Summary of data on egg-laying capacity, egg-to-adult viability and sex-ratios of *Drosophila pseudoobscura* injected with 0.4 µl of a 10 µg/ml of a buffered-saline solution of LSD-25, BOL, or D-Lysergic acid

Treatment	Total No. of flies tested	Total No. of eggs laid	Range	Flies laying (%)						Average No. of eggs/fly	Adult ♂♂ emerging	Adult ♀♀ emerging	Not emerging (%)
				0–99 eggs	100–199 eggs	200–299 eggs	300–399 eggs	400–499 eggs	500–599 eggs				
Saline	55	16,820	69–548	3.6	21.8	25.5	18.2	23.6	7.3	306	6,837	7,319	15.8
LSD-25	56	17,995	68–494	1.8	7.1	35.7	25.0	30.3	0.0	322	7,275	7,767	16.4
BOL	58	14,626	0–444	5.2	18.9	39.6	27.6	3.4	0.0	252	5,685	5,545	23.2
Lysergic acid	55	10,897	30–378	7.2	40.0	50.9	1.8	0.0	0.0	198	4,553	4,683	15.2

Data on buffered-saline injected controls are included.

which detected offspring wastages in *Drosophila*[17–19] have utilized doses much higher than those used in our experimentation. This may be one of the reasons for the difference in results. It must be remembered, however, that in every case (including our experiments) the doses administered to the animals were much higher per gram of body weight than those taken by human users. The last statement must not be taken as meaning that the drug should be considered safe to use. Nothing is known about its metabolic fate in *Drosophila*, and there is a considerable body of information from mammalian systems to cause concern.

Although our data do not show effects of LSD-25 they certainly show effects of the other 2 chemically related compounds. Attempting to make any kind of generalizations and derive definite conclusions from these results should, again, be considered premature. One can state only the obvious and this is that both D-lysergic acid and BOL influence the egg-laying capacity of our experimental animal; the latter compound also appears to exercise a significant influence on egg-to-adult viability among the offspring of the treated individuals. Here again, detailed metabolic studies are needed to determine what is the part of these molecules that creates these effects[23].

Résumé. On a injecté du LSD-25, de l'acide bromolysergique-diéthylamide et de l'acide D-lysergique à des *Drosophila pseudoobscura* au troisième stade larvaire. Le LSD-25 n'affecte ni leur capacité de ponte, lorsqu'elles sont adultes, ni la viabilité (rapport numérique adultes/œufs) de leur progéniture. En revanche, la capacité de ponte est réduite tant par l'acide lysergique que par l'acide bromolysergique-diéthylamide, et ce dernier altère en outre la viabilité.

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Ant Compound Eye: Size-Related Ommatidium Differences Within a Single Wood Ant Nest

The worker population of a red wood ant nest provides a unique opportunity for investigating the effects on behavior of naturally occurring quantitative differences in neural and sensory structures. A relationship has been isolated between the size of these workers and the efficiency with which they learn to navigate terrain while foraging for colony food[1]. It was found for workers from a nest of Swiss red wood ants (*Formica rufa*), that the larger the head and such structures as the corpora pedunculata of the brain (supraesophageal ganglion) and the compound eye, the more efficient the foraging behavior.

It is thought that workers from a single nest have similar genetics, and that worker size is a function of seasonal factors such as temperature and food supply during critical growth stages[2–4]. The population is continuously distributed in size, without distinct morphological subgroupings (castes), and adult size is not related to age. Workers at all size levels forage for food in the terrain surrounding a nest, navigating by means of sequences of visual, chemical and tactile information[5,6].

One mechanism by which size could influence navigation efficiency would be through increases in the number of component elements in the visual and other information processing systems. While it is known that the number of components in the compound eye and other sensory and neural structures is greater in larger species of ants and other insects than in smaller related species[7–9], we know of no data on such size differences within the worker population of a single ant nest.

The object of the present study was to determine whether such quantitative differences occur in the compound eye as size increases within the worker population of a nest of California red wood ants (*Formica integroides*). The species is similar in behavior and morphology to the Swiss ants used in the size-efficiency study. The subjects were 67 adult workers taken from collections made in late summer and fall from a single isolated nest, with the selection made to achieve a distribution over the size range.

Three measurements were taken on each ant from standard photographs made of head and eye preparations. These measurements were: 1. a planimetric measure of head surface area (Figure 1A); 2. the length of the right compound eye (Figure 1A); and 3. the number of ommatidia in the right compound eye (Figure 1B). The ommatidia were counted from photographs of an impression of the eye made by covering it with a collodion-ether (50:50 v/v) mixture, allowing the mixture to peel away from the surface, and then photographing it with the external surface of the impression facing the objective, using a Leitz Ortholux microscope and point source illumination from below. This method eliminates depth of field problems that are inherent in photographing the eye itself, and it can be used on living and intact specimens.

In addition to these measures, the mean ommatidial lens diameter was determined for a second sample of 20 ants from this population. For these, after the standard head area measure was taken, the right compound eye was excised and a central group of ommatidial lenses photographed. Diameters for each lens were then measured from the photograph, and the mean diameter calculated.

The relationships of these 3 compound eye parameters to head area are shown in Figure 2. It is seen that each parameter increases with head area, and correlation analyses (product-moment correlation coefficient) indicates significant relationships in each case (for ommatidium number, $r = 0.94$; for eye length, $r = 0.92$; for lens diameter, $r = 0.84$; $p < 0.001$ in all cases). Visual inspection of the results of a least-squares regression analysis for ommatidium number and eye length (Figures 2, A and B) indicates that the relationships are actually curvilinear, and suggests that these parameters may reach an asymptote at head area values of 1.25 to 1.50 mm^2.

While we know of no previous data for a single ant nest on relationships between eye component dimensions and size, there is precedent for intra-nest comparisons between gross organ size and total size[1,2,10]. Similar curvilinear relationships have been found.

It has been shown previously for insects that both environmental and genetic factors can affect compound eye dimensions. Thus, for *Drosophila*, it has been found that number of ommatidia can be influenced by temperature conditions during larval growth stages[11]. It is also known for related species of ants[7], *Hymenoptera*[8], and other insects[9], that as body size increases across species there is correlated increase in the size and number of ommatidia. It has been suggested for these interspecies results[8,12] that the size correlated increases produce greater sensitivity (larger ommatidia) coupled with

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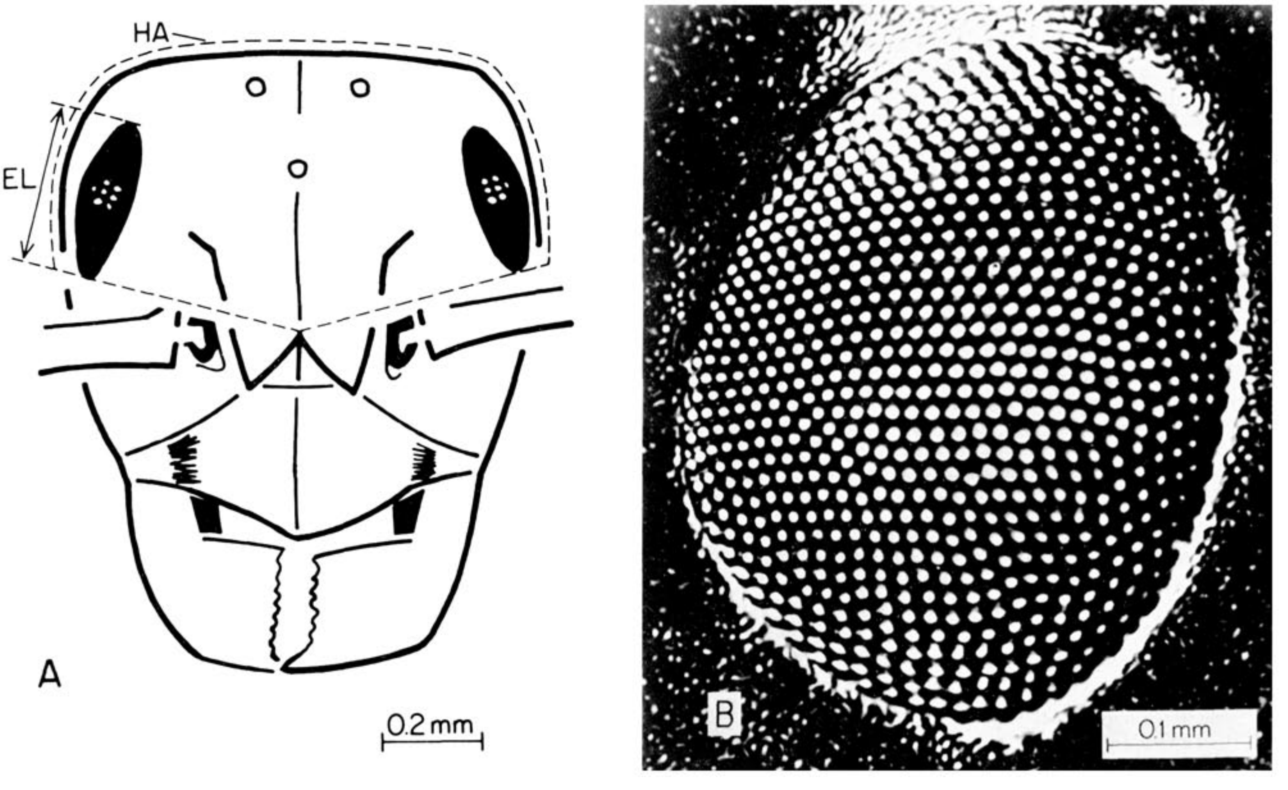

Fig. 1. A) Antero-dorsal view of red wood ant head, showing the planimetric head area measure (HA-within dotted lines) and the measure of compound eye length (EL). B) Photograph of collodion imprint of right compound eye, where circular dots are light images produced by ommatidial lens impressions.

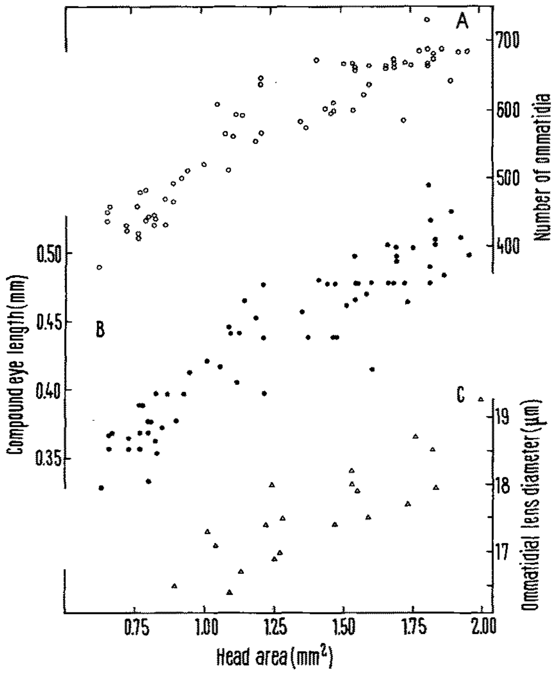

Fig. 2. Scatter plots of eye-head relationships, with eye parameters on the ordinate and head area (mm^2) on the abscissa. A) (open circles) Number of ommatidia vs. head area. B) (filled circles) Compound eye length (mm) vs. head area. And C) (open triangles) ommatidial lens diameter (μm) vs. head area.

increased acuity (larger number of ommatidia in a given visual angle). If this interpretation is applicable to the worker ant population from a single nest it could be an important factor in the previously reported correlations between worker size and foraging navigation efficiency[1].

Résumé. Pour compter le nombre de facettes de l'œil composé de la fourmi, une nouvelle méthode a été mise au point en utilisant des photographies d'empreintes de collodion. Dans une population d'ouvrières provenant d'un seul nid de fourmis rouges lignicoles, le nombre et le diamètre des facettes augmentent avec la grosseur de l'œil et de la tête. Pour une telle population il y a une relation entre la grosseur des tissus neuraux et sensoriels, l'œil composé inclus, et l'efficacité avec laquelle une fourmi ouvrière parcourt le terrain en cherchant de la nourriture.

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Induced Production of Cleistothecia in *Aspergillus unguis*

The members of the *A. nidulans* group of RAPER and FENNELL[1], excepting *A. unguis*, are characterized by the prolific production of cleistothecia in culture. These authors, therefore, cast an aura of serious doubt on the validity of the species *A. unguis*, as inscribed below: 'The discovery of occasional cleistothecia and ascospores in a culture with structural pattern and general morphology of *A. unguis* raises some doubt concerning the validity of this species, particularly when the ascospores exhibit the general pattern of those present in *Aspergillus nidulans*. We believe, however, that the species *A. unguis* should be retained, at least for the present, to include the numerous strains belonging to the *A. nidulans* group, which grow restrictedly on many substrata, produce long sterile spicular hyphae, and are commonly isolated from soil and from situations indicating at least secondary pathogenicity.'

In this paper, the authors report the composition of a modified version of the normal Czapek's medium (Table I), which successfully permits the induction of cleistothecia in the normally asexually reproducing cultures of *A. unguis*, with the result that the retention of the species *A. unguis* in the nidulans group becomes entirely redundant.

Materials and methods. The culture of *A. unguis* figuring in this experiment was from KAKKAR's personal collection (No. RBK/301), and was originally isolated from heavily manured soil, but it is of interest to record that, during its entire period of retention under cultural conditions, it failed to produce cleistothecia and ascospores, in contrast to Strain WB 2393 of RAPER and FENNELL[1] described above.

Our previous investigations have already established[2] that the 2 genotypes in *Aspergillus* species can be conveniently grouped with regard to caffeine sensitivity, under 2 distinct heads, viz., 1. the caffeine-resistant (CR) and 2. the caffeine-sensitive (CS). Both *A. nidulans* and *A. unguis* display, under controlled cultural conditions, a slow but definite growth pattern on caffeine reinforced medium, thus showing, that they are definitely CR. This response was obtained even at the abnormally high concentrations of caffeine viz., at 6 to 10 g/l during the incubation period of 45 days.

The medium was accordingly modified, and the modified Czapek's medium containing sucrose, 10 g; KH_2PO_4, 1 g; $NaNO_3$, 3 g; KCl, 0.5 g; $MgSO_4$, $7H_2O$, 0.5 g; $FeSO_4$, 0.01 g and caffeine 6 g/l, with pyrex-thrice-distilled water

Table I. Constitution of modified Czapek's medium reinforced with caffeine

Medium (g)	
Sucrose (10)	$FeSO_4$ (0.01)
KH_2PO_4 (1)	Caffeine (6–10)
$NaNO_3$ (3)	
KCl (0.5)	Pyrex thrice distilled water
$MgSO_4$, $7H_2O$ (0.5)	up to 1 l

pH of the medium, 6.5.

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