bright clouds, flashing out chiefly in the west and south-west, between 7 and 8 p.m. He says: "From 8 p.m. to a little after 9 the phenomena observed were confined to the north, and took the form of a fine display of the aurora borealis. Streamers were comparatively rare, but at half-past eight there was a brilliant arc, reaching some ten degrees above the horizon at the highest point, which was in or very near to the magnetic meridian. Spectroscopic observations of the luminous clouds showed that the light consisted mainly of that which is characteristic of the aurora, being almost perfectly monochromatic and near wave-length 557. No clouds were seen when the aurora was brightest. During the maximum display of the aurora the characteristic bright line of the spectrum was seen in nearly every part of the sky, even where there was no visible haze or cloud." At the time of observation Mr. Fowler thought that the clouds did not owe their brightness simply to reflected aurora light, but as the observations towards the north were vitiated by the glare of the light of the Imperial Institute, he thinks that he may have been misled.

Rear-Admiral J. P. Maclear observed the aurora at Cranleigh, Surrey. The following is an extract from his description of the appearance presented:—"After sunset two white luminous clouds, like bright fog clouds, became apparent in a west north-west direction, and as darkness came on the northern horizon was lighted with a pale green light. At 8h. 45m. there was a rose-tinted patch like a cloud near the tail of the Great Bear, at the same time the low arch of light to the northward was bordered with a very faint rose tinge. At 9h. the light gradually faded away."

MIRA CETI.—Observations of this variable star have shown that it has continued to brighten since the predicted date of maximum (February 17). At the present time (March 4) it is a trifle brighter than δ Ceti, a star of magnitude 4.2, and is quite a conspicuous naked-eye star for a little while after darkness sets in. There are no indications that it has even yet reached the maximum. On some previous occasions it has reached the second magnitude. The predicted date of maximum was no doubt calculated on the basis of the period of 333 days, deduced by Argelander, but it is well known that the period, like the maximum brightness, is not always the same. There is evidence of a regular irregularity to the extent of twenty-five days. The present apparition is anything but favourable, owing to the proximity of the star to the sun.

According to the meteoritic hypothesis, the general light changes in such a variable as Mira are produced by the revolution of a subsidiary swarm of meteorites round a larger central one, the maximum luminosity occurring at periastron, when the collisions are most numerous. A perfectly constant period, however, can only occur in the case where the central swarm has a regular figure and density. In swarms such as we see in the spiral nebulae, taking rotation into account, it is evident that the secondary swarm might reach periastron under very different conditions in successive revolutions, and the maximum luminosity might either precede or follow the periastron passage.

HALLEY'S COMET.—Prof. Glasenapp announces that the computing bureau established by the Russian Astronomical Society has undertaken the calculation of the true path of Halley's Comet with a view to predicting the exact date of the next return. He hopes that astronomers acquainted with unpublished observations of the comet will communicate the information to the Society.

IODINE AS A BASE FORMING ELEMENT.

AN important memoir is contributed to the current issue of the *Berichte* of the German Chemical Society, by Prof. Victor Meyer and Dr. Hartmann. A new substance of a somewhat surprising nature, the first member in all probability of an extensive series, has been prepared by them in the Heidelberg laboratory. We have been so impressed with the strongly-marked negative or acid-forming character usually exhibited by the halogen elements, that it is more or less astonishing to learn that a compound has been obtained containing iodine as the central, predominating, or grouping element, which not only contains that element acting in a tri-valent capacity exactly like nitrogen in ammonia, but which is a powerful base, combining with acids to form well-defined salts with elimination of water precisely as when a caustic alkali is neutralised by an acid. This remarkable new iodine compound is derived from an

as yet unisolated base $\text{I} \begin{smallmatrix} \text{H} \\ \diagup \\ \text{H} \\ \diagdown \\ \text{OH} \end{smallmatrix}$, similarly constituted to hydroxyl-

amine $\text{N} \begin{smallmatrix} \text{H} \\ \diagup \\ \text{H} \\ \diagdown \\ \text{OH} \end{smallmatrix}$. The substance itself is represented by the

formula $\text{I} \begin{smallmatrix} \text{C}_6\text{H}_5 \\ \diagup \\ \text{C}_6\text{H}_4\text{I} \\ \diagdown \\ \text{OH} \end{smallmatrix}$, and just before transmitting the manuscript for

publication, the information was appended that the pure di-

phenyl derivative $\text{I} \begin{smallmatrix} \text{C}_6\text{H}_5 \\ \diagup \\ \text{C}_6\text{H}_5 \\ \diagdown \\ \text{OH} \end{smallmatrix}$ had likewise been isolated, but fur-

ther particulars of it were reserved for a subsequent communication.

Prof. Meyer was led to suspect the possibility of the existence of such a compound from the fact that the oxy-iodine derivative of benzoic acid, the so-called iodoso-benzoic acid,

exhibits a very much feebler acid character than ordinary iodoso-benzoic acid, $\text{C}_6\text{H}_4\text{I} \cdot \text{COOH}$, and partakes indeed more of the character of a phenol, indicating that the group $\text{I} : \text{O}$ is endowed with basic instead of acid properties. This supposition, moreover, is confirmed by the remarkable observation of Willgerodt, who has shown that the analogous derivative of the hydrocarbon benzene itself, iodoso-benzene $\text{C}_6\text{H}_5 \cdot \text{IO}$, forms a series of well-defined salts with acids. Hence it would appear that the as yet unisolated compound $\text{H} \cdot \text{I} : \text{O}$ cannot be called hypo-iodous acid, for it is apparently a basic substance, and not an acid at all. An attempt was therefore made to saponify iodosobenzene by boiling it with dilute sulphuric acid, in order to convert it, if possible, into phenol and the sulphate of the supposed base. Dilute sulphuric acid readily dissolves iodosobenzene with formation of a sulphate, as shown by Willgerodt, but on mere boiling it still exhibits the reactions of iodosobenzene. Upon evaporation of the solution, and warming for several hours over the water-bath, however, it loses its capability of liberating iodine from potassium iodide, and a sulphate of a basic substance is indeed found to have been produced. As a method of preparation, however, the following is a much more convenient process:—

The iodosobenzene is placed directly in the calculated quantity of strongly cooled concentrated sulphuric acid. The solution becomes coloured brown, and contains no trace of the original iodosobenzene, as evidenced by its inability to liberate iodine; it consists almost entirely of the sulphate of the new base. The liquid is diluted by adding pieces of ice to prevent loss by rise of temperature, and the solution is most advantageously used to prepare the insoluble halogen salts, which much resemble those of silver, lead, and thallium, by adding a solution of potassium or sodium chloride, bromide, or iodide.

The free base is best obtained from the precipitated iodide by agitation with moist silver oxide. It may also be obtained directly from the sulphate by addition of baryta water; the solution thus obtained, however, is much more dilute. The aqueous solution of the base reacts very strongly alkaline. It cannot be readily obtained in the anhydrous condition, as it concentrates to a thick gum. Analyses of the iodide indicate that the empirical formula of the salt is $\text{C}_4\text{H}_3\text{I}$. Upon dry distillation the iodide decomposes completely to mono- and di-iodobenzene; hence its molecular formula must be three times the empirical, or $\text{C}_{12}\text{H}_9\text{I}_3$.

The formula of the base itself must consequently be

The reaction for its formation from iodosobenzene may be most simply stated thus:—

It may also be expressed so as to account for the action of the sulphuric acid as follows, starting with the sulphate of iodosobenzene:—

The chloride, $C_{12}H_9I_2Cl$, is a white curdy precipitate much resembling silver chloride. It crystallises from warm acetic acid, but the crystals are most readily obtained by mixing the aqueous solution of the free base with cold acetyl chloride, and boiling the resulting precipitate in the liquid for a short time; the clear solution deposits white rosettes of needles on cooling. The crystals melt at $200^\circ-201^\circ$, decomposing into chlorbenzenes like the iodide.

The bromide, $C_{12}H_9I_2Br$, is a pale yellow precipitate similar to silver bromide; it melts at $167^\circ-168^\circ$ with similar decomposition. The melting point of the iodide is 144° .

The nitrate was obtained from the sulphuric acid solution by the addition of nitric acid, in the form of a white semi-solid precipitate, which changes into a mass of crystals upon agitation with ether. It dissolves in hot water.

The sulphate is readily soluble in water, as is evident from the mode of preparation; it dries to a solid, which has not yet been crystallised.

Concerning the second member of the series, $I \begin{array}{c} C_6H_5 \\ | \\ C_6H_5 \\ | \\ OH \end{array}$, it is

stated that it has been obtained from its iodide by the action of moist silver oxide, and that it is likewise a strongly alkaline substance readily soluble in water. The iodide, a polymer of iodobenzene, passes completely into the latter substance upon dry distillation.

Further details of these interesting compounds, which must of necessity considerably modify our conception of the nature of iodine, are promised for the next number of the *Berichte*.

A. E. TUTTON.

PRINCE HENRY THE NAVIGATOR.

THE Royal Geographical Society held a special meeting on March 5, to celebrate the five-hundredth anniversary of the birth of Prince Henry the Navigator, the real initiator of modern maritime exploration. H.R.H. the Duke of York and the Portuguese Minister were present amongst the large audience, and appropriate addresses, illustrated by reproductions of early charts and historical portraits, were given by Mr. Clements R. Markham, F.R.S., President of the Society, Sir George Taubman-Goldie, Captain Wharton, F.R.S., Hydrographer, Mr. Beazley, Mr. H. Yule Oldham, Lecturer on Geography at Cambridge, and the Portuguese Minister. The anniversary was celebrated on a large scale with considerable pomp at Oporto, the ceremonies occupying three days.

If the formal celebration of the lives of the initiators of great movements in history and in science is a privilege of which their successors do well to avail themselves, the ceremonies observed at Oporto and in London, on March 4 and 5, were grateful acts. Prince Henry, distinguished from all his namesakes by his inseparable surname "the Navigator," was born on March 4, 1394, the son of King John I. of Portugal, and of Philippa, daughter of the Duke of Lancaster. From his early years he showed himself exceptionally studious, and when taking part in the siege of Ceuta, in 1415, he undoubtedly learned much of the interior trade of Africa, which supplemented the knowledge derived from the Arab geographers. But it is probable that the main incentive in his life-long effort to promote naviga-

tion and maritime discovery was the prospect of achieving the sea-route to India, and of making his country the first mercantile power in Europe. At the age of twenty-four he had definitely made up his mind on the subject of his life-work, and chose as his residence Sagres, at the extreme south-western corner of the Iberian peninsula facing the unknown ocean. The Prince made himself a master of the mathematics and astronomy of the day, and strove to induce mariners to follow his example and make use of the astrolabe in navigation. Observations at sea with an instrument so crude were necessarily very unsatisfactory, and, like their predecessors, the sailors of that day kept prudently within sight of land. Aided by the funds of the Order of Christ, Prince Henry fitted out expedition after expedition to trace out the African coast to the southward past Cape Nun. Inducements to trade were held out to adventurous merchant seamen of all nations, but these were insufficient as long as the explorers ventured no further than Cape Bojador. In 1434 Gil Eannes rounded that Cape, but the barren coast of the Sahara still met his eyes. In 1443 Antonio Goncalves crossed the Tropic of Cancer, reached and passed Cape Blanco, and brought home gold and slaves. From this time advance was more rapid, the inducements of commerce brought more volunteers to the work, and in three years the fertile coasts beyond Cape Verde were reached, and before the death of the Prince, in 1460, his efforts were rewarded by the rolling back of the cloud of absolute ignorance from over 1500 miles of hitherto unknown coast. The enterprise thus inaugurated went on with increasing success until Diaz rounded the Cape of Good Hope in 1486, and Vasco da Gama fulfilled the life's ambition of Prince Henry by reaching India in 1497, and raising Portugal to the height of its short-lived fame.

Prince Henry emphatically lived for his work, pursuing it without intermission in spite of the vast weight of prejudice and indifference against which he had to fight, and the result of that work is his best monument. He, if any one man, was the first to stir into strength the movement toward maritime exploration, which not only revealed the true form and extent of the most ancient continent, but in direct succession led to the discovery by Cabral of the new world, a discovery in no way brought about by the earlier voyages of Columbus, although these in a sense were the outcome of the same original impulse. It is through Ca da Mosto, a Venetian sailor engaged in African discovery for the Prince, that the best account of him as a man, and of his methods as a patron of exploration, are handed down. In his words—"He was the noblest Prince of his age, a man whose smallest virtue would suffice to immortalise him."

SCIENCE IN THE MAGAZINES.

SCIENCE makes a good show in the March magazines. Sir Robert Ball, F.R.S., contributes to the *Fortnightly* an article on "The Significance of Carbon in the Universe." The object of the article is to call attention to an investigation carried out by Dr. G. Johnstone Stoney, F.R.S., nearly thirty years ago, but the significance of which has not been widely recognised. From the tenor of the article we presume that the author refers to Dr. Stoney's paper "On the Physical Constitution of the Sun and Stars," read before the Royal Society in 1867. The paper is well known to workers in astronomical physics, though Sir Robert laments that some eminent physicists whom he questioned were unaware of its existence. Dr. Stoney gave evidence to show that the photospheric clouds on the sun were composed of carbon. In his words—"We have strong reasons for suspecting that the luminous clouds consist, like nearly all the sources of artificial light, of minutely divided carbon; and that the clouds themselves lie at a very short distance above the situation in which the heat is so fierce that carbon, in spite of its want of volatility, and of the enormous pressure to which it is there subjected, boils." (*Roy. Soc. Proc.* vol. xvi. p. 29, 1867-8.) Sir Robert Ball has taken the result contained in this conclusion, and expanded it into a lucid article containing much that is interesting. Dr. J. W. Gregory describes his adventurous journey to Mount Kenya. It is impossible not to admire the indomitable spirit he displayed throughout the whole expedition. He went to Africa to obtain information upon certain points, and though he found himself stranded at Mombasa before anything had been done, he got together a party of forty Zanzibaris, marched into the interior, accomplished his task, and returned to the