

I said nothing on the subject of compulsory Greek, but as my silence has been taken to imply complete assent to its abolition, let me say that while I have voted, and shall vote, against enforcing the study upon candidates for degrees in mathematics or natural science, I am convinced that the quality of any literary, historical, or philosophical study, whether in modern or ancient fields, is gravely injured wherever it is undertaken without a knowledge of Greek.

Manchester, November 20.

R. S. CONWAY.

### The Preservation of Natural Colour in Plants.

IN NATURE of November 9 Dr. Rendle directs attention to a method of producing compounds of chlorophyll and copper similar in colour to that of the natural pigments of the leaf and of a comparatively stable nature. It may be worth while to point out that the chemical changes underlying the method are fairly well known, as a result of Willstätter's investigations of chlorophyll and its derivatives. The knowledge derived from Willstätter's work forms a very profitable basis for an investigation of the problem of preserving the colour of herbarium specimens.

The chromogen complex of chlorophyll contains magnesium bound to nitrogen in a complex way. The chromogen group of chlorophyll *a* may be represented by the formula,  $C_{32}H_{30}ON_4Mg$ . The magnesium is easily removed by the action of acids, and the derivatives thus obtained, phæophytin, phytochlorin, etc., containing the group  $C_{32}H_{32}ON_4$ , have optical properties different from those of chlorophyll; in solutions they are of a yellowish-olive green colour, and they exhibit characteristic absorption spectra.

It is possible in many cases to introduce a metal into these magnesium-free derivatives whereby compounds with optical properties similar to those of chlorophyll are produced. A full discussion of the various methods for introducing the different metals is out of place here, but it may be pointed out that magnesium can be reintroduced into the chlorophyll molecule by treatment with methyl magnesium iodide. Some metals are very easily introduced—*e.g.* copper, zinc, and iron—by treating the magnesium-free derivative with the metallic acetates in acetic acid or alcohol; zinc acetate even acts in cold solution.

It is a remarkable fact that some of these metal compounds are more stable—for example, in relation to acids—than the original magnesium complex. It is possible to arrange the metals in a series according to the stability of the compound; the extremes of this series are potassium (very unstable) and copper (very stable). Magnesium occupies an intermediate position.

The procedure in the treatment of a specimen is thus the following:—

(1) *The Magnesium is removed from the Chlorophyll.*—This can easily be done in the case of plants with an acid cell-sap (*e.g.* *Oxalis acetosella*) by dipping them into boiling water. In other cases the tissues can be made permeable by treatment with alcohol or acetone (in such a concentration that chlorophyll is insoluble, *i.e.* 10–60 per cent.). Subsequent treatment with dilute acid removes the magnesium.

(2) *The Metal is introduced.*—It must be remembered that zinc, although a little less stable than copper, can be introduced without heating, and thus without the risk of injuring the specimen. The shade of colour obtained varies with the different metals.

Investigations on these two points will no doubt add to our knowledge of the most suitable methods of preserving the colours of museum specimens of plants.

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### Artillery and Rainfall.

THE following quotation may help to settle the question as to the effect of artillery on the rainfall, at any rate so far as the present generation of your readers is concerned.

It is taken from a translation of "Plutarch's Lives," by John and William Langhorne, and occurs in the life of "Caius Marius," where Plutarch comments on a battle fought against the "Teutones" in 102 B.C.

"It is observed, indeed, that extraordinary rains generally fall after great battles; whether it be that some deity chooses to wash and purify the earth with water from above, or whether the blood and corruption, by the moist and heavy vapours they emit, thicken the air, which is liable to be altered by the smallest cause."

Now, since the battles and rainfall referred to occurred some 1500 years before artillery was invented, it is clear that artillery cannot be the cause of the rainfall.

MORITURUS.

### GOVERNMENT CONTROL OF FOOD SUPPLIES.

WHATEVER difference of opinion may exist in regard to the stimulus which has moved the Government to take control of our food supplies, all are agreed that it has not come about a moment too soon, and most will admit that we should now be much better off had it been taken in hand more than a year ago.

The provisions outlined will empower the Food Controller to take measures both preventive and regulatory; the former to prevent waste, the improper use of food, such as giving to animals food that ought to be reserved for human beings, and market manipulation, cornering, or holding up of food supplies. The regulatory measures apply to the production of flour from grain, the sale and distribution of articles of food, and the fixation of prices.

If properly and intelligently applied, the scheme ought to work well. There can be no doubt that a great deal of food is still wasted, not alone by sections of the population who are earning more money than they have ever handled before, but also by public institutions; and many still believe in the catering for the Army, although this last has been improved. Nothing short, however, of some measure equivalent to "food tickets" will prevent over-consumption and waste on the part of those who, owing to the war, are better off than in normal times. But by a strict system of inspection it ought to be possible to reduce or abolish waste in public institutions and in the Services.

It is, perhaps, in respect to the application of the regulatory provisions that the public may harbour some misgivings, and particularly in respect to the manufacture of wheat-flour—a subject which is dealt with elsewhere in this issue.

The control of sale and distribution is certain to prove a difficult undertaking, but with suitable organisation it can in time be satisfactorily attained. The most delicate problem of all is, however, the fixation of prices, and here expert knowledge of food values will be indispensable if approximately the same amount of nourishment