	Tons.
Blown away	31,480
Temporary deposit in the town	3,472
Permanent deposit in the town	48
	35,000

The method of determining the permanent deposit was by means of glass plates a foot square, which were exposed at different stations for three months at a time. The surface was then rinsed with water to remove any loose material, and the deposit removed and analysed. As this tarry material is much the most deleterious ingredient of the soot, the method of comparing the translucency of these plates after exposure with certain standards may be recommended as a rough test of atmospheric pollution by smoke.

Cohen and Ruston have calculated that in a domestic fireplace about 6 per cent. of the fuel escapes as soot, whereas in a boiler or other furnace the loss may be reckoned at $\frac{1}{2}$ to $\frac{3}{4}$ per cent. Taking the estimated coal consumption from both sources, we get for the whole country a loss in the form of soot of :—

	Tons
6 per cent. on the estimated domestic consumption of 32 million tons ...	1,920,000
0·5 per cent. on the estimated factory consumption of 100 million tons ...	500,000
	2,420,000

From the ratio of soot emitted to soot deposited in Leeds, the above 2,420,000 tons will yield a deposit of nearly 300,000 tons in the neighbourhood where the coal is consumed; for it must be remembered that the whole quantity will sooner or later reach the earth.

Comment is unnecessary. On the ground of the discomfort, dirt, waste, and pecuniary loss which smoke entails, the evil is one which should receive serious consideration, and it is to be hoped that the forthcoming conference and exhibition which is being promoted by the London Coal Smoke Abatement Society will be successful in directing more attention on the part of the authorities to the disastrous effects of smoky chimneys.

J. B. C.

BELGIAN BOTANICAL INVESTIGATIONS.[1]

THE supplementary part of the seventh volume is entirely occupied with a sketch of the geographical botany of Belgium by Dr. J. Massart, providing a continuation of the more specialised account of the vegetation of the littoral and alluvial districts by the same author published in the original volume, and previously noted in NATURE. The sketch does not contain any such detailed observations as are recorded in the botanical surveys carried out in Great Britain by W. G. Smith, C. E. Moss, and others, but incorporates the results of various Belgian researches, notably the modification of leaves in dry and moist localities furnished by Miss M. Ernould, the periodic phenomena of vegetation carefully studied by the meteorologist, Dr. E. Vanderlinden, in connection with climatic variations, as well as several geological and agricultural investigations. Geology occupies a more prominent position than is usual in an œcological botanical memoir, and practically supplies the basis of treatment in the most important chapter. The classification of associations is artificial. Uncultivated and cultivated areas are placed in antithesis. As might be expected in a country where mountain ranges are wanting and intense cultivation is general, there are few natural associations; apart from the dunes, the most important are the types of vegetation growing on cliffs and rocks.

A notice of Dr. Massart's able contribution would be quite incomplete without an expression of cordial admiration of the excellent photographs and maps that are collected in the "Annexe." Of the photographs, more than half are stereoscopic, and to ensure that they shall be fully appreciated a simple but effective stereoscope is provided. It will be observed that the author has paid particular attention to the photography of cryptogamic plants; fungi are the most suitable for the purpose, but the lichens (Figs. 434 and 636), the mosses (Figs. 332 and 414), and the algæ (Fig. 222), also the mycorrhiza of beech (Fig. 320), are particularly well defined. Discrimination between the photographs of flowering plants would be idle where nearly all are successful and convey their special meaning.

The eighth volume contains three extensive papers, a study by Dr. V. Gallemaerts of the phanerogams growing on willows, an investigation by Mrs. J. Schouteden-Wery as to the factors which regulate the distribution of algæ off the south-western region of the Belgian shore, and the observations of Dr. Vanderlinden mentioned above; in the last the observations, concerned chiefly with the comparative dates of flowering, extend over a period of fourteen years.

[1] "Recueil de l'Institut Botanique Léo Errera (Université de Bruxelles)." Publié par Jean Massart. Tome Supplémentaire vii.bis, pp. xii+332. Annexe au tome supplémentaire vii.bis, pp. iv+466 photographs+9 maps +2 diagrams+pp. v-xiii. Tome viii., pp. ix+383, avec Stéréoscope. (Bruxelles: Henri Lamerton, 1910 and 1911.)

BIOLOGICAL STUDIES IN JAVA.[1]

THE memoir referred to below contains a series of articles embodying the results of six months' study and observation in Java in the winter of 1909–10. The subjects dealt with are:—(1) climbing organs within the genus Randia; (2) Javan Myrmecodia; (3) the "silver-field" of *Haplochilus panchax*; (4) the microbiological processes in the humus of certain humus-collecting Epiphytes; (5) the bacteria nodules on the leaf-margins of *Ardisia crispa*.

Not the least interesting is the account of the author's investigation of the biological phenomena of *Myrmecodia tuberosa*, of *Hydnophytum montanum*, and, incidentally, of *Polypodium sinuosum*. Miehe briefly reviews the work of his predecessors, Beccari, Treub, and others, on the same subject, and adds a bibliography relating specially to the interrelations of ants and plants. The tuberous-stemmed rubiaceous genera Myrmecodia and Hydnophytum are among the most remarkable vegetable productions of the Malay Archipelago, alike in habit of growth and the economies of nutrition. These plants are epiphytes, usually gregarious, and commonly associated with the equally singular *Polypodium sinuosum*. They form irregularly shaped fleshy stems or tubers, ultimately 6 to 9 inches or more in diameter, with chambers and intersecting or blind galleries, in nature perhaps eventually always inhabited by a certain kind of ant and a fungus. A few short branches bearing a tuft of crowded leaves are given off from the tuberous stem, and the flowers are small and inconspicuous.

How far the association of these three organisms is an instance of beneficial symbiosis is still uncertain. Beccari, one of the earliest investigators and illustrators of this class of plants, came to the conclusion that the shape and development of the stems was entirely dependent on the action of the ants. But Treub proved by experiments with seedlings and older plants that the development of the thickened stems and the formation of galleries was absolutely independent of the ants. Hence some other use had to be sought for the passages and chambers open to exterior influences. Treub and subsequent investigators claim to have proved that these interior surfaces, which are of two kinds, play an important part in the economy of the plant, furnishing, in effect, the channels of absorption and transpiration. The absence of stomata from the exterior parts of the stem and tuber is advanced in support of this theory.

Miehe instituted further experiments to determine the nature of the vital functions of these two different surfaces of the galleries and chambers. In certain parts of the system the surface of the walls was smooth and of a "leather-yellow," in others black and warted. The result of numerous experiments was the same, namely, that the warty surface rapidly absorbs water, whereas the smooth surface does not possess this property. The fungus which inhabits the tubers has not been determined, but it is probably allied to Cladosporium and Cladotrichum.

[1] "Javanische Studien." By Hugo Miehe. Pp. 299–431. (Des xxxii. Bandes der Abhandlungen der Mathematisch-Physischen Klasse der Königlichen Sächsischen Gesellschaft der Wissenschaften, No. iv.) (Leipzig: B. G. Teubner, 1911.) Price 6 marks.

It is always present, and confined to those parts of the walls of the labyrinth which are studded with warts, there forming a dense carpet, which gives the dark colour to the walls. The ant, *Iridomyrmex myrmecodiae*, which inhabits the tubers under natural conditions is a small red one, but this was dispossessed by a larger black species in plants under cultivation in the garden of Buitenzorg.

The two kinds of wall-surface are thus briefly characterised:—"One part is smooth, light brown, impervious to water, free from fungus, and on which alone the ants place their pupæ; the other part is warty, discoloured, pervious to water, clothed with fungus, and never bears pupæ." Further, the ants deposit their excrement exclusively in the fungus galleries, so that the breeding part is kept pure and clean. Although a system of galleries and chambers is developed under artificial conditions independently of ants, the association of the three organisms points to a beneficial symbiosis whereby nutrition of the host plant is supplemented and the ants are provided with a home.

W. BOTTING HEMSLEY.

THE STUDY OF DAYLIGHT ILLUMINATION.[1]

PROF. L. WEBER has lately published an account of the series of tests of daylight illumination carried out by him in Kiel during the years 1905–8. Measurements of this kind were previously undertaken and described by the author so far back as 1890; his main object on this occasion has been to devise a more accurate and convenient means of specifying daylight illumination and the requisite window-area in interiors.

The results of a new and complete series of measurements of light from the unrestricted sky, carried out at mid-day, classified for the months of the year and extending over the years 1905–8, are now given. The author also describes an improved form of photometric apparatus specially devised for this work. The results of an extensive series of tests of the day-illumination in the State schools at Kiel are also presented. At the time of previous experiments the individual characteristics of the various class-rooms and the prevailing climatic conditions had not been sufficiently correlated, so that it was difficult to frame very precise general recommendations. Prof. H. Cohn has, however, suggested that the illumination on any desk should not fall below 25 metre-candles (approx. $2\frac{1}{2}$ foot-candles), and that this result would in general be secured if the projected solid angle subtended by the window-area at this desk was not less than 50 square degrees.

This solid window-angle is often taken as the sole criterion of effective illumination. Yet it leaves out of account the effect of reflection from the walls in the room, and also the position of the window with respect to the surroundings outside.

An improvement now suggested by Prof. Weber takes the form of measuring the "light-value" (Lichtgüte) of the window. This quantity denotes the value of the projected area of the portion of the window-area which is entirely unobscured by surrounding trees or buildings, the area of the entire window being taken as 100. Prof. Weber describes two new instruments for the convenient measurement of these quantities.

Authorities, in estimating the daylight requirements of a room, usually require that the ratio of the window-area to the floor-area of the room should not exceed 1 : 6, or in some cases 1 : 10. The author suggests that if this ratio were multiplied by the "light-value" we should get a much more serviceable factor (which he denotes by P) for expressing the admission of light to the room.

Further data are needed before one can state quite definitely what value P should assume for various interiors, but this information could readily be obtained. As an illustration the author summarises the results of tests in 520 typical class-rooms, the illumination on the best and worst illuminated desks, and on a desk intermediate between these extreme positions, being studied. For 171 of the rooms P had a value >10, and in 304 rooms it was >5 but <10. In conclusion, he estimates that in only 5 per cent. of these class-rooms would the illumination, under average climatic conditions, during the year fall below Cohn's minimum of 25 metre-candles.

Prof. Weber next gives an account of his examination of the conditions of illumination in the library of the University of Kiel. He shows that, so far from complying with Cohn's minimum figure, even the best lighted tables would only receive 2–3 metre-candles during December. He also points out that the rule prescribing the window space for a given floor-area is quite inapplicable to rooms in which the floor is filled by vertical stacks of books, and that such shelves rarely receive sufficient light.

Finally, there is a communication from H. Borchardt which contains a summary of the theoretical and experimental methods employed for studying the distribution of brightness in the sky. A chart (based on a method devised by Prof. Weber) is given showing the approximate intensity and distribution at different periods of the year. The sky rarely approaches the ideal diffusely radiating hemisphere assumed in conventional calculations. The illumination is really due to mixture of diffused and transmitted light, the proportions of which vary with different climatic conditions. The distribution of brightness alters accordingly.

[1] A reprint from the *Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein*, Band xv., Heft i.

THE FLORA OF DAGHESTAN.

MR. N. I. KUZNETSOF concludes an article in the *Izvestiya* of the Imp. Russ. Geogr. Soc., Nos. 6–7, 1910, on the flora of the mountain region of Daghestan, with an historical sketch of its origin and distribution. Daghestan was raised above the water at the beginning of the Tertiary period, and its climate subsequently became drier and assumed a more continental character as the Sarmatic Sea around it dried up, and consequently the Tertiary forest which clothed it must have gradually dwindled. At the same time, the combined action of erosion and tectonic movements produced bare slopes, which, especially those facing south, afforded excellent conditions for the development of upland xerophytic vegetation. Here gathered forms which had existed in various parts of Daghestan from the beginning of the Tertiary period, and were now distributed, some in the north, others in the south, some on the schists, others on the limestones, and in connection with climatic conditions.

In the Glacial period Daghestan received fresh accessions from the north, and from the west through Asia Minor. Firs and birches now clothed the country, crowding out what was left of the Tertiary timber trees, which are now represented only by an occasional Tertiary birch, *Betula Raddeana*, or oak, *Quercus macranthera*. Many slopes, especially the southern, were never forested, and many limestone plateaus would not harbour arboreal vegetation, and there xerophytic types spread vigorously.

In the steppe period the forest trees retired into the heart of the country, their place being taken by xerophytic forms, while in the open valleys appeared representatives of the hot desert flora of the Mediterranean. The mountain xerophytic forms of Daghestan spread widely during this period. Some forms, not adapted to migration, remained in the country, others spread to other parts of the Caucasus, while those easily distributed extended so far as the steppes of South Russia, when these were laid bare by the retreat of the Pontic Sea. Maps accompanying the article show the distribution of the most characteristic forms.

VITAL EFFECTS OF RADIUM AND OTHER RAYS.[1]

ADOPTING the chronological order in which the radiations of radium and other sources were discovered and applied, the lecturer considered, in the first place, the effects of light and radiant heat, dwelling especially upon the fact that the chemical rays—*i.e.* blue, violet, and ultra-violet—were those which had vital effects upon the tissues. The differential effect of these rays as compared with those of longer wave-length at the other end of the

[1] Abstract of a discourse delivered at the Royal Institution, on February 2, by Sir James Mackenzie Davidson.