fed on a cow which had a serum agglutinin titer of $10^{-4.6}$ against a strain of the *T. brucei* subgroup: *Anopheles (Anopheles) implexus* Theo., *Mansonia (Coquillettidia) fuscopennata* Theo., *Aedes (Neomelanoconion)* sp., *Eretmapodites* sp., *Culex (Culex) annulioris* Theo. (Culicidae), *Tabanus taeniola* P. de Beauv., *Chrysops distinctipennis* Aust. (Tabanidae), *Stomoxys* (?) *nigra* Macq., *S.* (?) *calcitrans* L. (Muscidae). Twenty-four hours after the feedings, the abdominal contents were smeared onto separate pieces of filter paper which were dried and stored in a $CaCl_2$ desiccator at 25°C. Each blood smear was cut out of the filter paper and divided into two pieces. One piece from each smear was placed in 0.1 ml of physiological saline on a glass slide. The saline was rinsed through the smear, by use of a small Pasteur pipette, for approximately 30 seconds. Each extract was tested without further dilution, and in every case strong agglutination was observed.

In these experiments agglutinating antibodies against trypanosomes were readily detected in the stomach contents of hematophagous Diptera which had fed upon infected animals. It is evident that the collection of blood meals from such Diptera in the field offers a method of obtaining blood samples from the wild animals on which they feed and that the samples may be tested for the presence of antibodies against any parasitic organism for which a sensitive serological test is available. At least for the larger hematophagous Diptera it is probable that the identification of the host animal (*1*) and the detection of antibodies in that host can be made from the same blood meal. This technique therefore appears to provide a means for determining the presence of antibodies in populations of wild animals with minimum disturbance of the environment.

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References

1. B. Weitz, *Bull. World Health Organ.* **15**, 473 (1956); *Exptl. Parasitol.* **9**, 63 (1960).
2. M. P. Cunningham and K. Vickerman, *Trans. Roy. Soc. Trop. Med. Hyg.* **56**, 48 (1962); M. P. Cunningham, *E. African Trypanosomiasis Res. Organ. Rept. Jan.–Dec. 1960* (Nairobi, 1961).

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Nictitating Membrane: Classical Conditioning and Extinction in the Albino Rabbit

Abstract. The distribution of response latencies and the percentage performance curve of a classical conditioning group, by comparison with a control group, indicated that the extension of the nictitating membrane elicited by a puff of air to the cornea was successfully conditioned to a previously neutral stimulus.

The nictitating membrane (plica semilunaris) in the albino rabbit consists of a curved plate of cartilage covered with glandular epithelium. It is drawn from the inner canthus of the eye laterally across the cornea by a sheet of smooth muscle, but the mechanism of its action is not clearly understood (*1*).

Though there have been no reported attempts to condition this membrane in the rabbit, incidental observations in our laboratory have indicated that an extension of the membrane is reliably elicited by a puff of air to the cornea. We have observed that when the membrane is activated it rarely extends past the midline of the pupil and always leaves a portion of the cornea exposed, and that even highly conditioned rabbits do not appear to be capable of a sustained extension of the membrane. These two properties would appear to provide the experimenter with an even greater degree of control over the sensory consequences of the unconditioned stimulus than that existing in our previously reported study of conditioning of the rabbits outer lid (*2*).

The conditioning apparatus and manner in which the rabbit was restrained within a Plexiglas box has been described (*2, 3*). To permit the recording of movement of the membrane and to insure continual exposure of the cornea, the upper and lower eyelids of the rabbit's right eye were taped open. When the restraining box was positioned in a nonactivated refrigeration unit, a 6-inch speaker and a rod supporting an air jet and gravity-return potentiometer were positioned about 5 inches in front of the rabbit. A silk thread was attached to a rod which was mechanically coupled to the shaft of the potentiometer. A small metal hook connected to the other end of the silk thread was attached to a nylon loop which was sutured in the nictitating membrane of the rabbit's right eye. The signal from the potentiometer was amplified and graphically recorded. The orifice of the air jet was adjusted to deliver an 80-mm puff of compressed nitrogen of 100 msec duration from a position about ½ inch from the dorsal region of the right cornea. The conditioned stimulus (CS)

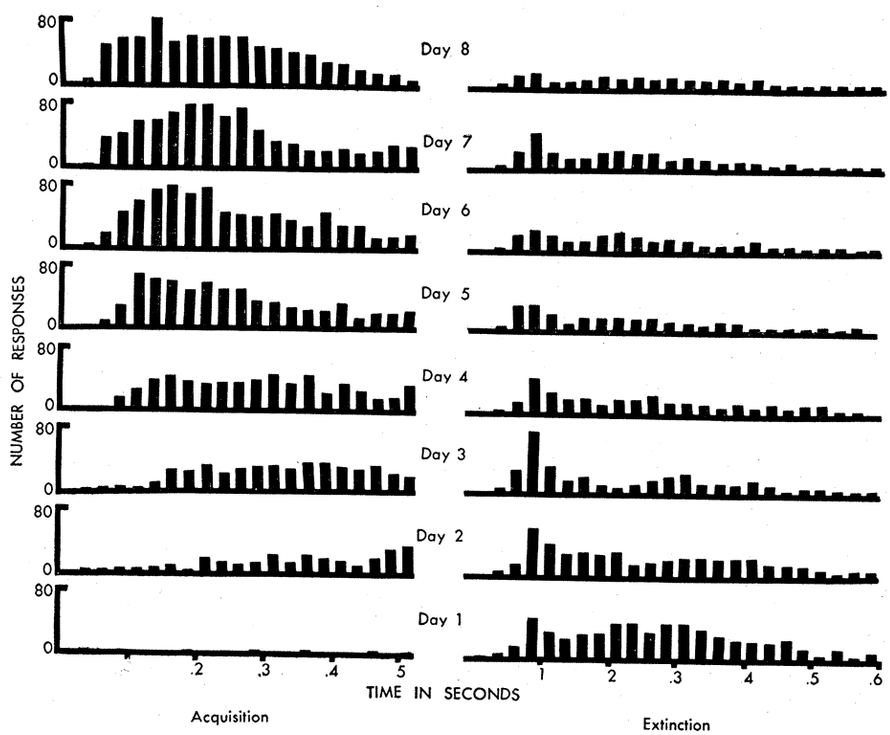

Fig. 1. Latency distributions of all membrane responses of group E in acquisition and extinction.

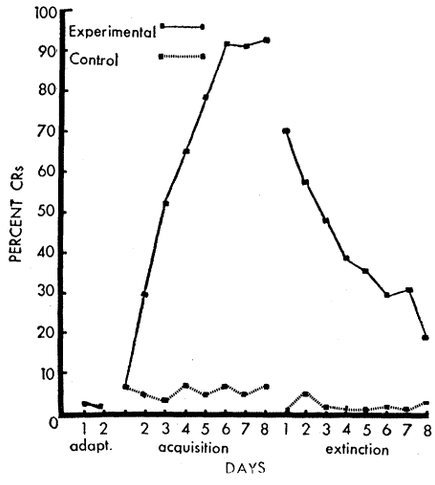

Fig. 2. Mean percentage of responses plotted in 70 trial blocks in acquisition and extinction.

consisted of an 800-cy/sec tone of 72 db SPL, presented for 600 msec.

Eighteen albino rabbits, 85 to 100 days of age, were assigned to one of two groups for 2 days of adaptation, 8 days of acquisition training, and 8 days of extinction. In each day of acquisition a control group of six rabbits (group C) received a random presentation of 70 CS alone and 70 unconditioned stimuli (UCS) alone trials restricted within two trials blocks at randomized intertrial intervals of 5, 10, and 15 seconds (mean of 10 seconds). A classical conditioning group of 12 rabbits (group E) received 70 paired presentations of the CS and UCS a day at a CS-UCS interval of 500 msec and randomized intervals between trials of 15, 20, and 25 seconds (mean of 20 seconds). For each of the 2 days of adaptation a measure of spontaneous membrane movement was obtained in both groups by recording the frequency of responses in intervals corresponding to the 70 CS-UCS trials that were employed in acquisition for group E.

In adaptation and acquisition all membrane extensions of at least 1 mm deflection from the baseline were recorded from 0 to 525 msec after initiation of the trial. In extinction the interval was extended to 600 msec. The distribution of response latencies for group E in acquisition and extinction is shown in Fig. 1. The left-hand side of the figure shows that the distributions are unimodal and the modal latency systematically decreases from 525 msec on the second day of acquisition to 150 msec on the eighth day. This finding is consistent with the progressive decrease in response latency reported by Pavlov (*4*) for simultaneous conditioning of the salivary response. An analysis of variance of the mean latency of conditioned responses over days revealed that the decrease in response latency was significant ($P < .01$).

In extinction, two modes appear in the distributions. Although there is a progressive decrease in frequency of responses over days of extinction, there appears to be no systematic shift in the modal latencies. The first mode on the left was primarily a function of a high frequency of short latency responses in two rabbits. Examination of the latency distributions of responses in both groups in adaptation (not shown) and those of group C in acquisition and extinction (not shown) revealed they were unsystematic and infrequent and essentially like that shown in Fig. 1 by group E on the first day of acquisition. Consequently, there is no evidence in the data of reflex responses to the CS, or of sensitization.

The percentage responses for both groups in adaptation, acquisition, and extinction are shown in Fig 2. For adaptation the percentage of spontaneous responses was about 1.5 for both groups. In acquisition, the responses for group C did not increase over days, and never exceeded a 6-percent level. Group E showed a steady increase in responses from 6 percent on the first day to an asymptotic level of about 92 percent on the last 3 days of acquisition.

However, in the previously reported study of the conditioning of the outer lid (*2*) the highest level of conditioning attained was 72 percent. A *t*-test comparison of mean percentage conditioned responses of group E on the first day and the eighth day of acquisition was highly significant ($P < .001$). Group E showed considerable resistance to extinction. The mean response was from 71 percent on the first day to 20 percent on the eighth day. On the other hand, in group C extinction and adaptation were closely parallel (*5*).

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References and Notes

1. S. Duke-Elder, *System of Ophthalmology* (Kempton, London, 1958), vol. 1; R. J. Last, *Wolff's Anatomy of the Eye and Orbit* (Saunders, Philadelphia, 1961).
2. N. Schneiderman, I. Fuentes, I. Gormezano, *Science* **136**, 650 (1962).
3. J. W. Moore and I. Gormezano, *J. Exptl. Psychol.* **62**, 552 (1961).
4. I. P. Pavlov, *Conditioned Reflexes*, translated by G. V. Anrep (Oxford Univ. Press, London, 1927).
5. This study was supported by NSF grant G-16030. One of us (I.F.) participated under the NSF undergraduate participation program (grant G-16282).

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Chemical Stratification in Lake Fryxell, Victoria Land, Antarctica

Abstract. A landlocked lake of sodium-mixed-anion type in lower Taylor Valley has a salinity ranging from 1/35 to 1/5 that of sea water. The lake seems to be chemically stratified into three distinct layers. Several possible sources are postulated for the dissolved salts. The chemical zonation may have been initiated by past climatic variation; however, a thermal or magmatic origin for some of the waters is also indicated. No single origin for the lake waters or the stratification seems likely.

Lake Fryxell occupies the center of a wide, shallow basin in lower Taylor Valley in latitude 77°35′S, longitude 163°35′E. The average depth of the lake, including a hummocky ice cover about 4.5 m thick, is about 8 to 10 m; maximal depth, measured near the center of the lake at hole number 2 (see Table 1), is 13 m. Water samples, including melted ice core, were collected only from hole number 2; however, some physical data recorded nearer shore (at hole number 1) are included for comparison. Similar ice thicknesses reported for Lakes Vanda and Bonney (*1*) and smaller lakes at Cape Royds (*2*), suggest a local equilibrium between ice formed and that lost by sublimation which is comparable to that described for arctic areas (*3*).

Fryxell is fed primarily by meltwater from Canada and Commonwealth glaciers. The concentration of dissolved salts in the lake ranges from approximately 1/35 to 1/5 that of sea water (Table 1). The principal dissolved salts are sodium chloride and sodium bicarbonate. The silica value is anomalously high in the water from 12-m depth; however, considering the *p*H of the water and the analytical method employed (silicomolybdate)