Danish variety, it produced 27 per cent of bunt. Martin wheat, when contaminated with bunt spores from White Odessa grown on the University Farm, Cambridge, produced 54 per cent of bunted ears, and this White Odessa bunt had grown previously on Little Joss wheat, and the spores originated, so far as is known, from the original inoculum obtained from Little Joss wheat in 1923. It is clear, therefore, that physiological forms exist; indeed, that this pathogen is analogous to the host which it parasitises, in that it is a population from which units may be obtained.

It may well be, however, that there were present naturally, on the original seeds of these varieties that were sown in 1923, a few bunt spores other than those with which I contaminated them artificially—physiological forms which would flourish in one environment and not in another.

Futhermore, in their study of *T. caries* many workers have undertaken very comprehensive experiments in order to determine the relative susceptibilities of wheat varieties to this parasite. So much so that collections of bunt—"botanical specimens of no commercial value"—have been forwarded from country to country that their virulent nature may be determined. I suggest that this is an excellent method for the commercial propagation and perpetuation of this disease—but one scarcely to be recommended in the best interests of agriculture. Although no varieties are universally immune, it may well be that certain varieties are moderately resistant to certain physiological forms in certain localities, and it is with these that the plant breeder and the practical farmer are concerned. It will not aid the cause of either to risk introducing foreign physiological forms.

It may seem that these two opinions are contradictory: for in one it is stated that no resistant varieties have been encountered; whereas, on the other hand, the opinion is expressed that it is most unwise to permit the introduction of physiological forms from one country to another, since it is to the detriment of both farmer and plant breeder. In certain environments, however, it may be possible to breed varieties resistant to indigenous physiological forms of this disease which would be susceptible to forms introduced from other countries.

W. A. R. DILLON WESTON.

Dominion Rust Research Laboratory,
Winnipeg, Man., Feb. 10.

Plant Distribution.

IN the course of work on the geography of the Angiosperms, I have been impressed by the absence of any satisfactory theoretical explanation of the more general features in the distribution of these plants. It will, I think, be agreed that the present distribution of the Angiosperms has been brought about by the intermingling, at different times and in different degrees, of a number of floras which have developed at different times and in different parts of the world. This being so, any general theoretical explanation must provide not only a means of actual plant-movement, and a motive force for it, but also a directional control of movement and a discriminating or sifting factor.

The dissemination of dispersal units obviously furnishes the means of movement, and the contemporary topographical outline and relief is clearly potent in controlling its direction. As to the motive force, it is generally believed to-day that plant migration has been and is caused by change in external conditions and particularly by climatic change. That is to say, change in external conditions is considered to make dispersal effective in bringing about changes in species position. There is little doubt that this belief is correct, but it cannot be looked upon as an explanation of the facts of plant geography unless there is added to it some explanation as to how external change can react so as to entail species movement.

It is one of the most obvious facts of plant distribution that a species can develop and maintain itself satisfactorily only within certain definite climatic and edaphic conditions; that it has, indeed, a 'range of tolerance' to external conditions. In view of this, it is possible to put forward the theory that 'range of tolerance' to external conditions—or, more shortly, 'tolerance'—is a specific character, subject to variation and change in the same ways and by the same means as morphological characters.

If this theory is accepted, then external change, which is itself a movement of conditions, must result in species movement, because dispersal, which is *potentially* in all directions, will be *effective* only in those directions which will maintain the spatial correlation between the species and the conditions within its range of tolerance. By the same theory, the necessary sifting effect among species will follow from the differential effect of one and the same external change upon species having different tolerances.

This theory of tolerance is set out and discussed at length in a forthcoming paper.

R. D'O. GOOD.

Department of Botany,
University College,
Hull, Feb. 19.

Sir Isaac Newton and the Greek Philosophers.

A FEW years ago I suspected that justice was not given to the brilliant astronomical discoveries of the ancient Greeks, and this led me to copy, to collect, and to classify several thousands of their passages relating to the structure and polity of the universe. A sound independent basis was thus established for checking the originality of the reformers of astronomy since the sixteenth century, and for rendering "unto Cæsar the things which are Cæsar's", in a very important period of the history of science.

The book of Copernicus, who had closely studied the philosophers of antiquity in their own language, broke down badly under the crucial and unanswerable test of comparison; and his heliocentric system is known to have been adopted from the Greeks without a single word of acknowledgment.

In the work of the great Kepler, I came across several theories that had already been propounded by the ancients; but that founder of modern astronomy was just and generous, and ever eager to applaud the discoveries of his predecessors, so far as he could be acquainted with their writings.

The treatment of the philosophers of antiquity by Newton is comparable with that of Kepler, and he did not hesitate to attribute to the Pythagoreans and to Aristarchus the discovery of the true system of the world. It is a well-known fact that, in the first century of our era, Plutarch conceived universal attraction, asserting, moreover, that gravity, counterbalanced by centrifugal force, prevents the moon from falling on the earth, like a stone in a sling. As Newton does not mention the philosopher of Chæronea, he evidently never saw the passages in which these ideas had been expressed. He did not understand the Greek language; and, like all great creators in science, he read little. Were he to have been acquainted with the scientific works of Plutarch, he would never have failed to do him justice, as he had done, for example, to Kepler for his famous laws, or to Bouillaud for the law of inverse squares.