Effect of Desiccation on the Humidity Response of *Tenebrio*

THE ecological significance of an experimentally demonstrated and strongly marked preference for low humidities shown by certain arthropods has recently been discussed by Smith¹. *Tenebrio molitor* L. is one insect the behaviour of which in humidity gradients has been fully studied and which shows a well-defined dry preference²⁻⁴. In laboratory cultures of adult *Tenebrio*, however, we have frequently observed that, if a wad of wet cotton-wool be placed in the culture dish, the animals rapidly accumulate on the wool and drink. It is thus clear that the dry preference does not express itself in all conditions.

We have investigated the effect of desiccation upon the intensity of the humidity response of this insect, using a technique similar to that employed by Gunn and Pielou². All experiments were carried out at 25° C. under artificial light and with a gradient of 93-44 per cent relative humidity. Animals from stock cultures maintained at the experimental temperature were placed in dishes containing damp cotton-wool for a period of 12 hr.; the intensity of their humidity preference was determined and they were then desiccated over calcium chloride. The intensity of their response was redetermined after 40 and 80 hr. At the end of this period the animals were returned to the dishes containing the damp cotton-wool and, after a period of 40 hr., their response was again assessed. The results obtained are shown in curve A of the accompanying graph, which is based upon seven independent experiments.

It will be seen that there is a change in the humidity preference as the desiccation proceeds. Once the animals are allowed renewed access to water, the original dry preference is shown. There is no sig-

nificant difference between the reaction intensities of watered animals before and after the period of desiccation. This eliminates the possibility that starvation has contributed to the changing pattern of humidity behaviour, as has been found by Willis and Roth⁵ in *Tribolium*.

Gunn and Pielou were able to show that the receptors responsible for the initiation of the dry preference of *Tenebrio* lay in the antennæ. Over a short gradient of 100-94 per cent relative humidity they found no response to humidity by animals lacking antennæ. We have been able to confirm this observation. We find, however, that with the wide gradient of 93-44 per cent relative humidity a wet preference is exhibited. The intensity of this preference is but slightly affected by desiccation. Although the intensity of the final wet preference of normal desiccated animals is slightly greater than that of comparable animals without their antennæ, we are unwilling to conclude at the moment that any specific sense organs concerned with a wet preference lie on the antennæ. It is clear, however, that such sense organs must exist elsewhere on the body.

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¹ Smith, A., *Bull. Ent. Res.*, **42**, 535 (1951).

² Pielou, D. P., and Gunn, D. L., *J. Exp. Biol.*, **17**, 286 (1940).

³ Pielou, D. P., *J. Exp. Biol.*, **17**, 295 (1940).

⁴ Gunn, D. L., and Pielou, D. P., *J. Exp. Biol.*, **17**, 307 (1940).

⁵ Willis, E. R., and Roth, L. M., *J. Exp. Zool.*, **115**, 561 (1950).

Effect of desiccation upon the humidity preference of adult *Tenebrio*. Black circles, normal animals; open circles, animals without antennæ. Reaction intensities of less than 50 indicate a dry preference; greater than 50 a wet preference. The lines running through the points indicate twice the standard errors of the mean values

Evaluation of Small Radii of Curvature using the Light-Profile Microscope

THE light-profile microscope described by Tolansky¹ is being applied in this laboratory to several fields, including the study of features of crystal growth², the measurement of the thickness of thin film³ and evaluation of amplitudes of oscillation⁴. In this communication a brief description is given of a further application, whereby the radii of curvature of small spheres, droplets, cavities, etc., can be readily measured.

When the light profile passes over a curved surface, a curved profile line appears in the field of view, a spherical surface leading to a profile which approximates to part of an ellipse, the eccentricity of which is determined by the ratio of the magnifications in extension and in depth. From the curved profile and the known magnifications, the curvature of the surface can be evaluated. (Depending on the flatness of field of the particular objectives available, it may in individual cases be necessary to determine field curvature and correct for this—an easy matter.)

The reliability of the procedure has been tested by using it on a steel ball-bearing of radius 0.6 mm., for with such an object Newton's rings can readily be obtained to give a precise local value of curvature. Furthermore, a principal advantage of the light profile is the availability of high power. The steel ball was placed on a cover slip and examined with λ 5,461 at $\times$ 875 (4-mm. objective). Newton's rings are seen in Fig. 2. Fig. 1 shows the light profile at $\times$ 450 in extension. The optical arrangement suited to the light profile is not the best for interferometry,