directly on photographic printing paper, hence the mirror image reversal. It may be noted that in the electron photograph, only the printing ink produces an image, there being no indication of the surrounding paper.

(*a*) (*b*)

(*a*) Radiograph with 10 kV. X-rays; (*b*) 'radiograph' with 190 kV. X-rays.

It seems possible, using the original method of Tasker and Towers, to make at least a rough estimate of the range of the secondary electrons emitted from metals. By placing a step wedge of 'Cellophane' between a sheet of lead and a photographic plate and irradiating with 170 kV. X-rays, it appears that the electrons are stopped by a thickness of 'Cellophane' equivalent to approximately 0·012 gm./cm.².

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Nickel and Multiple Trace Element Deficiencies in Agricultural Crops

IN the course of work promoted by the Agricultural Research Council on mineral deficiency, wheat and other crops on Romney Marshes responded in 1944 to diagnostic injections[1] of compounds of manganese, iron, boron, copper, zinc and nickel. Field experiments on a factorial pattern were carried out in 1945 to test the significance of these diagnoses. All the crops (wheat, potatoes and broad beans) that were sprayed with solutions containing these elements gave increases in yield for each of the six elements. All these increases in yield were statistically significant and economically important; except that for copper and zinc on wheat the odds were only 14 : 1 and 11 : 1 respectively that the effect was not due to chance. A non-factorial experiment on cabbages gave corresponding results but at a low level of significance.

We believe this to be the first indication that nickel is of importance in increasing crop yield, and also the first record of zinc deficiency in the British Isles that has been proved by the increase in yield as a result of treatment with zinc. Thompson and Roberts[2], however, have recorded an improvement in the foliage of cherries as a result of zinc injection.

The importance of the zinc deficiency was established in experiments carried out in a field of potatoes selected because of the widespread and severe symptoms characteristic of manganese deficiency[3]. Although there was a striking improvement in colour and appearance of foliage as a result of spraying with manganese alone, there was no detectable yield effect. Spraying with zinc sulphate alone, however, raised the yield from 27 cwt. per acre (odds 30 : 1), while the effect of spraying with both zinc and manganese was to raise the yield 78 (to a total of 227) cwt. per acre with odds of more than 1,000 : 1 that the effect was not due to chance.

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Detection of Manganese Deficiency in Plants by Tissue Tests, Using Tetramethyldiaminodiphenylmethane

THE tissue test method[1,2] has proved useful in the diagnosis of mineral element deficiencies in a variety of crop plants. Using this technique, however, it has not been possible hitherto to detect deficiency-levels of manganese in plant extracts, due to the fact that Morgan's reagent (100 gm. sodium acetate and 30 ml. glacial acetic acid per 1 litre at *p*H 4·8) does not extract sufficient manganese from healthy or manganese-deficient tissues to be detected by the formaldoxime test[3]. The minimum concentration for which this reagent can be used is 1 part in 5 million. The value of the latter reagent in detecting excessive concentrations of manganese in plant tissue extracts has been reported previously[2,3,4].

Recently, a more sensitive reagent, tetramethyldiaminodiphenylmethane[5,6] has been used successfully by me to detect traces of manganese in plant tissue extracts. Special measures were taken to purify all reagents, to ensure that glassware was scrupulously clean and that the plant material used was free from dust. The plants used in the initial tests were healthy and manganese-deficient oats; the latter had been grown in fen soil and exhibited typical visual signs[7] of manganese deficiency. The results for healthy and manganese-deficient oats were more than 100 and 20 parts of manganese per 1,000 million respectively.

The procedure finally adopted for testing healthy and manganese-deficient cereal tissues is as follows. 1 gm. of macerated stalk tissue is extracted for 15 min. with 10 ml. of purified Morgan's reagent and 5 ml. of the extract pipetted off into a clean specimen tube. 0·5 ml. of a saturated aqueous solution of potassium periodate is then added, followed by 0·1 ml. of a 1 per cent solution of tetramethyldiaminodiphenylmethane in acetone. The intensity of the resultant blue colour is proportional to the manganese present in the extract. Prepared manganese standards made up in Morgan's reagent are used for matching purposes.

The following special precautions are taken prior to testing. Water, glacial acetic acid and acetone are redistilled, and sodium acetate, potassium periodate and tetramethyldiaminodiphenylmethane are recrystallized. Glassware and plates used are washed with hydrochloric acid, and thoroughly rinsed with glass-distilled water, alcohol and acetone and then dried. The plant material is brushed with a soft camel-hair brush to ensure that dust particles do not adhere to the outer surfaces. The stainless steel scalpel used to cut up the tissues must be sharp, and it is rinsed with redistilled acetone and dried before use.

Using this procedure, a number of test cases of manganese deficiency in cereals from field crops have been confirmed, but the applicability of the test to other crop plants for the detection of deficiency-levels remains to be established. The sensitivity range, from 100 to 1 part per 1,000 million, should, however, be adequate for most crops.

In the original publications[5,6], chloroform is recommended as a solvent for the reagent, but more consistent results have been obtained with acetone.

This work has been carried out with the aid of a special grant from the Agricultural Research Council and will be reported fully at a later date.

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Blood Groups in Tribes of Tierra del Fuego and their Bearing on Ethnic and Genetic Relationships

BLOOD groups were determined years ago by Rahm in two tribes of Tierra del Fuego. In *Onas*, prevalence of group *O* was found, as in American Indians in general; but out of 33 *Yámanas* (*Yá'ıgans*) only three were stated to belong to group *O*, and thirty to group *B*[1]. On account of this extraordinary finding, we decided to examine blood groups in these two tribes and in that of the *Alakalufs* living in the zone of the Tierra del Fuegan channels and never before studied as to their blood groups. This work was urgent as these three tribes are on the way to extinction.

Determination of blood groups was made partly by A. S., and partly by A. L. and L. R., in 40 *Yámanas* at different places on the northern and southern shores of the Beagle Channel, especially on the Chilean island of Navarino, and in 20 *Onas* and 17 *Alakalufs* met in Río Grande (Atlantic border of Isla Grande de Tierra del Fuego), Punta Arenas (Magallanes) and other places. When making contact with the *Yámanas* we soon became convinced that a study of blood groups in the tribes of this country will be of use only when a most careful inquiry has been made independently into the ethnic and genetic conditions of every individual. This work was done by G. M. To appreciate rightly the situation, it must be borne in mind that even in primitive tribes, as in our own society, ἔθνος by no means coincides with γένος. We have found in the three tribes cases of 'ethnic mutation', for example, two *'yámanas'* born of an *Alakaluf* mother and a Chilean father! We counted these individuals as *Alakalufs*. As to ethnic mutation from Indian to white, this also is a question of choice, though greatly dependent upon economic or social standards, as has been discussed more fully elsewhere[2]. Several 'whites' of *Ona* or *Yámana* extraction living in the tribe or in close contact with it were added to the respective tribe in our summary.

The findings of Rahm as to the prevalence of group *O* in the *Onas* were corroborated by our work. But we were unable to confirm his findings in the *Yámanas*; in our material, 31 out of 40 *Yámanas* were of group *O*. It was the same with the *Alakalufs*, where 13 out of 17 were of group *O*. Of the 77 individuals belonging ethnically or genetically to the three tribes mentioned, 58 individuals, that is, 75 per cent, were group *O*; the remaining 19 individuals were of group *A* (11), *B* (7) and *AB* (1).

The significance of these 25 per cent of non-*O* groups in the tribes of Tierra del Fuego was obtained when our material was sorted into two categories: that of 'Indians', that is, individuals of 'pure' race or belonging to crosses between members of the three tribes; and that