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 redescribed 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.)

Colonel Kyd probably, as was the fashion of the day, had a town house in Calcutta. But he appears to have passed a good deal of his time at Shalimar; and in his will he directed that he should be buried in his garden there. The part of the Botanic Garden nearest to Colonel Kyd's house was devoted to the planting of teak trees, in accordance with the Company's earnest desire to supply themselves with timber for ship-building. The experience of thirty-four years having shown that good teak timber cannot be successfully raised on the muddy soil of the Gangetic delta, this part of the garden (extending to about forty acres) was in the year 1820 given up by Government to the Lord Bishop of Calcutta (Dr. Middleton) as the site for a Christian college. The Garden was thus reduced to its present area of 270 acres."

SCIENTIFIC SERIALS.

Bulletin of the New York Mathematical Society, vol. iii. No. 9, June 1894. (New York: Macmillan.)—Prof. E. W. Brown, under the heading "The Lunar Theory" (pp. 207-215). gives an admirable abstract of vol. iii. of Tisserand's "Théorie de Mécanique Céleste, Perturbations des Planètes d'après la Méthode de Hansen; Théorie de la Lune." Herein he opens with the remark: "It is somewhat strange that a subject like the lunar theory, which has received so much attention since its first principles were given by Newton, should be allowed to pass its second centenary before the appearance of a treatise like the present one." His opinion is that, notwithstanding a few defects, the book will take a high rank amongst the many classic treatises on celestial mechanics.—Students of the Theory of Numbers have recently been gratified by the publication (1892) of Bachmann's "Die Elemente der Zahlentheorie." An analysis of its contents, with a brief consideration of the parts which call for special remark, is given by Dr. J. W. A. Young (pp. 215-222).—Prof. Conant (pp. 223-224) calls attention to a work which occupies a unique place among translations, viz. "Memoirs on Infinite Series." These are classic memoirs by Lejeune-Dirichlet (2), Abel, Gauss, and Kummer. The book is brought out, under the auspices of the Tokio Mathematical and Physical Society, by Japanese professors.

IN the numbers of the *Journal of Botany* for June and July, Mr. A. B. Rendle describes new species of Asclepiadeæ and Convolvulaceæ from Tropical Africa, including a new genus of the former order *Odontostelma*, which is also figured.—A new British *Rubus*, *R. Rogersii*, n. sp., is described by Mr. E. F. Linton.—Mr. F. J. Hanbury contributes "A Tentative List of British *Hieracia*," numbering upwards of 100 species.

IN Nos. 5-7 of the *Bullettino della Societa Botanica Italiana* are two papers on fungus diseases of cultivated trees, by Sig. P. Baccarini. The "petecchia" or "vaiolo" (pock) of the orange has been ascribed to various causes. It is always accompanied by a number of fungi, but these are apparently saprophytic, and not pathogenic. The true cause appears to be a bacillus. The "mal nero" of the vine is also attributed to a microbe, *Bacillus vitivorus*, n. sp.—Sig. S. Sommier has two papers on the little-known flora of the Island of Giglio, near to Elba.—Sig. A. Jatta completes his paper on the lichens of Italy, of which he enumerates 1407 species.

THE number of the *Nuovo Giornale Botanico Italiano* for July is occupied by three papers:—"On the Roman Flora," by Sig. A. Terracciano; "On the Flora of Sicily," by Sig. L. Nicotra; and "On the Disease of the Strawberry caused by *Sphærella Fragariæ*," by Sigg. E. Baroni and G. Del Guergio.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 24.—"On the Influence of certain Natural Agents on the Virulence of the Tubercle-Bacillus." By Dr. Arthur Ransome, F.R.S., and Sheridan Delépine.

June 7.—"The Influence of Intra-Venous Injection of Sugar on the Gases of the Blood." By Dr. Vaughan Harley.

In a previous paper (*Roy. Soc. Proc.* 1893), he showed that the intra-venous injection of grape sugar caused an increase in the lactic acid in the circulation. It appeared probable that the lactic acid had combined with the bases of the carbonates in the blood, having driven out the carbonic acid.

Experiments were made on dogs to see what changes were produced in the gases of the blood after intra-venous injections of sugar.

It was found the quantity of carbonic acid was diminished, it being most markedly so during the first hour after the sugar injection, and still somewhat so three to five hours later. These results support the view that the lactic acid drives the carbonic acid from the sodium salts and replaces it.

In the next place, the changes met with in the quantity of oxygen in the blood were investigated. It was found the oxygen was markedly diminished during the first hour after the sugar injection. During the third and fifth hours the quantity in arterial was that usually found in venous blood. The explanation of this cannot up to the present be explained.

June 21.—"Researches on Explosives. Preliminary Note." By Captain Sir A. Noble, K.C.B., F.R.S.

The researches on which I, in conjunction with Sir F. Abel, have been engaged for very many years, have had their scope so altered and extended by the rapid advances which have been made in the science of explosives, that we have been unable to lay before the Society the results of the many hundreds of experiments under varied conditions which I have carried out. We are desirous also of clearing up some difficulties which have presented themselves with certain modern explosives when dealing with high densities and pressures, but the necessary investigations have occupied so much time that I am induced to lay a few of our results before the Society, trusting, however, that before long we may be able to submit a more complete memoir.

A portion of our researches includes investigations into the transformation and ballistic properties of powders varying greatly in composition, but of which potassium nitrate is the chief constituent. In this preliminary note I propose to refer to powders of this description chiefly for purposes of comparison, and shall devote my attention principally to gun-cotton and to those modern explosives of which gun-cotton forms a principal ingredient.

In determining the transformation experienced during explosion, the same arrangements for firing the explosive and collecting the gases was followed as are described in our earlier researches,[1] and the gases themselves were, after being sealed, analysed either under the personal superintendence of Sir. F. Abel, or of Prof. Dewar, and to Prof. Dewar's advice and assistance I am indebted, I can hardly say to what extent.

The heat developed by explosion, and the quantity of permanent gases generated were also determined as described in our researches, but the amount of water formed plays so important a part in the transformation that special means were adopted in order to obtain this product with exactness.

Numerous experiments were made to ascertain the relation of the tension of the various explosives employed, to the gravimetric density of the charge when fired in a close vessel, but I do not propose here to pursue this part of our inquiry, both because the subject is too large to be treated of in a preliminary note and because approximate values have already been published[2] for several of the explosives with which we have experimented.

With certain explosives, the possibility or probability of detonation was very carefully investigated. In some cases the explosive was merely placed in the explosion vessel in close proximity to a charge of mercuric fulminate by which it was fired, but I found that the most satisfactory method of experiment was to place the charge to be experimented with in a small shell packed as tightly as possible, the shell then being placed in a large explosion vessel and fired by means of mercuric fulminate. The tension in the small shell at the moment of fracture and the tension in the large explosion vessel were in each experiment carefully measured.

It may be desirable here to explain that I do not consider the presence of a high pressure with any explosive as necessarily denoting detonation. With both cordite and gun-cotton I have developed enormous pressures, close upon 100 tons per square inch (about 15,000 atmospheres), but the former explosive I have not succeeded in detonating, while gun-cotton can be detonated with the utmost ease. It is obvious that if we suppose a small charge fired in a vessel impervious to heat, the rapidity

[1] *Phil. Trans.* vol. clxv. p. 61.
[2] Noble, "Internal Ballistics," 1892, p. 33; *Roy Soc. Proc.* vol. lii. p. 128.