deepened and widened to their present condition during the relatively short epoch of glacially lowered sea-level. The embayed shores, first used by J. D. Dana as a confirmation of Darwin's subsidence-theory, have none of the characters of recently dissected land. Another point firmly brought forward is the unconformity between the reefs and the floor from which they have grown upward. That floor may be seen, for instance, beneath elevated fringing reefs in the New Hebrides. It has, at some epoch, been subject, not to marine planing, but to subaerial denudation. At Havannah harbour in Efate it must have stood above the sea before the corals grew. The joint evidence of the drowned valleys with their mature forms and of the unconformity of the reefs on an old land-surface points very strongly in favour of Darwin's views. Efate and Oahu in the Hawaiian Islands furnish instances of oscillatory movements, and some authors have held these to be incompatible with a broad system of subsidence. Davis justly styles this objection as "the most singular of all." Finally, the inequality of the depths to which drowning has taken place in adjacent regions is a powerful argument against ascribing the submergence to an increase of water in the sea. Davis, with characteristic width of outlook, believes that "some combination of regional subsidence with Glacial changes of sea-level—or with changes of sea-level caused by movements of the sea-bottom—is worthy of careful consideration as being probably nearer the truth than either process taken alone." But his reasoned conclusion is that subsidence has played by far the greater part.

In a still more recent paper Davis deals with the Queensland platform ("The Great Barrier Reef of Australia," *Amer. Journ. Sci.*, vol. xliv., p. 339, 1917), which he believes to be due in large measure to coral-reef agencies, which produced a mature reef-plain before the subsidence occurred that gave rise to the present barrier reef and the embayment of the coast.

GRENVILLE A. J. COLE.

A BACTERIAL DISEASE OF CITRUS.

DR. ETHEL DOIDGE, mycologist to the Department of Agriculture of the Union of South Africa, who is becoming well known for her researches into the bacterial diseases of plants, is to be congratulated on the excellent piece of work which is described in detail in an article on "A Bacterial Spot of Citrus."[1] At a time when research in phytopathology is largely at a standstill, it is refreshing to read of such ably conducted scientific investigations in our Colonies as these are.

The citrus "spot" is a disease of economic importance in the citrus orchards of the Western Province of the Cape, and attacks not only the fruit, but also the leaf and the branch of the tree. The fruit is disfigured and ultimately destroyed, while the attacks on the tissues of the stem cause very commonly gummosis in the spring.

The cause of the disease was ascertained to be a species of Bacillus new to science, *B. citrimaculans*, A comparative table is given of the characters of this and the two organisms known to attack the citrus in America, viz. *Bacterium citriputeale* and *Pseudomonas citri*. The description of *B. citrimaculans* given by the author, together with its full "group number," may be held up as a model to be followed by workers in this field. The opinion is expressed that very probably the organism is a soil bacillus, which first invaded rotting fruits lying on the ground, and has now taken on a parasitic habit. The organism loses its virulence rather rapidly when cultivated on artificial media. The most frequent method of infection is through wounds, and the author considers the possibility of stomatal infection an open question at present. While preventive measures are not discussed, it is pointed out that any improvement in the sanitation of the affected orchards would doubtless prove beneficial. Since it was found that the organism is very sensitive to copper sulphate, it is suggested that spraying with Bordeaux mixture should be tried. E. S. S.

[1] *Annals of Applied Biology*, vol. iii., January, 1917, pp. 53-81, with 10 plates.

THE FLORA OF THE SOMME BATTLEFIELD.[1]

THE ground over which the Battle of the Somme was fought in the late summer and autumn of 1916 rises gradually towards Bapaume, and at the same time is gently undulating, with some well-marked branching valleys initiating the drainage system of the area. Before the war the land was for the most part under cultivation, but on the highest levels there were large areas of woodland, such as High Wood and Delville Wood, now shattered and destroyed.

During last winter and spring all this country was a dreary waste of mud and water, the shell-holes being so well puddled that the water has remained in them, and even in the height of the summer there were innumerable ponds, more or less permanent, in every direction.[2]

The underlying rock is everywhere chalk with a covering of loam of varying thickness. As a result of the bombardment the old surface soil has been scattered and the chalk partially exposed. One effect of the shelling, however, has been to disintegrate the underlying chalk and produce a weathering effect which has been accentuated by the winter rains, snow, and frost. A general mixing of chalk, subsoil, and scattered top soil and also a rounding of the sharp edges have taken place, so that instead of the new surface soil being sterile, the shelling and weathering have "cultivated" the land. That this is so is proved by the appearance of the Somme battlefield during the past summer.

Looking over the devastated country from the Bapaume Road, one saw only a vast expanse of weeds of cultivation which so completely covered the ground and dominated the landscape that all appeared to be a level surface. In July poppies predominated, and the sheet of colour, as far as the eye could see, was superb; a blaze of scarlet unbroken by tree or hedgerow. Here and there long stretches of chamomile (*Matricaria chamomilla*, L.) broke into the prevailing red and monopolised some acres, and large patches of yellow charlock were also conspicuous, but in the general effect no other plants were noticeable, though a closer inspection revealed the presence of most of the common weeds of cultivation, a list of which is given below.

Charlock not only occurred in broad patches, but was also fairly uniformly distributed, though masked by the taller poppies. Numerous small patches were, however, conspicuous, and these usually marked the more recently dug graves of men buried where they had fallen. No more moving sight can be imagined than this great expanse of open country gorgeous in its display of colour, dotted over with the half-hidden white crosses of the dead.

In all the woods where the fighting was most severe not a tree is left alive, and the trunks which still stand

[1] Abridged from an article by Capt. A. W. Hill, Assistant Director, Royal Botanic Gardens, Kew, in the *Kew Bulletin of Miscellaneous Information*, Nos. 9 and 10, 1917, by permission of the Controller of H.M. Stationery Office.

[2] For a description of the battlefield shortly after the fighting Mr. John Masefield's recently published book, "The Old Front Line" (Wm. Heinemann), should be read.

are riddled with shrapnel and bullets and torn by fragments of shell, while here and there unexploded shells may still be seen embedded in the stems. Aveluy Wood, however, affords another example of the effort being made by Nature to beautify the general scene of desolation. Here some of the trees are still alive, though badly broken, but the ground beneath is covered with a dense growth of the rose-bay willow herb (*Epilobium angustifolium*) extending over several acres. Seen from across the valley, this great sheet of rosy-pink was a most striking object, and the shattered and broken trees rising out of it looked less forlorn than elsewhere.

The innumerable shell-hole ponds present many interesting features to the biologist. In July they were half-full of water, and abounded in water beetles and other familiar pond creatures, with dragonflies flitting around. In nearly every shell-hole examined, just above the water-level, was a band of the annual rush (*Juncus bufonius*, var. *gracilis*), and this plant appeared to be confined to those zones where the ground was relatively moist, and to occur nowhere else. With the Juncus, and often growing out of the water, were stout plants of *Polygonum persicaria*, and water grasses, not in flower, were often seen spreading their leaves over the surface of the pools.

In the battlefield area not only were the common cornfield weeds to be seen, but here and there patches of oats and barley, and occasionally plants of wheat, sometimes apparently definitely sown, perhaps by the Germans, though more often the plants must have grown from self-sown seeds of crops that were on the land before the war. Here and there, too, could be seen opium poppies representing former cultivation and remnants of battered currant and other bushes which alone remained to show where once had been a cottage garden. Both weeds and corn afford good evidence that the soil has not been rendered sterile by the heavy shelling, but how and when the land can be brought into a fit state for cultivation are questions not easily answered.

On the banks and sides of the roads traces of the old permanent flora still remain, and perennial plants, such as *Scabiosa arvensis*, *Eryngium campestre*, *Galium verum*, chicory, *Centaurea scabiosa*, *Cnicus acaulis*, and other characteristic chalk plants were occasionally seen.

The clothing of this large tract of country with such a mass of vegetation composed almost entirely of common annual cornfield weeds is remarkable when one remembers that it has been the seat of encampments, and for the most part out of cultivation since the autumn of 1914. It is well-nigh impossible that such masses of seed can have been carried by wind or birds to cover these thousands of acres, and the plants must therefore have grown from seed lying dormant in the ground. No doubt in the ordinary operations of ploughing and tilling of the ground in years before the war much seed was buried which has been brought to the surface by the shelling of the ground and subsequent weathering. In this connection the presence of charlock on the more recently dug graves, where the chalk now forms the actual surface, is of interest, since it adds further proof of the longevity of this seed when well buried in the soil.

List of Plants.

Delphinium Ajacis, Reichb., larkspur; *Papaver Rhoeas*, L., poppy; *Fumaria officinalis*, L., fumitory; *Raphanus Raphanistrum*, L., white charlock; *Brassica sinapis*, Vis., yellow charlock; *Matricaria chamomilla*, L., chamomile; *Centaurea cyanus*, L., cornflower; *Cnicus arvensis*, Hoffm., thistle; *Sonchus arvensis*, L., corn sowthistle; *Sonchus oleraceus*, L., sowthistle; *Specularia speculum*, A. DC., looking-glass flower; *Anagallis arvensis*, L., scarlet pimpernel; *Myosotis arvensis*, Hoffm., forget-me-not; *Convolvulus arvensis*, L., small bindweed; *Solanum nigrum*, L., nightshade; *Plantago major*, L., etc., plantain; *Veronica hederaefolia*, L., etc., speedwell; *Galeopsis ladanum*, L., hemp-nettle; *Chenopodium album*, L., goosefoot; *Atriplex patula*, L., orache; *Polygonum aviculare*, L., knotgrass; *Polygonum persicaria*, L., persicaria; *Rumex obtusifolius*, L., dock; *Euphorbia helioscopia*, L., sun spurge; *Mercurialis annua*, L., dog's mercury; *Juncus bufonius*, L., var. *gracilis*, St. Amand rush. A few grasses and occasional plants or patches of oats, barley, and wheat.

COAL CONSERVATION AND ELECTRIC POWER SUPPLY.

WE referred in our issue of January 3 to the interim report on electric power supply in Great Britain prepared by the Coal Conservation Sub-Committee of the Reconstruction Committee. Dr. C. Addison, Minister of Reconstruction, states in an introductory note that the important issues affecting municipalities and public bodies raised in the report will be explored in all respects by the Government before any action is proposed to Parliament upon the subject.

The report deals, first, with the extent to which conservation of coal could effect economy in the production of motive power and other forms of energy used for industrial purposes in this country; secondly, with the expansion of industry which should result, in the way of new manufactures, from the proper use of the coal so saved; and thirdly, with the steps necessary to attain these objects.

It contains many valuable tables and other details, and the following summary of the chief points dealt with and the conclusions arrived at:—

(1) The coal consumption involved in the production of motive power in the United Kingdom amounts at the present time to 80,000,000 tons per annum, equivalent in value to, say, 40,000,000*l.* at pit-head.

(2) In the industrial reorganisation which must take place on the termination of the war the further development of power is of great importance. The present use of motive power per employee is only about half that in the United States of America. Large quantities of electrical power will be required for the development and carrying on of new processes not at present undertaken in this country. Processes involving some millions of horse-power at present worked in America, Norway and Sweden, Germany, etc., can be profitably carried on, and, having in view the desirability of making all essential products in the Empire, should be carried on in this country.

(3) It is only by largely increasing the amount of power used in industry (by two or more times) that the average output per head (and as a consequence the wages of the individual) can be increased. The pre-war earning power, or wages, of each individual was far too low.

(4) Power may be most efficiently applied to industry by the medium of electricity.

(5) The economical generation of the electrical energy so required is thus of great importance, and the first question to be answered is whether the best economy can be obtained by each works or municipal area providing for its own individual needs, or by a comprehensive scheme.

(6) Technically and economically the electrical energy can be best provided by a comprehensive system, as may be amply proved from experience gained in those