moving during the exposure either will be blurred on the negative or, as is usually the case, will not show at all. A record is therefore obtained of the number of stationary insects during the exposure. Fig. 1 shows two sample photographs. The greater number of visible insects in the first exposure indicates the smaller amount of activity; conversely, fewer visible insects in the second exposure indicates a higher level of activity.

The frequency of exposures is determined by the nature of the experiment. In the present work at least two kinds of series are used. In one, a group of photographs (usually 12–14) is made automatically with 1-min. intervals, every 2 hr. The results from each group are averaged, and the total number of insects minus this mean is plotted against the mean time at which the photographs were taken. In a type of experiment where more rapid activity changes are expected, one exposure is made every 2 min. throughout the test period. The negatives on the long strip of 35 mm. film (25 ft. for 6½ hr.) are examined with a dissecting microscope and the number of stationary insects in each exposure is determined. Fig. 2 indicates increasing, somewhat rhythmic, activity for 15 starved adult *D. melanogaster* over a period of 5 hr. in constant illumination.

This method provides rapid and accessible records of: (1) the number of insects stationary during each exposure; (2) their positions in relation to special items, such as the food supply. Both kinds of results are readily obtained from each exposure as an individual unit without comparing adjacent pairs. Some effects on activity of varying periods of light and dark may possibly be studied with this technique by timing the light source to remain on only during the 1-sec. exposure and by varying the experimental lighting conditions. The method should prove useful in studies with other small animals besides insects. A report of the present studies of insect activity in relation to the local passage of weather systems will be presented later.

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## Photochemical Reduction of Blue Tetrazolium by Isolated Chloroplasts

The use of oxidation-reduction colour indicators the solubility of which is unchanged during reduction in the Hill reaction of photosynthesis provides no information as to the site in the chloroplast in which the reaction occurs. Dyar[1] used blue tetrazolium, which is colourless and soluble in the oxidized form in water but insoluble and highly coloured when reduced, to localize regions of dehydrogenase activity in plant cells. In chloroplasts reduction was apparently confined to grana-like bodies. In some materials the reaction was dependent on light, suggesting a relation to the Hill reaction. Since non-plastid cytoplasm may have contributed to the reaction, we were interested in whether isolated chloroplasts were capable of reducing the dye.

Intact chloroplasts were isolated from red kidney beans essentially by Jagendorf and Evans's method[2]. The isolation buffer consisted of 0·3 *M* sucrose, 0·05 *M* *p*H 8·5 phosphate and 0·01 *M* potassium chloride. 5 gm. of interveinal tissue from primary leaf blades of red kidney beans were ground with 15 ml. buffer for 20 sec. in a Waring blendor, model *PH-5*, in the high-speed position. The homogenate was filtered through cheese-cloth, and the filtrate centrifuged for 3 min. at 1,000*g*. The resulting pellet, consisting mainly of whole chloroplasts, was made up to the original volume with *p*H 6·5 *M*/10 phosphate buffer. Equal volumes of the chloroplast suspension and Dyar's blue tetrazolium solution were mixed in Thunberg tubes and, after evacuation, incubated at 32° C. for 1 hr. in a water-bath, either in the dark, or illuminated at 20 cm. from a 100-W. incandescent bulb.

Reduction of the chemical, indicated by the development of a deep blue colour, was confined to grana-like structures, as in the chloroplasts in cells pictured in Dyar's article. The reaction was dependent on light, as was the staining of chloroplasts in intact mesophyll cells when small pieces of leaf were incubated with the blue tetrazolium solution.

Irradiation of chloroplast preparations 5 cm. from an *SL* 2537 'Mineralight' ultra-violet lamp (UV Products, S. Pasadena, Calif.) for 30 min. prevented development of colour.

These results extend Dyar's observations on reduction of blue tetrazolium to isolated chloroplasts, and suggest that the reaction may prove useful as a sensitive test of the structural integrity of chloroplasts during fractionation.

This work was supported in part by U.S. Public Health Service grant *E*-596*C* to one of us (M. C.).

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## Physiological Races of *Phytophthora infestans* Mont. (de Bary) in Northern Ireland

The presence of several races of the blight fungus, *Phytophthora infestans*, was recorded in Northern Ireland by Doling[1]. Races commonly occurring in commercial crops were race 0 and race 4, the latter predominating. However, from hybrids of *Solanum demissum* × *Solanum tuberosum* further races were identified as follows: race 1; race 2; race 1, 2; race 1, 4; and race 1, 2, 4.

During the past season, because of suitable weather conditions (Table 1), the spread of potato blight was extremely rapid, and damage to the commercial crop was extensive. At the Plant Breeding Station, Loughgall, many seedlings which had been free of blight in previous years were attacked. These included seedlings bred from parental material carrying one or more of the four major *R* genes.

Table 1. Weather Records, Loughgall, 1958

| Data | June | July | August | September |
|---|---|---|---|---|
| Mean maximum temperature (° F.) | 62 | 66 | 64 | 64 |
| Mean minimum temperature (° F.) | 48 | 51 | 51 | 52 |
| Mean relative humidity (per cent) | 82 | 82 | 84 | 89 |
| Total rainfall (in.) | 4·99 | 5·47 | 3·54 | 3·23 |
| No. of days with 0·01 in. or more precipitation | 20 | 23 | 22 | 20 |
| Total sunshine (hr.) | 113·2 | 143·5 | 107·9 | 89·1 |