

fundamental a rôle was assigned, two (the red and the green) did not exist at all so far as known, and one existed only in a wholly erroneous color, and, moreover, in the fovea where vision is most acute, not even the visual yellow, the sole carrier of so large an assumption, has ever, by the most careful methods, been detected; it would seem to be far simpler to suppose that the objective color of the absorbent medium has nothing to do with the case.

The proof which was furnished by König immediately after the Ebbinghaus theory was proposed that the absorption of the visual purple is exactly what is needed to account for that increment in vision which is gradually acquired upon the oncoming of darkness; rendered the theory, of course, far more untenable still, and in fact Professor Ebbinghaus himself seems to be no longer inclined to insist upon it. He says (*Grundzüge der Psychologie*, I., 261, 262): "Ich habe vor einiger Zeit einen Versuch in dieser Hinsicht gemacht und darauf hingewiesen, dass zwischen der Art, wie die Farbenblinden Gelb und Blau im Spectrum verteilt sehen, und der Lichtabsorption des Sehpurpurs und des Sehgelb (nach der Untersuchungen Kühnes) eine auffellende Aehnlichkeit bestehe. Da nun offenbar die Bewusstseinswirkung der optischen Reize durch eine den Eindrücken entsprechende Absorption der verschiedenen Lichtstrahlen vermittelt werden muss, so nahm ich an, dass eben in dem Sehpurpur die Heringsche Blaugelbsubstanz zu erblicken sei.

"Ich sehe jedoch davon ab, die an diesen Ausgangspunkt angeschlossenen und zum Teil davon gang unabhängigen Gedanken hier zu wiederholen, weil sich bei genauerer Untersuchung des Sehpurpurs durch A. König meine ihn betreffende Annahme nur teilweise bestätigt fand. Das Sehgelb allerdings zeigte in dem einzigen Falle, in dem es erhalten werden konnte, eine mit der Blauempfindung der Farbenblinden annähernd übereinstimmende Lichtabsorption. Die Lichtabsorption des Sehpurpurs selbst dagegen entsprach vielmehr der Verteilung der Helligkeiten in dem Dunkelspectrum des normalen Auges, d. h. also auch in dem Spectrum der total Farbenblinden."

To refrain from reproducing the theory in

its author's own text-book of psychology is probably to be regarded as tantamount to withdrawing it.

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SHORTER ARTICLES.

NOVA PERSEI, No. 2.

AN examination of the Draper photographs of the spectra of Nova Persei, No. 2, by Mrs. Fleming, shows that, like other novæ, it has been gradually changing into a gaseous nebula. The resemblance to the nebula N. G. C. 3918 is now so close that in a photograph taken on June 19, 1901, no marked difference was noted, except that the nebular line, 5007, is about eight times as bright as H α in the nebula, and only equal to it in the nova. The lines 3869, 3970 (H η), 4102 (H δ), 4341 (H γ), 4688, 4862 (H β), 4950, and 5007, are common to both and, except the last, have nearly the same relative intensities. Four bright lines between H γ and H β appear faintly in the nova and are not present in the nebula, while one, 4364, is seen in the nebula but not in the nova, perhaps owing to the proximity of H γ .

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LIME AND MAGNESIA IN PLANT PRODUCTION.

SINCE 1899, the writer, with Dr. O. Loew, of the Division of Vegetable Physiology and Pathology of the U. S. Department of Agriculture, has been carrying on a series of experiments on the relation of lime to magnesia in the growth of plants. Some very interesting results have been attained which are to be published in a Bulletin of the Division to be issued at an early date. It may be of interest to here set forth a few of those results.

It is well known that magnesium salts form some of the more noxious alkali soils of the arid regions. In other sections it has been noticed that the soils well fertilized, especially with certain crude potash salts, after a time fail to respond to the fertilizers applied and either become sterile or their productive capacity is greatly reduced. This is apparently due to the accumulation of magnesia in the soil, it being present in some potash salts to a great

extent. One examined by the writer contained 9.37 per cent. of this element.

In our experiments in water, sand and soil cultures covering a great many trials we found that magnesia in a soluble form in very small amounts was, in the absence of lime, very toxic to plants. By the addition of lime in a soluble form in amount equal to or in slight excess of the magnesia the poisonous effect of the latter was eliminated. The plant was even enabled to withstand any bad effects from a greatly increased amount of magnesia, provided the lime was also increased in an equal or greater degree.

While the addition of other salts to the magnesia in the culture solutions variously affected the toxicity, in no case as far as tested did it have any degree of action comparable with that of the lime salts.

In sand cultures in which the lime and magnesium salts were applied as nitrates the plants made the better growth where the lime was slightly in excess of the magnesia. With lime greatly in excess there was apparently a starvation of the plant, it making a straggling growth for awhile. With the magnesium in excess the plant soon succumbed, and in moderate excess made a slow and unwholesome growth.

In soil cultures in which magnesium carbonate had been added, calcium carbonate was not efficient in overcoming the noxious influence of the magnesia. This was undoubtedly due to the less solubility of the calcium carbonate in comparison with the magnesium carbonate. By the addition of calcium sulphate the toxicity of the magnesia was readily overcome.

In the practical application of lime for its physiological effect the process could be more intelligently carried on where the amount of soluble magnesia and lime already present, *i. e.*, the portion immediately available to plants, is known. However, the danger lies in under- rather than in over-liming. In a soil containing CaO 0.144 per cent. and MgO 0.144 per cent. soluble in 1.115 per cent. of hydrochloric acid the addition of 0.8 per cent. of gypsum, and again of 0.8 per cent. of gypsum and 0.2 per cent. of magnesium carbonate, produced plants similar to those in the natural

soil. With the addition of gypsum 0.2 per cent. and magnesium carbonate 0.68 per cent. the plants made a very slow and spindling growth, too much so for profitable crops.

In liming soils for the physiological effect the sulphate is, among the more soluble forms, the best available. Where a large amount is to be added on account of a high magnesia content of the soil it is better to add small portions yearly, as has been pointed out. However, the process should be repeated until the lime content of the soil is made to equal the total magnesia content.

As stated by Wheeler in his work on Rhode Island soils, calcium carbonate is the best form of lime for overcoming an acid reaction. In applying it for this or any other purpose care should be taken that magnesian limestone be not used unless the soil is also deficient in magnesia. Again in the continued application of crude potash salts the lime and magnesian content of the soil should be known. In case there is a deficiency of lime in the soil the addition of gypsum should also be made in some excess of the magnesia contained in the fertilizers.

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U. S. DEPARTMENT OF
AGRICULTURE.

QUOTATIONS.

INDUSTRY AND RESEARCH.

LORD GEORGE HAMILTON has written to Sir Alfred Hickman, M.P., ex-president of the British Iron Trade Association, explaining why certain contracts were placed by Indian railway companies with American firms. In the course of his remarks he says: "You seem to think that orders have only gone abroad because those who gave them did not understand their business. I wish that it were so. The competition we have to face is founded on something much more formidable and substantial. Chemical research, concentration of capital, thorough technical education, improved industrial organization have made in recent years greater advance in America than here; it is with the product of these combinations and not with the assumed stupidity of Indian officials that the British engineer has to contend." Sir Alfred