ent species of scorpions would suggest a similar variation in the constitution of their venom. In this work, such uniformity is found in the area designated as *A* (Fig. 1). Since the chromatograms for all species showed a trailing effect in the *N*-propyl alcohol solution, this was not recorded except for the *Hadrurus* genus, where trailing in the phenol solution definitely indicated unique components. Group *E* was not included in trailing of species other than those designated.

The uniqueness of group *F* in *Centruroides sculpturatus* is significant with regard to the physiological effect of this venom. Group *E,* occurring only in this species and *C. gertschi,* is also significant.

This work would further suggest that the convulsion factor is in group *A*, since it appears as the major component in *C. gertschi* and *Vejovis spinigerus,* while the major component of the *Hadrurus* genus is in group *B,* which could be the salivation factor.

The possibility of synergistic action of these components should not be overlooked. Consequently, small amounts of groups *B, C,* and *D* (evidenced by trailing on the chromatograms) in conjunction with component *E* or *F,* or both, could account for this reaction with the venom of *Centruroides sculpturatus* and *C. gertschi.*

Further isolation and purification of these components should establish this relationship.

ROY M. JOHNSON
HERBERT L. STAHNKE
Poisonous Animal Research Laboratory, Arizona State University, Tempe

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Feeding in Conflict Situations and Following Thwarting

Abstract. It is possible to quantify many different aspects of feeding behavior. In order to specify and differentiate the effects of deprivation levels, conflict, and thwarting, one cannot use only a single measure of this behavior pattern.

Several studies have shown that the concept of drive as an energizer of all behavior that leads to the consummatory response is inadequate to describe the changes in a behavior pattern that accompany a high score in consummatory activities (*1*). Further, Miller (*2*) has reported two conditions that increase the amount of food intake while exerting differential effects on a number of other presumptive measures of strength of hunger. These findings are disturbing, as various investigators who have described the effects of frustration (*3*) and conflict (*4*) as increasing drive strength have estimated the strength of drive by measuring a few, often a different few, of the many quantifiable aspects of a behavior pattern. The present report questions the description of such effects in terms of a unitary intervening variable.

Table 1. Feeding behavior: (*A*) following 1, 2, and 3 days deprivation (*N*=9); (*B*) in successive 15-minute periods of the feeding session, 2 days deprived (*N*=9); (*C*) in conflict sessions with high, medium, and low shock (*N*=12); (*D*) following thwarting (*N*=6). Significant differences: Italic type indicates that the difference between vertically adjacent pairs of numbers is statistically significant. In *A* and *C*, the pairs of asterisks indicate that the difference between the pairs of numbers not vertically adjacent are statistically significant. In *C*, bold-face type indicates that the differences between normal controls and all shock intensity tests considered together are statistically significant.

	Completed	Initiated	Initiated/Completed	Duration completed (0.01 min)	Total time feeding (min)
A. Days deprived					
1	*132*	612	*4.39*	3.8*	21.8
2	*196*	717	*3.52*	*3.3*	21.2
3	*252*	778	*2.87*	*2.8**	21.7
B. Successive 15 min of feeding session					
1st	*63*	*172*	*2.75*	*2.6*	*4.3*
2nd	*54*	*193*	*3.46*	*3.2*	*5.7*
3rd	*43*	182	*3.98*	*3.7*	5.8
4th	*36*	169	*4.50*	4.0	5.6
C. Conflict: normal control; high, medium, low shock					
N	**196**	**756**	**3.83**	**3.3**	**22.8**
High	*125**	*551*	3.27	2.8	13.7*
Md.	*155*	*580*	3.64	3.0	17.5
Low	197*	646	3.36	2.9	19.4*
D. Thwarted and normal control; 1, 2, 3 days deprived					
1, N	155	*536*	*3.12*	4.0	21.3
1, T	180	*686*	*3.44*	4.0	25.8
2, N	191	*557*	2.74	4.0	22.2
2, T	209	*701*	2.98	3.7	25.2
3, N	*223*	577	*2.50*	3.5	*19.3*
3, T	*164*	671	*3.60*	3.9	*25.4*

Three-spined sticklebacks (*Gasterosteus aculeatus,* L.) were maintained in aquaria divided by a partition into a food area and a living area. A portion of the partition was removed to permit 1 hour of access to the food at 1-, 2-, or 3-day intervals. For the thwarted feeding sessions the food was covered by a transparent plate for ½ to 2 hours. After intervals ranging from 3 minutes to 4 hours, access to the food area with the plate removed was allowed. In conflict sessions, the fish received electric shock at varying intensities (42 volts, 84 ma; 66 volts, 112 ma; 108 volts, 210 ma) through a pair of electrodes immersed in the water. The first two entries into the food area or the 10th and 20th grasp at food were the occasions for administering shock.

Tubifex worms were scattered in the food area. Samples taken from the tanks indicated that there were over 30 times as many worms present as the fish would remove in the feeding session. To test whether a change in the behavior of the prey would make them less available to their predators, the feeding responses of the fish were imitated by poising over the prey and touching them with the end of a broad pencil at a rate corresponding to that of the feeding stickleback. There were no significant changes in the reaction of the prey to the repetition of this stimulation.

Sticklebacks feeding on their ground-living prey swim near the floor of the tank and occasionally tilt their bodies to remain poised over the worms which are half-embedded in the sand. The eye movements during fixation on the prey are quite distinctive. Fixations may be followed by grasping the prey, scored as *completed feeding responses.* Each fixation, whether it led to the grasp or not, was scored as an *initiated feeding response*. Behavior such as attacks, returns to the living area, swimming up and down the walls of the food area, and so forth, has been grouped together as a bout of *nonfeeding behavior.* Such activities would appear in the absence of food and their frequency and duration could be changed by varying conditions other than deprivation. Then, *total time spent feeding* measures the predominance of feeding behavior in the 1-hour session, while the *ratio of initiations to completions* measures the predominance of one element in the feeding behavior pattern. In a bout of feeding, it is possible that few completions are performed because the *duration* of feeding responses is very long.

Behavior was recorded on a machine that moved a strip of paper at the rate of 5.6 cm/min (*5*). The frequency, duration, and order of succession of responses could be obtained from the records.

Increased deprivation time results in a greater number of completed feeding responses, a shortened duration of feeding responses, and a decrease in the ratio of initiated to completed feeding responses (Table 1, *A*, *B*). But neither the number of initiations nor the total time spent feeding is reliably increased by deprivation.

These effects on feeding behavior are reversed in the course of the feeding session, as the fish become satiated: the frequency of completions decreases, response duration becomes longer, and there are more initiations per completion. The time spent feeding and the frequency of initiations increase at the beginning of the feeding session, remain at high values, and then fall off slightly at the end of the hour.

Hunger shows its effects on the predominance of completions over initiations, not on the predominance of feeding behavior over nonfeeding behavior.

In the conflict sessions (Table 1, *C*), the total time spent feeding is below normal values, and more markedly so for increasing shock intensities. But the ratio of initiations to completions is lower than normal, and the duration of feeding responses is below normal. These latter two effects are not changed by increasing shock intensities.

Nonfeeding behavior has become more predominant in the conflict sessions, but when feeding behavior is shown it is like that of very hungry fish (*6*). As a result, over half the fish performed more completed feeding responses than normally under conditions of low shock, with some fish scoring as much as 40 percent over normal values.

As the feeding session progresses, the usual satiation changes occur and deviations from normal feeding scores are less marked. For example, the initiated to completed response ratio is below normal throughout the session, but reliably below normal only for the session as a whole or for the first 15 minutes of the session (*4*).

The effects of thwarting (Table 1, *D*) resemble those of conflict in that the fish may perform more or fewer completed feeding responses than normally. But now total time spent feeding and the frequency of initiations have increased, whereas the initiation to completion ratio is higher than normal.

It is noteworthy that the usual differences in feeding behavior for the three deprivation conditions have disappeared in the tests that follow thwarting.

The effects of thwarting and of conflict must be specified in terms of measures that indicate the predominance of the observed pattern of behavior over its alternatives and the predominance of high and low intensity forms of the behavior pattern. A model linking these two aspects of motivated behavior has been described (*7, 8*).

BEATRICE TUGENDHAT

Psychological Laboratory,
Wellesley College,
Wellesley, Massachusetts

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6. The conflict study shows how cessation of feeding occurs. In the course of normal feeding sessions, only increases in time spent feeding were reliable. Though interruptions of feeding involving returns to the living area are few at the end of the session, these are of a reliably longer duration and extend further away from the food area. In the stickleback's normal environment this should increase the likelihood of exposure to stimuli that evoke behavior incompatible with feeding and thus end feeding activities.
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Changes in Soluble Proteins of Developing Lily Anther

Abstract. The extract of soluble proteins from *Lilium* anthers is characterized by four electrophoretic components. Three of the components show quantitative differences markedly correlated with the synchronized division of the microspores contained within the anthers. One of the components increases in amount before mitosis and disappears at mitosis; two of the components have peak values at the time of mitosis and decrease thereafter; a fourth component remains relatively constant in amount throughout.

In recent years it has become increasingly apparent that many of the major steps of chromosome synthesis take place before the visible events of mitosis. In particular, one may cite the synthesis of deoxyribonucleic acid (*1–4*) and of nuclear histones (*3, 5*). The anthers of *Lilium* are favorable material for investigating relationships of this sort since mitosis of the microspores within the anthers is highly synchronized and precisely correlated with the length of the developing flower bud (*6*). Foster and Stern (*1*), for instance, have shown striking changes in the quantity of soluble deoxyribosides in the anthers, which are correlated with bud length and hence with the mitotic process. The work reported here is a preliminary study by analytical electrophoresis to determine the behavior of the phosphate buffer-soluble fraction of anthers prior to and during mitosis.

Anthers were collected from flower buds of *Lilium longiflorum* cv. 'Croft' of specified lengths and placed in a freezer until samples of sufficient size were obtained. The bud lengths studied were 40 and 50 mm (before mitosis), 60 mm (during mitosis), and 80 mm (after mitosis). A single sample consisted of the anthers from 10 to 15 buds which were within 1.0 mm of the desired length. Each sample was extracted, with the aid of glass homogenizers, in the cold, in a 0.1 ionic-strength phosphate buffer of *p*H 7.0 (*7*). Extracts were centrifuged at about 4000*g* for 0.5 hour, and the supernatants were dialyzed for 18 hours against three changes of buffer. After ultraviolet estimation of the protein concentration, the dark-colored extracts were diluted with buffer to approximately 12 mg/ml to facilitate electrophoretic analysis, and aliquots of these diluted samples were analyzed for protein concentration by the Folin method. The instrument for electrophoresis and the methods of

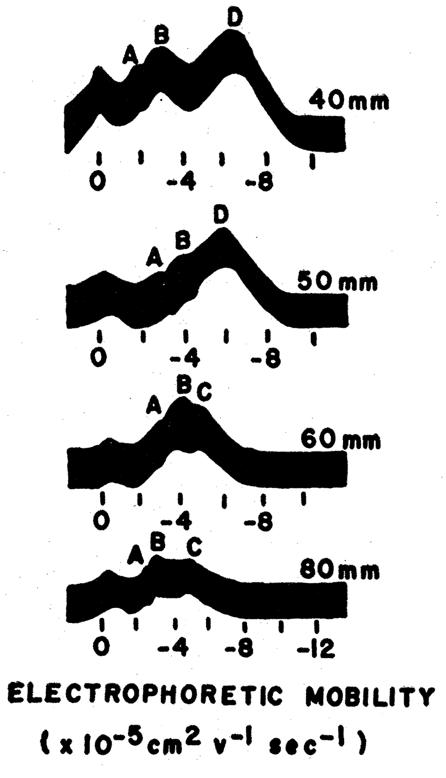

Fig. 1. Descending electrophoresis patterns, at *p*H 7.0, of phosphate buffer-soluble proteins extracted from *Lilium* anthers. Potential gradients were 6.9, 6.8, 7.0, and 6.7 v/cm for the 40-, 50-, 60-, and 80-mm samples, respectively.