consist of an inner granular segment, and a much longer outer segment. The lentiform body of the inner segment which is difficult to demonstrate appears planoconvex in shape. Cones, designated as type I, in this dark-adapted eye have a long myoid, a large oval granular lentiform body, and a small conical-shaped outer segment. In the peripheral end of the lentiform body deeply staining granular masses are also found. These cones may easily be missed in the eye since they are so completely masked by the outer segments of the rods. Their structure, however, definitely indicates that they are cones. Cones of type II are equally as numerous as type I, and have a similar width of about 5 μ at the level of the lentiform body. Their myoids are very short and the lentiform body contains a large, distinct, so-called oil globule, masses of deeply staining material and granular inclusions. Because of their distinct oil globule, these cones are very prominent and easily seen. Whether these two types of cones are different because of function or the state of activity is not known, but it would seem that they are functionally different since they are not similar in the same preparation.

The ventral portion or the lower 30% of the eye consists of rods and cones of type I. The rods, twice as numerous as the cones, are like those in the upper region except at the transition from the upper to the lower regions where they are longer, causing a thickening of the retina which is easily discernible in the sections. This thickening is also very evident in the whole fixed eyes, and it outlines the lower region as a crescent-shaped area. Cones of type II (those with oil globules in the lentiform body) have never been found. Cones of type I are present but much smaller than those in the upper region, being only about 2 μ wide through the lentiform body.

From histological sections and experiments on covering the eye it would seem that the lower region is for the the utilization of the light that comes from above in the absence of light from below, causing the animal to become dark. Stimulation of the upper portion containing rods and well-developed cones of different types, by light from below causes a light adaption.

THE REACTIONS OF FRAGMENTS OF THE LARVAE OF *AGLAIS ANTIOPA* LINN. TO SOUNDS

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Many caterpillars respond more or less vigorously to sounds by abrupt cessation of locomotion and freezing, contraction of certain longitudinal muscles or both (c.f. Minnich '36). Even fragments of the caterpillar body may continue to show muscular contraction (Minnich 1925, 1936), as shown by experiments on the caterpillars of the mourning cloak butterfly, *Aglais antiopa* Linn., and of the milkweed butterfly, *Danias plexippus* Linn. When the decapitated bodies of these caterpillars were divided into approximately equal thirds, the two anterior divisions responded in both species, while the posterior third appeared to respond only in the first.

The abundance of larvae of the mourning cloak butterfly at Salsbury Cove during the summer of 1936 afforded an opportunity to test further the sensitivity of fragments of these caterpillars to sounds. Full grown larvae were lightly ligatured with a silk thread immediately behind the head, and carefully decapitated. If the ligature was undisturbed there was no loss of blood. A particular segment or group of segments was then ligatured at each end and the remainder of the worm severed just beyond the ligatures. Before isolating fragments at the posterior end, the larva was decapitated and placed under a glass cover for 12-24 hours to allow the expulsion of the faeces from the posterior part of the gut. Failure to observe this precaution resulted in a fragment which was stiff and obviously distended with faecal material, a condition which was believed to modify the response.

The body of the larvae of *Aglais* posterior to the head consists of 13 segments of which the anterior 11 are readily distinguished while segments 12 and 13 are practically fused into a single terminal division of the body. Segments 1, 2, and 3 bear the thoracic legs, segments 4 and 5 are without appendages, segments 6, 7, 8, and 9 bear the abdominal legs, segments 10, 11, and 12 again lack appendages, and segment 13 finally, bears the claspers. Some of these segments are so short that they are very difficult to isolate. It was necessary, therefore, in a number of cases to use fragments of more than one segment.

The isolated fragments were placed under small glass covers to prevent evaporation. In making a test the cover was removed and a 256 v/s tuning fork, with the open end of the resonance box about 5 cm. from the fragment, was struck a vigorous blow with a leather bound stick. The interval between the isolation of the fragment and the first trial and between subsequent trials was at least one hour, and usually much longer.

In table 1 the various fragments used are listed and the presence or absence of response is indicated. The responses of such fragments are, of course, much less vigorous than those of the intact animal. They vary from the movement of a spine or leg to a contraction involving the entire fragment. Fragments with legs were often placed with their lateral or dorsal surfaces down in order better to observe possible leg movements. An interesting observation made in this connection was that in fragments bearing abdominal legs, a frequent response was the spreading apart of these legs. As I have previously pointed out (Minnich 1936), when subjected to strong sound stimuli, some species of caterpillars may loose their grip of the substrate and fall. Since caterpillars when disturbed retain their grip of the substrate by means of the abdominal legs, the spreading apart of these legs in the sound response shows why they fall.

The results in the table show that small fragments and even single segments are able in many cases to respond to sound. Moreover some of the fragments continued to respond for several days. Thus

TABLE 1

Segments composing fragment	*Number of fragments*	*Responsive*	*Unresponsive*
1 & 2	2	2	
3	1		1
3 & 4	3	2	1
4	1		1
5	2	1	1
5 & 6	1	1	
6	1	1	
7	1	1	
8	3	3	
10	1		1
9–13	1	1	
10–11	1		1
10–13	4	3	1
11–13	1		1

one preparation of segment 8 continued to respond for 4 days while a fragment consisting of segments 9-13 was still responsive on the twelfth day after operation when it was discarded. Observations on small fragments of this caterpillar thus confirm the results of earlier and cruder experiments with large fragments (Minnich 1925), viz., that the receptors for sound vibrations are generally distributed over the body with the possible exception of the extreme posterior end.

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SEROLOGICAL STUDY OF THE RELATIONSHIP OF COMMON ANIMALS

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The 1936 collection of blood sera to be used in a study of the relationships of animal species as indicated by the precipitin reaction was begun at the Marine Biological Laboratory of the Carnegie Institution, at Tortugas, Florida, continued at the United States Bureau of Fisheries Laboratory at Beaufort, North Carolina, and concluded at the Mount Desert Island Biological Laboratory. At the latter station the collection of Crustacean bloods was supplemented by the addition of blood sera of the following species: *Carcinides maenas, Cancer borealis, Cancer irroratus, Hyas araneus* and *Homarus americanus*. In each case the blood was allowed to clot, the serum collected and filtered through Seitz filters, and stored in sterile condition in vaccine vials.