1970; Cleworth, 1969) have suggested that "turning-off" may serve as a submissive signal. Certainly incidental observations confirm that the extent of aggression shown is greatly reduced when the opponent is electrically silent. We now feel that this work, in conjunction with our previous paper, in which stable groups were established, provides strong evidence for social communication in these animals via an electrical channel.

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Changes in preference for cage environments following habituation and shock in the Mongolian gerbil*

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Twelve Mongolian gerbils were given daily tests of their preference for their own familiar vs other novel litter environments. The gerbils showed a striking preference for the home environment which gradually declined over 6 days of testing. The home litter preference was reinstated following aversive stimulation. The data are discussed in terms of habituation, dishabituation, and fear. Some incidental observations on depth perception in this species are also reported.

Preliminary to a laboratory investigation of intraspecific aggression in the Mongolian gerbil *(Meriones unguiculatus),*[1] it was decided to ascertain whether gerbils would recognize and prefer their own litter environment to others'. If a definite preference were indicated, would it decrease or "habituate" upon repeated exposure? Were such a decrement to occur, would the initial preference be reinstated following aversive stimulation?

*We are indebted to Dr. Gordon G. Gallup for his comments and suggestions.

SUBJECTS AND MAINTENANCE CONDITIONS

The Ss were 12 Mongolian gerbils which comprised three natural litters of four animals each. Litters X and Z contained three males and one female each; Litter Y contained four males. The animals were 90-120 days old at the time of testing and were all experimentally naive. The litters were housed separately in clear plastic compartments, 15 x 11 x 8 in., with ¼-in. hardware cloth tops. Wood shavings covered the compartment bottoms. Ad lib food and water conditions were maintained throughout the experiment.

APPARATUS

A preference apparatus and a shock-administration apparatus were employed. The three plastic housing compartments described above served as the bases of the preference apparatus. Each litter compartment was fitted with a cover made of ¼-in. hardware cloth. Three platforms of size equal to that of the compartment covers were then constructed out of the same material. The platforms were separately suspended by pulley systems 1/8 in. above each covered litter compartment. In order to ensure that the platforms remained stationary above their compartments, small strips of latex rubber were employed to attach the corners of each platform to the corners of each associated cover. The platforms and compartment covers were connected to relays in such a manner that any pressure exerted on a given platform by the weight of an S would complete a circuit that activated one of three electric timers corresponding to the litter above which the S was situated. The amount of time S spent above each litter environment was thus automatically accumulated.

The shock-administration apparatus was a commercial operant-conditioning chamber (Lehigh Valley Model 1578) with stainless steel grid bars.

PROCEDURE

The three litters were housed in their respective compartments for 3 days prior to testing. The tails of the Ss were marked so that individuals could be easily recognized and individual preference records maintained.

All Ss were given daily litter-preference tests on Days 4-11. A test consisted of placing an individual gerbil upon the platform of the leftmost compartment and starting a 10-min trial timer. The gerbil could then move freely from platform to platform (which were spaced about 1/8 in. apart). Only very rarely did a gerbil leave the platforms themselves, but rather spent its 10-min session moving from platform to platform, sniffing the compartments and the perimeter of the platforms. At the time of testing, each compartment contained three of the four original inhabitants, two of the remainder being placed in individual cages awaiting their test trials, and the final S being placed on the platforms. To avoid any spatial bias, the positions of the litter compartments beneath the platforms were

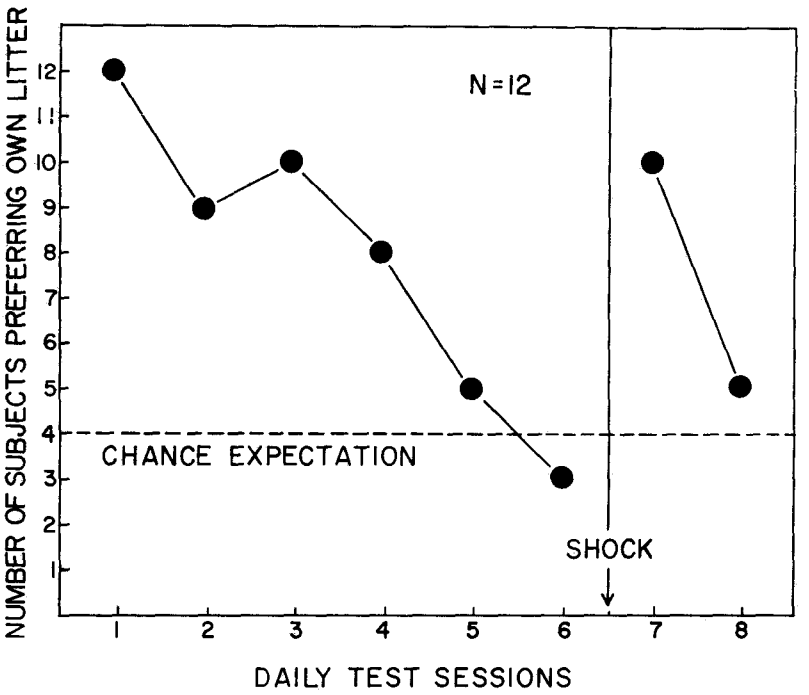

Fig. 1. Number of Ss preferring their own to other litter environments (N = 12). Aversive stimulation administered immediately before seventh test session.

randomized each day.

On Day 10, immediately before its preference test, each S was given an inescapable shock in the operant chamber. The shock was 1.0 mA in intensity and 30 sec in duration. The S was left in the shock chamber for 1 min following the shock and then was tested on the preference platforms as usual. A final preference test, without preceding shock, was administered 24 h later on Day 11.

RESULTS

A gerbil was said to have preferred a given litter if it spent a greater number of minutes above that litter than above any other. In Fig. 1 the number of Ss (out of 12) preferring their own litter is plotted as a function of daily testing sessions. Preference for the "home" litter is greatest on the first test and declines consistently to a low-chance level on the sixth testing day. The preference for home vs other litters is statistically significant for the first four tests. Data and significance tests for all test trials are given in Table 1.

Table 1
Gerbil Preferences for "Home" and "Other" Litter Environments

Test Session	"Home"	"Other"	χ^2	p
1	12	0	24.00	<.01
2	9	3	9.38	<.01
3	10	2	13.50	<.01
4	8	4	6.00	<.05
5	5	7	0.37	>.05
6	3	9	0.37	>.05
7	10	2	13.50	<.01
8	5	7	0.37	>.05

Note–Expected chance frequency distribution of home : other = 4 : 8.

The application of electric shock resulted in a reinstatement of the preference for the home litter, when the test was given 1 min following shock. On the final test, 24 h following shock, preference returned to the chance level.

DISCUSSION

The present results suggest that the gerbil both recognizes and prefers the familiar home litter environment. The cues mediating this behavior, although not as yet identified, are probably olfactory. It is most unlikely that a sebaceous scent marking made on the platform itself by the gerbil being tested mediated the preference behavior, since the same platform covered different compartments in a random order. The decline in home litter preference from the first to the sixth test resembles the familiar function associated with the "habituation" phenomenon. The animals spent increasingly less time above their home litters, the remaining time being spent, approximately equally, above the two unfamiliar litters.

The previously declining preference was significantly reinstated by aversive stimulation. The present design is not appropriate for a determination of whether the increment in preference on the seventh test was an instance of "dishabituation," which might have been produced by any novel stimulation or change in conditions, or instead may have resulted from increased "fear" induced by the electric shock. In this connection it is interesting to note that fearful rats have been shown to prefer a familiar stimulus, while nonfearful rats prefer a novel stimulus in preference tests (Dember, 1956; Thompson & Higgens, 1958). Leventhal & Killackey (1968) have found this preference for a familiar compartment in frightened rats to be increased by the injection of adrenalin. It is thus possible that the observed decrement in preference for the familiar litter in the present study may have been due not to habituation to the familiar compartment itself, but rather to a gradual decline in fear evoked by the general testing situation.

Thiessen et al (1968) have reported that gerbils appear to be deficient in depth perception. Our incidental observations during the course of this experiment do not support that conclusion. The gerbils rarely, if ever, fell from the platforms used in testing and showed appropriate behavior at the edges of the platforms. Thiessen et al's conclusion seems valid in the case of *visual* depth perception in vibrissaeless animals, as measured on a visual cliff. With vibrissae intact, and given a running surface of some texture, gerbils appear to "perceive depth" quite well.[2] We, too, occasionally have observed gerbils fall from solid surfaces and high places, but only when these surfaces were quite smooth.

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NOTES

1. Ginsburg, H. J., & Braud, W. G. A laboratory investigation of aggressive behavior in the Mongolian gerbil *(Meriones unguiculatus)*. In preparation.

2. Since the writing of this paper, a number of formal reports of visual and tactual depth perception in the gerbil have been published that are consistent with the informal observations made here. See, for example, Cole & Topping, 1969.