mmediately reduced. The great increase in the actual weight of the crop treated with nitrogenous manures, however, completely overrides percentages, and hence the table showing the effect of nitrogenous manures records a great increase of sugar, corresponding with the application of nitrogenous fertilizers. Dr. Gilbert says: "I cannot discuss the physiological explanations of the fact that nitrogenous manures have such a marked effect on the production of the non-nitrogenous substance—sugar."

It would also be an interesting physiological question why the percentage of sugar is highest when no nitrogenous manure is applied, and also why nitrogen, even in the form of farm-yard manure, appears to at once lower the proportion of sugar in mangel. Also, why further additions of nitrogen still further lower the percentage of sugar. The percentages stand as follows:—

Sugar, per cent. (in mangel-wurzel).

No manure	11·4 per cent.
Superphosphate...	10·4 ,,
Farm-yard manure	8·6 ,,
Farm-yard manure and sodium nitrate	7·1 ,,

The actual quantities of sugar per acre stand as follows, in pounds:—

No manure	950 pounds per acre.
Superphosphate	1028 ,, ,,
Farm-yard manure	2513 ,, ,,
Farm-yard manure and sodium nitrate...	3109 ,, ,,

Judged by *percentages* we have a descending series, but judged by actual quantities an ascending series of figures. It is somewhat difficult in the face of the diminishing percentages of sugar caused by the application of nitrogenous manures, to see how the functional powers of the plant to make sugar have been heightened or intensified. Still, Dr. Gilbert says: "A direct connection between the supply of nitrogen to the plant and the formation of non-nitrogenous substances is obvious." Might it not be as truly said, "A direct connection between the weight of the crop and the weight of non-nitrogenous substances contained in the crop is obvious"?

We have received a copy of memoranda of the origin, plan, and results of the Rothamsted field and other experiments, which gives an excellent idea as to the work carried on by Sir John Lawes on his Hertfordshire property. Sir John began to experiment on growing crops in 1837, but fixes the actual commencement of the Rothamsted Station in 1843, when he associated Dr. Gilbert with himself in carrying out a magnificent series of agricultural experiments. A large staff of chemists and assistants are employed entirely at Sir John's own cost, and he has provided for the continuance of the work after his death by setting apart £100,000 for the purpose as well as sufficient land for carrying out his intentions. It is pleasant to find Sir John Lawes and his indefatigable coadjutor Dr. J. H. Gilbert still young in mind and constitution, and able to throw all their old ardour into their work.

FLETCHER'S COMPRESSED OXYGEN FURNACE.

THE use of oxygen with coal-gas in a laboratory furnace has up to the present been attended with serious difficulties, owing to the intensely local nature of the heat obtained, and the consequent perforation and destruction of crucibles and other vessels.

In this furnace, diffusion of the heat is secured by using a fine jet of Brin's compressed oxygen directed centrally into one end of a tube a quarter of an inch in bore, open at both ends, the oxygen jet acting as an injector, and drawing with it from four to eight times its bulk of air, the proportion depending on the size of the oxygen jet. This tube, containing the mixture of oxygen and air, is used as the central part of an ordinary blow-pipe of heavy cast-iron, which is placed close up against the burner-opening of one of Fletcher's ordinary injector furnaces, lined with a specially refractory material.

The power of the furnace depends entirely on the quantity of oxygen and gas supplied, and can be adjusted to any power from a dull red, which can be maintained for many hours steadily, without attention, to a heat which will "drop" the most refractory crucible in less than five minutes from the time the gas is lighted.

When working at moderate temperatures, the furnace is sufficiently quiet to admit of its use on a lecture-table, but at its highest power the noise is considerable.

There is no difficulty in adapting the burner to other forms of furnace, provided it is found possible to produce satisfactory casings to withstand the heat; those made for the crucible furnace stand, as a rule, exceedingly well, but with alterations in form great difficulties are introduced, more especially with muffles, which, as at present made, will not stand any sudden

heat, nor will they hold their shape at any temperature approaching whiteness. The burner alone will be useful in heating many substances in the open, but, owing to the broad and diffused flame, it is of little practical value for blow-pipe work.

The special advantages of the apparatus are that it is entirely self-acting, requires no attendance, and that it greatly increases the range of temperatures which can be obtained by any simple apparatus. The largest size at present made takes crucibles not exceeding 3 inches high.

FOREST CONSERVANCY IN CEYLON.

COLONEL CLARKE, the Acting-Conservator of Forests in Ceylon, in his Report for last year says that since attention was called in 1873 to the gradual destruction of forests in Ceylon efforts have been made to check the evil. At first the expense was the great obstacle. The Government did not see its way to expend the large sums that would be necessary before the forests could be regarded as self-supporting. However, in 1885, "The Forest Ordinance" was passed, under which certain areas of forest lands were acquired by the State and made State forests, the owners of those areas or persons having any interest in them being compensated for the loss of their rights. These tracts were to be clearly marked out, and, where necessary, replanted and improved. It is yet too soon to say what the effects will be of this systematic treatment, but the Government hopes that a constant supply of good timber will be at hand, and that the climate of the island will be benefited by increased care of the forests. Forests, Colonel Clarke says, make the climate more equable, increase the relative humidity of the air, and perhaps increase the rainfall. Furthermore, the water-supply is regulated by forests, the springs being more regular and sustained, and the rivers more continuous in their flow. Adjacent fields are protected by them and the speed of the wind is reduced. In tropical countries especially, where, during the wet season, the rain falls in torrents, forests are useful in preventing the soil from being washed away into the rivers and bays. Besides, it is confidently expected that a substantial revenue will be derived from the sale of timber, fuel, &c. India, which, relatively speaking, has not more valuable forests than Ceylon, yielded in the year 1883-84 a gross revenue of £1,052,190, representing a clear profit of £403,815. In the past the native forest-keepers connived with gangs of natives who plundered the forests and deprived the island of the revenue that would otherwise have accrued. The evil effect of the destruction of forests that was so very common until quite recently in every quarter of the globe, is apparent

everywhere. Some striking instances were given in 1885 before the Select Committee of the House of Commons on Forestry. For example, what was fifty years ago the great rice-producing district of the west of India, Ratnagiri, has suffered terribly from the denudation of the Western Ghats of the dense forests which extended all over that range of mountains. Again, the native State of Jinjira was all but ruined by the indiscriminate felling of the forests which covered the whole State, which is from fifteen to a hundred miles in breadth, and about forty in length. Similarly, in Ceylon itself, the chena cultivator in the Southern and North-Western Provinces and in the Province of Uva is threatened with ruin.

The recommendations made by Colonel Clarke in 1887, and approved of by Government were the following:—The Government Agent and the Conservator of Forests were annually, subject to the approval of the Government, to agree on what works were to be accomplished in the way of demarcation, conservation, &c., and these were to be carried out by the Provincial Forester under the authority and protection of the Government Agent. In departmental questions, such as those relating to pay, promotion, discipline, and other matters, the Conservator of Forests was to be supreme. The present mode of working is illustrated by the plan of operations for this year, drawn up by Colonel Clarke, and sanctioned by the Government in March last. The plan is drawn up under four heads: (1) demarcation; (2) timber and firewood supply; (3) re-afforestation; (4) extra establishments. With regard to demarcation it was seen that this was urgently needed in the neighbourhood of the large towns, and Government was, therefore, recommended to allow the whole available staff to be placed at this work. The forests in the northern, eastern, and north-central provinces were to be allowed to take care of themselves for a time, as the population was very sparse in those regions. Thus it was proposed to begin at once with the Mitirigala and Kananpella forests, which lie in the vicinity of Colombo and on the banks of the Kelani. The present system, by which contractors cut timber for the Public Works Department, is to be changed, for no sufficient check can be exercised over the contractors and their workmen, and it is intended to establish depots in various centres where it is considered that there will be sufficient demand for timber and firewood. When this is done, not only will the heavier timber be utilized as at present, but also the lighter portions which are now left to rot in the forests. Two great depots are to be established, one on the east coast and one at Colombo. To the latter will be sent all the timber that is intended for export, such as ebony, satinwood, &c., and to the other depot those timbers which are in demand in India, but which would not bear the cost of transit to Colombo. According to the Report ten depots in all will be established this year. An effort will be made to give the forests of Ceylon a trial for railway sleepers. Colonel Clarke says that the local demand should be met, as two trees which are very plentiful in the island are, in his opinion, suitable for that purpose, Palai (*Mimusops Indica*) and Kumbuk (*Terminalia glabra*). Re-afforestation, in Colonel Clarke's opinion, is not a pressing question; demarcation should first be completed. Many of the Ceylon forests, he thinks, are overworked, and require a long period of rest. To carry out the works now absolutely necessary for the protection of the forests, the staff is to be increased by adding forest-rangers and river-guards.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The list of lectures in Physics this term includes Prof. Stokes's on Physical Optics, Prof. Thomson's on the Properties of Matter and on Mathematics for Students of Physics, and Mr. Wilberforce's on Dynamo-electric Machines. Among the numerous chemical lectures we do not note any very novel feature. Prof. Newton will lecture on the Evolution of the Animal Kingdom, and Mr. Gadow on the Morphology of the Ichthyopsida, recent and extinct. In Botany, the Readership has not yet been filled up; Mr. Gardiner is giving a general elementary course, Mr. Potter is lecturing on the Geographical Distribution of Plants, and Mr. Vaizey on the Classification of Plants. In Geology, Mr. Marr lectures on the Principles and on Advanced Stratigraphy, Mr. Harker on Petrology, Mr. Roberts on Advanced Palæontology, and Mr. Seward on Palæobotany. The physiological and anatomical courses are much as usual. There are three (graduated) sets of demonstration classes in Mechanism, and lectures by Prof. Stuart and Mr. Lyon. In Mathematics, Prof. Cayley is lecturing on Elliptic Functions, Prof. Darwin on Orbits and Perturbations of Planets, Mr. Pendlebury on the Theory of Numbers, Mr. Hobson on Fourier's Series and on Conduction of Heat, Mr. Larmor on Electrostatics, Mr. Forsyth on Theory of Functions, Dr. Besant on Analysis, Dr. Glaisher on Elliptic Functions, and Mr. Herman on Hydrodynamics.

At Sidney Sussex College, an examination for Open Scholarships in Natural Science will be held on January 1 next; two are offered, one of £70 and one of £40; subjects—Chemistry, Physics, Biology, and Geology. The Tutor will give further particulars on application.

King's College offers one Exhibition for Natural Science; examination to begin about December 10.

Emmanuel, Jesus, and Christ's Colleges will hold joint examinations for Open Scholarships on December 11 and following days. All candidates must show a competent knowledge of Chemistry. Candidates may also be examined in Physics, in Elementary Biology, and in Geology. The Tutors will give full particulars.

SCIENTIFIC SERIALS.

Bulletin de la Société de Naturalistes de Moscou, 1888, No. 2.—On the development of Amphipods, by Dr. Sophie Pereyaslavtseva.—List of plants of Tambof, by Litvinoff.—On the great comet of 1887, by Th. Bredichin (in French).—Short notes on some Russian species of *Blaps*, by E. Ballion (in German).—On the Mollusks of Caucasia, by O. Retowski. Twenty-nine species from Novorossiisk, and ten from Abhasia are described (in German).—The *Chlorophyceæ* of the neighbourhood of Kharkoff, by D. B. Ryabinin. Until now, this subdivision of Algæ has been rather neglected in Russia, and only 100 species have been described in the neighbourhood of Moscow. M. Ryabinin's list comprises 233 species, belonging to 74 different genera (with notes in French).—Materials for the flora of Moscow, by Prof. Gorojankin (in Russian). The capital work of the late Prof. Kaufmann, "The Flora of Moscow," which was published in 1866, has been revised by M. Petunnikoff, who compared it with the rich materials of the Moscow Botanical Garden, and published a supplementary list. Students of the Moscow University having been directed during the last three years to collect new materials during special excursions, Prof. Gorojankin has availed himself of all their collections, as well as of a dozen other collections, and now publishes a new supplementary list, which contains 102 new species of Phanerogams and two species of Cryptogams.—The spiders and other insects of Sarepta, by A. Becker (in German).—The Dariinsk mineral water in the Government of Moscow, by A. Sabanéeff (in Russian). The spring is rich in iron, and is like that of Lipetsk.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, October 3.—Dr. D. Sharp, President, in the chair.—Mr. F. P. Pascoe exhibited a number of new species of *Longicornia*, from Sumatra, Madagascar, and South Africa.—Dr. P. B. Mason exhibited, for Mr. Harris, a specimen of *Chærocampa Nerii*, recently captured at Burton-on-Trent.—Mr. S. Stevens exhibited a specimen of *Vanessa Antiopa*, which he caught in the Isle of Wight in August last.—Mr. E. B. Poulton exhibited a living larva of *Smerinthus ocellatus* in the last stage, fourteen larvæ of *Boarmia roboraria*, and some cocoons of *Rumia cratægata*. The object of the exhibition was to show the influence of special food-plants and surroundings on the colours of the larvæ and cocoons.—Mr. M. Jacoby exhibited a varied series of *Titubæa sanguinipennis*, Lac., from Central America. He stated that many of the varieties exhibited had been described in error as distinct species.—Mr. Billups exhibited specimens of *Bracon brevicornis*, Wesm., bred from larvæ of *Ephestia Kühniella*. He remarked that this rare species had only been recorded as bred on two or three occasions, viz. by the Rev. T. A. Marshall, Mr. W. F. Kirby, Herr Brischke, and Mr. Sydney Webb.—Mr. W. Warren exhibited specimens of *Antithesia ustulana* and *A. fuligana*; also bred series of the