This relation between energy and acuity held with steady fixation, but it did not hold with a moving fixation target. Thresholds obtained with the 99 msec flash were greatly increased during visual tracking, and vertical thresholds became much higher than horizontal ones. In contrast, when the 1-μsec flash was used there was a maximum increase of less than 1 min with no separation between horizontal and vertical thresholds.

Tracking the target naturally causes motion of the acuity object's image on the retina. Since there is a lag in the visual response to the changing pattern of retinal illumination, the acuity object looks blurred. Horizontal movement makes the horizontal stripes appear longer and dimmer. Resolution of vertical stripes is affected more than that of horizontal ones because light from the vertical stripes is spread, in effect, over the dark spaces between them, thereby reducing contrast as well as brightness.

The smaller effect of ocular pursuit at higher luminances may be related to the fact that the acuity loss caused by a given decrement in brightness is smaller at high luminances than at lower ones (*5*). Over a certain range of high brightness, visual acuity is not altered by varying luminance. Faster discrimination of the moving image may also reduce the effect of eye movement at higher brightnesses. The perception of flicker presents a similar case of improved temporal resolution accompanying increased luminance (*6*).

The stroboscopic flash minimizes the effect of eye movement by virtually stopping motion of the retinal image. During the 1-μsec exposure the acuity object's image moves hardly any distance at all on the retina. Hence threshold was constant under varied target speed.

The reason that equal increments in target speed have less effect at higher speeds is probably that they do not produce corresponding increments in speed of eye movement. The eye can make smooth following movements at velocities up to about 30° per second, but at higher target speeds sustained pursuit motion becomes increasingly slower than target speed (*7*).

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22 November 1961

Mating Competitiveness of Chemosterilized and Normal Male House Flies

Abstract. Male house flies sterilized by feeding on a diet containing 1 percent of apholate (2,2,4,4,6,6-hexa(1-aziridinyl)-2,4,6-triphospha-1,3,5-triazine) were as successful as normal males in competition for mates. The percentage of sterile eggs laid by females in cages containing normal and chemosterilized males was as high as, or higher than, would be expected from the ratio of sterile males present.

Insect control by means of sterilization has received much attention in recent years, and the release of sterilized males has been used in screw-worm eradication (*1*). Sterility in insects has been achieved primarily through irradiation, but recently chemicals producing this same effect have been found and possibilities of using them have been discussed (*2, 3*). Laboratory and initial field studies (*4*) have indicated the possibility of using chemosterilants to control house flies [*Musca domestica* (L.)], but much remains to be learned about the effects of these compounds on the behavior and physiology of the insects. One important aspect to be considered is the sexual competitiveness of chemosterilized males. According to Bushland (*5*) gamma irradiation does not affect the mating of sterilized screw-worms, but Davis *et al.* (*6*) found that radiosterilized male mosquitoes are not as competitive as normal males.

To determine the effect of chemosterilants on the mating behavior of house flies, experiments were conducted with male flies sterilized with apholate (2,2,4,4,6,6-hexa(1-aziridinyl)-2,4,6-triphospha-1,3,5-triazine). The male flies were isolated from the females and, for the first 3 days after emergence, they were given food (6 parts of sugar, 6 parts of powdered milk, and 1 part of powdered egg) which contained 1 percent of apholate; for the next 2 days they were given untreated food. On the fifth day the sterilized males, and/or normal 5-day-old males that had also been isolated from females but had been given only untreated food, were placed in cubic mating cages 4 feet square. To give both types of males an equal opportunity for initial mating, all males in each cage were given 30 minutes to become oriented before the 5-day-old virgin females, which had been

Table 1. Fertility of normal female house flies caged with normal and/or chemosterilized males at various ratios.

Ratio*	Number of females	Number of egg masses	Eggs per mass	Number of pupae	Percentage of egg masses with > 20% sterility	Percent sterility†
			Series 1			
0 : 1 : 1	80	61	82		15	12
1 : 1 : 1	40	50	85		62	66
1 : 1 : 2	30	18	93		100	69
2 : 1 : 1	53	29	73		93	92
3 : 1 : 1	35	14	126		100	98
5 : 1 : 1	30	18	92		100	100
10 : 1 : 1	30	19	141		100	100
1 : 0 : 1	20	26	67		100	100
			Series 2			
0 : 1 : 1	20			265		0
5 : 1 : 1	20			11		96
10 : 1 : 1	20			0		100
			Series 3			
0 : 1 : 1	20			2141		0
1 : 1 : 1	20			1168		46
1 : 1 : 1	20			665		69
2 : 1 : 1	20			610		72
3 : 1 : 1	20			275		87
1 : 0 : 1	20			0		100

* Chemosterilized males : normal males : normal females. † Based on all eggs in series 1 and on the number of pupae produced by flies in control cage containing only normal males in series 2 and 3.

given only untreated food, were released in the cage. Each cage contained from 15 to 20 females. Different ratios of sterilized or normal males were used to establish the desired competitive ratio. Four groups of tests were made; each group included a cage containing only normal males to provide information on the normal oviposition and hatching rates, and several cages containing various ratios of chemosterilized males to normal males. A cage that contained only chemosterilized males demonstrated the adequacy of the treatment.

Oviposition medium in the form of aged larval rearing medium was made available to the females for 4 hours once a week for 3 weeks. The moist medium was wrapped in black cotton cloth and partially encased in a 9-dram pharmaceutical vial, then placed in an 8-oz drinking glass. Twenty glasses were placed in each cage; the cages were kept under close observation, and whenever a female entered a glass the glass was immediately covered with a Petri dish so that the egg clusters of individual females could be examined separately. Occasionally two females entered the glass and were trapped at the same time. Two hours later the females were released into the cage and the containers of medium on which egg masses had been laid were moistened and held for 48 hours. After this interval the number of eggs and the percent hatch in each mass were determined. The effect of the sterile males in the population on the fertility of the females was judged by two criteria: (i) the percent sterility among all the eggs laid by all females in the cage and, (ii) the number of individual females that laid egg masses containing an abnormal proportion of sterile eggs (more than 20 percent, based on 12-percent sterility among normal eggs). The results are given in Table 1, series 1.

The average sterility among eggs laid by normal males and females was 12 percent, and 15 percent of the individual egg masses contained more than 20 percent sterile eggs. When chemosterilized males, normal males, and normal females were present at various ratios from 1:1:1 to 10:1:1, the proportion of sterile eggs exceeded that expected from the proportion of chemosterilized males present, as indicated by the following comparison of the induced sterility (actual sterility adjusted by Abbott's formula to compensate for 12-percent sterility occurring in the checks) and the expected sterility (in parentheses): 1:1:1, 61 (50); 1:1:2, 64 (50); 2:1:1, 91 (67); 3:1:1, 97 (75); 5:1:1, 100 (83); and 10:1:1, 100 (91).

The same trend was exhibited by the percentage of egg masses in each group containing more than 20 percent sterile eggs.

Additional experiments were made by a slightly different technique. When the flies in the mating cages were 8 to 10 days old, a quart container of larval rearing medium was presented for oviposition. Twenty-four hours later the medium was examined for eggs. If the number of eggs appeared normal, as compared with the number from cages containing only normal males, the medium was held for larval and pupal development. The percent sterility was estimated from the number of pupae obtained from normal males and from mixtures of normal and chemosterilized males. The results are given in Table 1, series 2 and 3. In these tests also the percent sterility was as high as, or higher than, that which would be expected from the ratio of chemosterilized males present.

In most of the experiments, the percentage of sterile eggs produced by normal females exposed to both normal and chemosterilized males exceeded the expected level. The only exception was the 46-percent production of pupae in comparison with controls obtained in one of two tests in which the ratio of sterile to fertile insects was 1:1:1 (1 sterile male, 1 normal male, and 1 normal female). In all other tests the level of sterility was in excess of the expectancy level.

It is difficult to explain these results. The chemically sterilized males may be more vigorous sexually than normal males or mating by sterile males may in some way tend to nullify the effects of prior matings by normal males. At any rate, the results are extremely encouraging in that they suggest that chemosterilized males are at least as competitive as normal males in mating with normal females. In order to realize the theoretical advantage in population control over that obtained by killing organisms, it is essential that sterility be produced in the organism without adversely affecting sexual vigor or behavior, as pointed out by Knipling (*2*). If subsequent investigations under field conditions substantiate the greater-than-expected results obtained in the laboratory, the chemosterilant approach to fly control should offer unusual opportunities for success provided practical and safe ways can be developed to achieve sterility in a substantial part of the total population (*7*).

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10 January 1962

Petrofabric Study of Deformed Salt

Abstract. Petrofabric examination of salt crystals in Grand Saline salt dome reveals a preferred orientation that may bear significantly on other physical properties and on the genesis of salt domes. The symmetry of the orientation patterns indicates that translation gliding in halite may occur predominantly on cubic glide planes.

A petrofabric study has been made of six oriented salt samples from the Morton Salt Company mine in Grand Saline salt dome, 65 miles east of Dallas, Texas. Previous studies of the internal structure of this dome include the work of Robert Balk (*1*) and more recently that of W. R. Muehlberger (*2*), as the mine works have expanded. The three perpendiculars, or poles, to the cleavage faces of each salt crystal were measured on a specially designed type of reflection goniometer, plotted on Schmidt equal-area nets, and contoured in the conventional manner. The orientation patterns consist of sets of three maxima, 90 degrees apart, representing groups of cubes with nearly the same relative orientation.

Dark, anhydrite-rich bands of salt in the dome strikingly indicate the flow structure, which consists principally of isoclinal folds plunging nearly vertical-