structed that the reaction within the tube can be observed, in order to be able to attain any desired temperature. When the ferric oxide is heated to about 600° in the stream of ammonium chloride vapour small glittering crystals commence to form after the expiration of a few minutes, the remainder of the oxide increases considerably in volume, and ammonium-chloride is rapidly absorbed. No fusion occurs, so that the absorption is a mechanical one; the ammonium chloride condenses upon the exterior of the particles, eventually converting the powder into a white mass. Upon subsequent microscopic examination of this white product large numbers of the small brilliant crystals of hæmatite are observed interspersed among the whitened particles. When the experiment is performed at 700°, the whole of the ferric oxide is converted into miniature crystals of hæmatite; it is probable that the ammonium chloride is totally dissociated at this temperature. The crystals exhibit all the peculiar crystallographic properties of hæmatite. The fundamental rhombohedron possesses the characteristic angle of 86°, and the subsidiary forms developed, including those of the scalenohedron, are precisely those exhibited by the natural mineral and are developed to about the same extent. This mode of synthesising hæmatite is very probably intimately connected with that described by M. Sainte Claire Deville in 1861. The latter method consisted in heating ferric oxide to redness in an indifferent atmosphere into which traces of hydrochloric acid gas were admitted. As the ammonium chloride in the experiment at 700° was most probably completely dissociated into hydrochloric acid and ammonia, it is extremely likely that the crystallising action was due to the free hydrochloric acid. The synthesis of hæmatite by means of partially or totally dissociated ammonium chloride vapour is interesting, however, as throwing light upon the mode of formation in nature, for the vapours evolved by the fumaroles in volcanic districts always contain a certain proportion of sal-ammoniac, and it is usually observed that the fissures through which these vapours pass are more or less covered with crystals of specular iron and hæmatite. There is every probability, therefore, that the formation of the crystals is due to the partially dissociated sal-ammoniac, just as in the artificial experiments above described.

THE additions to the Zoological Society's Gardens during the past week include a Moustache Monkey (*Cercopithecus cephus*) from West Africa, presented by Mr. Clayton Pickersgill; a Leopard (*Felis pardus*) from East Africa, presented by Mrs. J. R. W. Pigott; a Lioness (*Felis leo*) from East Africa, presented by Major Owen; two Tiger Cubs (*Felis tigris*) from Pehang, Malay Peninsula, presented by Lieut.-Colonel Sir Charles B. H. Mitchell, K.C.M.G.; a Common Jackal (*Canis aureus*) from India, presented by Mr. Gerard Gurney; a Monk Seal (*Monachus albiventer*) from Madeira, presented by Mr. C. F. R. Blandy; a Cockateel (*Calopsitta novæ-hollandiæ*) from Australia, presented by Miss Sloane Stanley; six South African Francolins (*Francolinus afer*), a Puff Adder (*Vipera arietans*) from South Africa, presented by Mr. J. E. Matcham; a Smooth Snake (*Coronella lævis*) from Hampshire, presented by Mr. Willingham F. Rawnsley; a Long-eared Fox (*Otocyon megalotis*) from Somaliland, a Geoffroy's Terrapin (*Platemys geoffroyana*) from the Argentine Republic, a Ceylonese Terrapin (*Clemmys trijuga*) from Ceylon, an Ocellated Monitor (*Varanus ocellatus*) from Lake Tanganyika, two Black and White Snakes (*Pituophis melanoleucus*) from New Jersey, U.S.A., a Black-winged Peafowl (*Pavo nigripennis*) from Cochin China, deposited; a Muscat Gazelle (*Gazella muscatensis*) from Muscat, received in exchange; two Collared Fruit Bats (*Cynonycteris collaris*), four Mandarin Ducks (*Æx galericulata*), six Australian Wild Ducks (*Anas superciliosa*), two Slender Ducks (*Anas gibberifrons*), a Magellanic Goose (*Bernicla magellanica*), a Black-headed Gull (*Larus ridibundus*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE RESULTS OF IMPRUDENT SOLAR OBSERVATIONS.—Dr. George Mackay, of the Royal Infirmary, Edinburgh, has sent us a pamphlet "On Blinding of the Retina by Direct Sunlight" (J. and A. Churchill), being a study in prognosis, based chiefly upon accidents incurred during the observation of partial solar eclipses. Tyros in observations of the sun, and also many incautious astronomers, have sustained more or less permanent injury to the sight by looking at it or its image without the interposition of a dark glass, or similar absorber, of sufficient thickness. During the progress of partial solar eclipses, the laity often make incautious observations, and the results of gratifying such curiosity have furnished Dr. Mackay with the chief part of the clinical material for his study. The paper, which originally appeared in the *Ophthalmic Review*, opens with a historical survey of the few cases of ocular injury from exposure to sunlight, recorded in historical literature. There is a tradition that Galileo seriously impaired the sight of his right eye by his solar observations, but Dr. Mackay has not been able to trace the story to its origin. It is well known that, in his later years, Galileo became quite blind, but the loss of sight was apparently caused by an affection of the cornea, and not by injury to the retina. The earliest precise description of the subjective sensations consequent upon focussing solar rays upon the retina is due to Reid, a Professor of Moral Philosophy in the University of Glasgow. He observed the transit of Venus in May 1761, without taking any precautions to modify the intensity of sunlight, and the result was that he was afflicted with metamorphosia; that is, objects appeared to him in distorted forms. Very few other cases of similar ocular injury have been described. Fortunately for Dr. Mackay, the partial eclipse of the sun in June 1890, and that of June 1891, both visible at Edinburgh, furnished him with seven new cases of "Eclipse Blinding," all of which he examined with great care, both with the ophthalmoscope and with type and colour-tests. The patients suffered from an impairment of visual acuteness, and, to most of them, dark spots appeared in their fields of vision. Sometimes these spots were fixed, and in other cases they oscillated rapidly. Dr. Mackay says that complete recovery from the injury, even in cases of only slight failure for test-type, is exceptional if investigated by sufficiently refined methods. It is pointed out that the treatment ought to be preventive: smoked and coloured glasses of the feeble shades ordinarily used by the public to view solar phenomena are quite insufficient. Experience shows that, to view the sun with impunity, even in January, it is necessary to use a glass so dark that no object illuminated by diffuse daylight is visible through it.

A NOVEL METHOD OF SOLAR OBSERVATION.—Dr. Deslandres made an important communication to the Paris Academy of Sciences on July 9. In December 1893, he suggested that separate photographs of the sun should be taken by means of the light of individual dark and bright lines in the solar spectrum. The success with which Prof. Hale has done this with the light of the K line shows that striking results may be expected from the development of the method. An ordinary photograph of the sun is mainly produced by the action, upon the sensitive plate, of the bright intervals between dark lines. Dr. Janssen's marvellous pictures of the sun are produced by using only light of high actinic power, and covering but a small region of the spectrum, to act upon his photographic plate. By carrying this principle still further, there can be no doubt that solar physics will be considerably advanced. The dark lines in the solar spectrum are only dark by contrast. Both Prof. Hale and Dr. Deslandres have shown that sun pictures can be produced by the light from them alone. Hence, by isolating a line due to any element, and using it to act upon a sensitive plate, a photograph is obtained of the layer of the sun in which that particular element predominates. Dr. Deslandres exhibited to the Paris Academy some of the photographs obtained in this way. His first results were produced by means of the light from the bright interval between two dark lines. The pictures thus obtained showed the photosphere with spots and faculæ much the same as

Janssen's photographs. One point confirmed by the pictures is that the difference between the brightness of the solar disc and that of the spots and faculæ is more marked the greater the refrangibility of the light employed. The bright lines due to the vapour of calcium, gave a different set of results. Such reversed lines do not represent incandescent solid or liquid, as in the preceding case, but are emitted by gaseous calcium at a higher level. Their light therefore imprints the image of the chromosphere upon the photographic plate. Dr. Deslandres' photographs of this kind agree with those previously mentioned as regards disposition and general forms of faculæ, but they differ in the fact that they show faculæ near the centre of the disc as clearly as faculæ near the edge, and also by greatly extending the areas of these bright patches. Using the light from a portion of the dark and wide calcium line, and exposing the photographic plate a little longer than when the bright reversal in the middle of the line was employed, a curious and altogether different result was obtained. The same faculæ appear upon the photograph, but they are not so clearly marked, and are of less extent. On the other hand, spots are shown very distinctly, with their penumbræ sharply defined. Dr. Deslandres has obtained similar photographs by using absorption lines of iron, aluminium, and carbon, which are wide enough to permit them to be isolated by means of his spectrograph. The results of further work in this direction will be awaited with interest.

THE ROYAL BOTANIC GARDEN, CALCUTTA.[1]

THE ponderous and important *Annals of the Royal Botanic Garden, Calcutta*, are known to all students of Indian flora. We have from time to time referred in terms of praise to these solid monuments of Dr. King's industry, and to the skill of the native lithographers and printers. The fourth volume of the *Annals* is before us, and is of equal excellence to the preceding ones. It is concerned with "The Anonaceæ of British India," a family of about six hundred species of woody plants. Although Dr. King, in an admirable introduction, gives an outline of the arrangement of the whole family, the present monograph only contains "a detailed account of those species which are indigneous to British India proper, to that part of the Malayan Peninsula which is under British protection, to the Islands of Singapore, Pangkore and Penang, and to the Nicobar and Andaman groups. This is the geographic area covered in the latter volumes of Sir Joseph Hooker's *Flora of British India*; and it may in the broad sense be considered for botanical (though not for political) purposes as *British* India, as distinguished from *Dutch* or *Netherlands* India, which consists of the Malayan Archipelago. The majority of the species indigenous to the British Indian area have already been dealt with by Sir Joseph Hooker and the late Dr. T. Thomson in that splendid fragment their *Flora Indica* (published in 1855), and still more recently by Sir Joseph Hooker in the first volume of his *Flora of British India*. It is with no idea of improving upon the work of these distinguished authors that I have re-described the same species in the following pages, but chiefly in order that the species which have been discovered since the order was dealt with by them may be described, and that the relations of the new to the older species may be understood." Dr. King points out that the Malayan Peninsula remains even now but partially explored, and that its complete examination must bring to many new *Anonaceæ*. But as there was an opportunity of printing a fully illustrated account of the family at the present time, and as there is no knowing when the mountain range which forms the backbone of the Peninsula may be explored, it was decided to publish the monograph, and risk the charge of having done so prematurely.

The great importance of such a work as that under notice can only be adequately judged by botanical experts. Altogether there are 220 lithographic plates, a figure of each species being given. These are accompanied by 169 pages of text, in addition to an index and the useful introduction, to which reference has been made. For the immense labour involved in the publication of such a volume, Dr. King deserves the thanks of all systematic botanists, and the Government of Bengal has done a great service to science by enabling the work to be published.

The hundredth anniversary of the death of Colonel Kyd, the founder and first superintendent of the Royal Botanic Garden at Calcutta, occurred last year, and Dr. King has taken advantage of the occasion by putting on record as much as can be traced of the early history of the Garden, and the career of its founder. The volume is dedicated to Colonel Kyd (of whom a portrait is also given), and prefaced with an interesting account, from which we have taken the following extracts:—

"Robert Kyd belonged to an old Forfarshire family, several members of which had preceded him in the service of the Honourable East India Company. He was born in 1746. At the age of eighteen he became a cadet of the Bengal Engineers, and on October 27, 1764, he received his commission as Ensign in that corps. His promotion to the rank of Lieutenant followed in the year after. Two and a half years later he became Captain, getting his majority on May 29, 1780, and his Lieutenant-Colonelcy on December 7, 1782. He died at Calcutta on May 26, 1793. From the fragmentary evidence which is still extant it appears that Colonel Kyd was a man of wide and varied sympathies and experience, and that, during the later years of his service he attained a position of so much influence that his suggestions on various weighty matters were not only listened to but promptly acted upon. Himself a keen gardener, he had brought together, round his country house at Shalimar, a collection of various plants of economic and horticultural interest which had been sent to him, partly by correspondents in the interior of the country, but which had chiefly been brought to him by Captains of the Company's ships returning from their voyages to the Straits and to the Malayan Archipelago. Colonel Kyd conceived the idea of supplying the Company's Navy with teak timber grown near the ports where it could be used in ship-building, and of increasing their commercial resources by introducing into India the cultivation of the spices which, in those days, formed so important an item in their trade, but for supplies of which they had to depend on their factories in Sumatra and Penang. He communicated this idea to the Governor-General of the day; and, in a letter written on June 1, 1786, he officially submitted a scheme for the establishment of a Botanical Garden, or Garden of Acclimatisation, near Calcutta. This scheme also included proposals for introducing, into territories subject to the Company, the cultivation of cotton, tobacco, coffee, tea, and various other commercial products. To have suggested to the local representatives of what was then practically a trading Company, the provision (at a considerable annual cost) of facilities for the pursuit of pure, as distinguished from economic, botany would probably not have increased the chances of the acceptance of the Garden scheme. The scientific aspect of the matter was therefore, with commendable sagacity, excluded from mention in the original proposal. So much, in fact, were the local Government impressed with the advantages of Colonel Kyd's proposed scheme that, without waiting for a reply to this letter from the Board, they secured land for the Garden 'in anticipation of sanction'; and, in a letter dated July 27, 1787, they reported this action to the Directors. This second letter, however, must have crossed a dispatch, dated London, July 31, 1787, in which the Board not only conveyed their sanction to the formation of the Garden suggested by Colonel Kyd, but warmly approved his action in bringing the proposal to their notice.

"Colonel Kyd's country house and garden stood near the village of Sibpur, on a promontory round which the Hooghly bends in passing the site of the present Fort William (at that time only recently completed), and which was known then (as it is now) as Shalimar. And it was land in the vicinity of Shalimar, and separated from his own private garden only by a ditch, which Colonel Kyd selected for the proposed Botanic Garden. The piece of land thus selected measures more than three hundred acres in extent, and is of rather irregular shape. It consists of a rather narrow strip running along the right bank of the Hooghly for about a mile and a half, but expanding towards its lower extremity into a large square block.

"Colonel Kyd, whose office at this time was that of Military Secretary to Government, was appointed Honorary Superintendent of the Garden, a post which he retained until his death. He never lived within the Garden. In fact, there was no dwelling-house within its limits until his successor, Dr. Roxburgh, built the present Superintendent's house in 1795.

[1] *Annals of the Royal Botanic Garden, Calcutta*, vol. iv. The Anonaceæ of British India. By Dr. George King, F.R.S., &c., Superintendent of the Garden, Calcutta. (Printed at the Bengal Secretariat Press, 1893.)