

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.

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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. 2½ 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 illumina-

tion, 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.

THE FLORA OF DAGHESTAN.

MR. N. I. KUZNETSOV 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 ultraviolet—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 A reprint from the *Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein*, Band xv., Heft 1.

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