occur with both slices and homogenates. Under anaerobic conditions there is considerable conversion of DDT to DDD. A very small amount of DDE similar in magnitude to that found under aerobic conditions is also produced. The fact that the conversion to DDD still occurs after a homogenate has been maintained under nitrogen at 75° C for 10 min suggests that this may be a non-enzymatic reaction similar to that of DDT with reduced porphyrins recently described by Miskus, Blair and Casida[9]. Under aerobic conditions the overall reaction of DDT is much slower. A very small amount of DDE is produced unless reduced glutathione is included in the incubation medium, when a four- to six-fold increase in this conversion occurs. This reaction appears to proceed marginally better with homogenates than with slices. No other non-polar metabolite was found in any incubation and, despite a careful search in a separate experiment, neither was DDA. Some incubations using rat liver homogenate under the same conditions suggest that the same two pathways also operate, but that the formation of DDD is even more favoured under anaerobic conditions than in the pigeon, while the amount of DDE formed is slightly less.

Further work on the *in vitro* metabolism of DDT and its metabolites is in progress.

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BIOLOGY

Scanning Electron Microscopy of Biological Material

THE scanning electron microscope has been used for biological work[1,2] but in general the results were disappointing because of the poor contrast obtained with secondary or back-scattered electron read-out.

This communication reports some preliminary results obtained with a different contrast mechanism. In these experiments, the fine electron beam is scanned across the specimen and the light, excited by the beam at different points on the specimen, is detected on a photomultiplier and the signal obtained is used to build up the microscope image on the face of a cathode ray tube. This contrast mechanism has been used by other workers[2-4] for studying cathodo-luminescence but, as far as we are aware, it has not been used for biological applications.

Some biological material (such as cotton fibre) is cathodo-luminescent without any treatment; other material can be selectively stained with a cathodo-luminescent dye, such as thioflavin *T*, to render the material visible. Micrographs have been obtained under both conditions; Fig. 1 shows a micrograph of spinach leaf in which the dye, thioflavin *T*, is apparently selectively taken up on the cell walls and gives rise to the high signal from these regions. This conclusion was supported by a similar image obtained by visible light fluorescence microscopy. However, the advantage of the scanning electron microscope is that the ultimate resolution obtainable (about 100 Å)[5] is much higher than is possible with fluorescent light microscopy. At the present time,

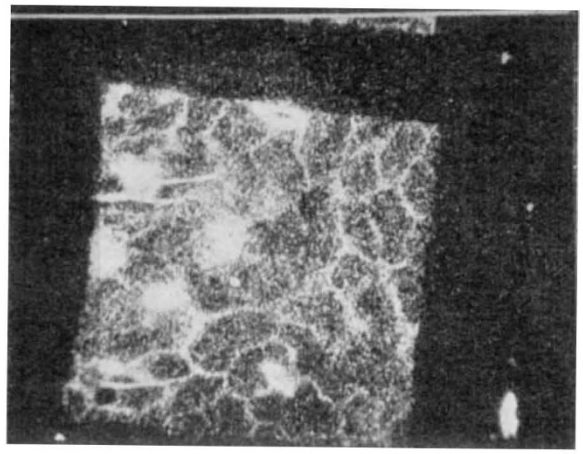

Fig. 1. Scanning electron micrograph of spinach leaf stained with thioflavin *T* using light collection only to build up the image. Beam current, $i = 10^{-9}$ amp; beam voltage, $V = 27$ kV; exposure time, 30 sec. (×240)

the highest useful magnification of scanning micrographs with this contrast mechanism is about 5,000 ×.

A number of problems are associated with this technique. The first is to ensure that the signal is due to light and not to scattered electrons. This has now been solved with a system of light collection that uses metallized mirrors. The second problem is to obtain sufficient signal to build up a useful image (see Fig. 1). This is not simply a question of focusing more electrons into the fine beam since 'poisoning' of the cathodo-luminescent material can occur and has been observed on a number of occasions with beam currents of the order of 10^{-9} amps. Hence, it may be necessary to use longer exposures (up to 30 min) and very stable power supplies for the electron optical column. As an alternative, stains may be found which are more resistant to electron bombardment.

If both these problems can be overcome, it should be possible to realize the potential of this method and to obtain micrographs showing resolution of a few hundred Ångstroms. An obvious extension of this technique is to identify different cathodo-luminescent materials by spectral analysis of the emitted light.

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Lift produced by the Heterocercal Tail of *Acipenser*

THE upward forces produced by the heterocercal tails of two species of Selachii, moving transversely through water at various speeds, have recently been measured[1]. It was found that the lift was approximately proportional to the 1·4th power of the transverse speed. The equilibrium of the fish, swimming horizontally, was discussed, and it was estimated that in each case the lift