infection similar to that described above for naturally infected fruit was seen (Fig. 1). Isolations were made of the fungus from the inside of the infected seeds, and it was found to be identical with that inserted into the fruit.

Internally infected seed was found to germinate at least as well as comparable healthy seed.

These observations and experimental results indicate that the infection of tomato seed by *Didymella* is not solely due to external contamination by spores but also involves internal fungal invasion.

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National Vegetable Research Station,
Wellesbourne, Warwick. June 18.

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Crystal Defects in Freshly Worked Surfaces

RECENTLY, it has been suggested[1] that the emission phenomena (Kramer effect) and the blackening of photographic plates (Russell effect) observed with freshly worked or evaporated surfaces of certain metals may be due to the presence of sites of low work function, since photoelectric emission can be observed in the visible range of light.

Using a number of overlapping optical filters of narrow band-width, the photoelectric response of such surfaces has been explored by means of an open-ended Geiger counter, operating in an air–alcohol mixture at 10 cm. mercury, and it has been found that with aluminium (abraded and evaporated) and zinc (abraded) an emission peak is present at a wave-length of 4700 A. Evaporated copper and gold were found to be inactive. From these and other experiments it was concluded that this selective photoelectric effect is found mainly with metals which are known to form 'excess-metal' oxides, such as aluminium, zinc or cadmium, and that the effect is due to the presence of crystal defects in the oxide. It is suggested that the selective photoelectric effect observed, and other associated phenomena, are due to oxygen ion vacancies acting as electron traps. The mode of formation of these imperfections in metal films, evaporated in the presence of traces of oxygen, is considered to be similar to that of 'additive coloration' used for producing *F*-centres in alkali halide crystals. The centres formed in abraded surfaces, on the other hand, may result from the encounter of an ion vacancy pair with a metal atom.

An oxygen ion vacancy is divalent; it would be expected, therefore, that it could accommodate one, two or three electrons. From experiments on the luminescence of zinc oxide, three impurity-levels at 3·1, 2·6 and 1·9 eV. are known to exist[2], and the 2·6-eV. level is probably identical with the impurity level at 2·64 eV. responsible for the selective photoelectric effect at 4700 A. The centres may therefore be identified with oxygen ion vacancies occupied by two electrons.

It appeared of interest to establish whether blackening of photographic plates (Russell effect) could be achieved with deformed ionic materials such as rock salt. Friction tracks were made on crystals of rock salt by sliding a hemispherical steel specimen over the surface. Blackening of photographic plates (*Q*2 Ilford) only occurred after the deformed part of the surface had been exposed to the action of X-rays. The formation of the image is not due to the action of hydrogen peroxide (Russell effect), as is the case with certain abraded and evaporated metals[3], since the interposition of a sheet of mica did not prevent blackening. It was concluded that the blackening of the photographic plate was due to luminescence centres which were formed during the irradiation of the highly deformed surface layer in the friction track. Fig. 1(*a*) shows micrographs of three tracks on a rock salt crystal made under three different loads and Fig. 1(*b*) shows the record obtained. Apart from the three black bands corresponding to the three friction tracks, a fourth band is strongly evident from a track made in a previous experiment, which had been thought to have been completely removed by washing the crystal with water. The fourth band indicates that deformation during the friction experiment extended to great depth.

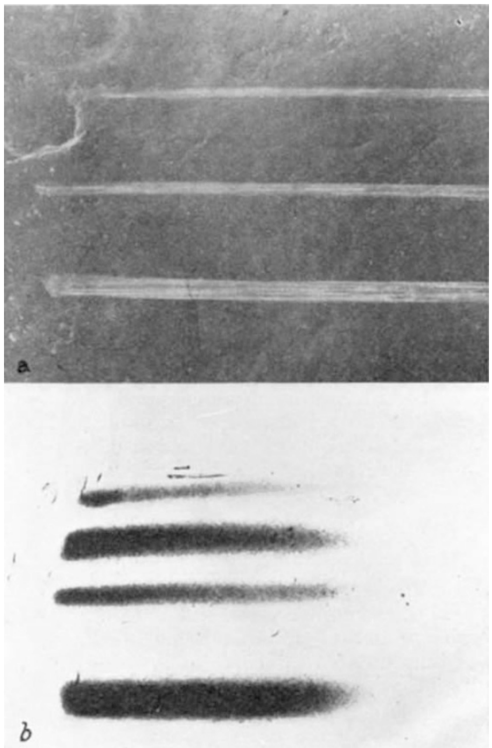

Fig. 1

From the response to photographic plates of various sensitivities, the range of wave-lengths within which the luminescence lies was estimated to be approximately 2000–3000 A., corresponding to a radiative transition of between 4 and 6 eV. This could be explained by a transition of an electron either from the *F*′-band to the valency band, or from the conduction band to an acceptor level of the V-centre type.

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