were carried back through the supply tube for a distance of ten meters. It may be that the sensitiveness of a flame requires a sufficient space through which vibrations may be carried backward in order for the incident sound to produce its effect, and that either a sufficient length of tubing or the enlargement in a bottle supplies this space, whereas a partly closed cock reflects the waves and does not give them access to the necessary space. This suggestion is at present little more than a guess, and it may be necessary to modify it when the exact mode of action of sensitive flames becomes better understood.

ARTHUR TABER JONES

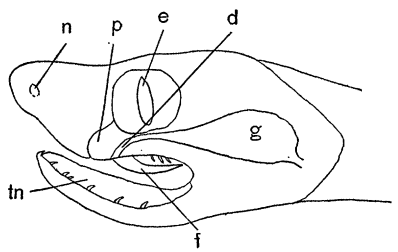
SMITH COLLEGE

THE VENOM OF NEW-BORN COPPERHEADS

THE writer recently received from a local attorney, Mr. C. Wm. Cramer, a female copperhead snake, *Agkistrodon mokasen* Beauvois, with three young. The young were born in a glass case in Mr. Cramer's office on September 13 and 15.

When received by the writer the young were about a month old and were about 20 cm long by 1 cm in diameter at the thickest region. They were quite active and aggressive, being more inclined to strike at moving objects near them than was their mother.

When only a day old, according to Mr. Cramer, one of these young snakes struck a live mouse upon the head. Mr. Cramer left the room, at this time, and when he returned, in about five minutes, the mouse was dead. In order to test the venom of these young snakes the writer placed a half-grown rat in the small case in which they and a blacksnake were confined. The activity of the rat soon excited the young copperheads and they were not slow to strike. Several times they hit the rat, but whether their fangs penetrated the skin it was not possible to determine; no blood was seen, but as the fangs, even in these tiny snakes, were about 3 mm long and as sharp as a needle it would seem likely that they would penetrate the rat's skin. The rat, however, was apparently not affected in the least although it was kept alive until the next day.



A lateral view of the head of a one-month-old copperhead snake, after removal of the skin. Outlined with a camera lucida. ×4. *d*, curved duct of poison gland; *e*, eye; *f*, poison fang; *g*, poison gland; *n*, nostril; *p*, pit; *tn*, tongue sheath on floor of mouth.

A few days later the young snakes were killed and skinned for mounting. At this time one or two of the poison glands, which were very large in proportion to the size of the snake, as is seen in the accompanying figure, were removed and were ground in a small quantity of normal salt solution. This solution was then hypodermically injected into several very young rats which were about half the size of an adult house mouse. None of these tiny rats showed any effect from the injection, though they were kept until the following day.

A poison gland was removed from one of the young copperheads and mounted for histological study. Its microscopic structure was apparently the same, except for differences caused by size, as that of the several adult glands with which it was compared, but there was little or no secretion to be seen in the alveoli. Of course the amount of secretion found in sections of adult poison glands varies in different individuals, but I have never seen an adult gland entirely devoid of secretion. Possibly if other of these young glands could have been sectioned they would have been found to contain secretion.

It would seem from the absence of injury to the half-grown rat from repeated attacks by the new-born copperheads; from the absence of any effect from the subcutaneous injection of crushed gland into very young rats; and from the apparent absence of secretion from the only gland microscopically examined that new-born copperheads, in spite of relatively very large fangs and poison glands, are not capable of poisoning other animals.

In the case of the mouse killed in Mr. Cramer's office it is possible that during Mr. Cramer's short absence from the room the adult copperhead may have struck the mouse, although he is sure that such was not the case. I have seen a mouse die almost instantly from the bite of a 30 cm rattlesnake.

Possibly some reader of SCIENCE may have made some more conclusive observations upon the age at which the pit-vipers acquire their power of injecting venom.

ALBERT M. REESE

WEST VIRGINIA UNIVERSITY

GRADUATE WORK IN HORTICULTURE[1]

GRADUATE students who are interested in horticulture are not now compelled to take their graduate work in closely allied subjects, especially botany. They can take it in horticulture directly, since sev-

[1] Published with consent of Director of Experiment Station.

eral departments of horticulture in the state and agricultural colleges of the United States are offering work leading to the degree of doctor of philosophy.

This change is to be commended, provided the students who desire this graduate training are properly prepared for it. Unless they are required to lay a good foundation through work in fundamental subjects during their undergraduate days, the problem of transforming them into real masters of science and doctors of philosophy in horticulture is very gigantic, if not impossible. As yet it can not be asserted that they measure up to expectations. Data have been taken on twenty-five graduate students in the agricultural division at the Michigan State College. Sixteen of them were in horticulture, the remainder in various other departments. Three were graduates from Canada, while twenty-two of them possess diplomas from the various agricultural colleges in ten different states of the Union. The record is given in the accompanying table.

UNDERGRADUATE WORK OF 25 GRADUATE STUDENTS

	No. of semester hours credit			
Subject	None	5 or less	6 to 12	12 or more
Logic	24	1		
Philosophy	25			
German	19	3	2	1
French	18		7	
College Mathematics	7	5	10	3
College Physics	9	5	9	2
College Chemistry			10	15

The data are very interesting. These students were adequately prepared in chemistry alone. Thirty-six per cent. had had no college physics and twenty per cent., five hours or less in that subject. Twenty-eight per cent. had not taken any college mathematics, while twenty per cen.t had taken five hours or less. Seventy-two per cent. of them knew no French, while those without German were seventy-six per cent. of the entire number. As to logic and philosophy, their preparation was nil. Furthermore, it was learned by personal inquiry that these same students were almost wholly deficient in the sphere of general cultural reading and had spent their entire time while undergraduates in taking purely practical subjects in their several fields.

Clearly, they were greatly handicapped in their ambition to do graduate work. It may even be conjectured that they were not fitted in the best way for life and success in the world of everyday activity. It is possible, with the exception of logic and philosophy, which are seldom, if ever, offered in agricultural and state colleges, for graduate students to take these subjects after registration in the graduate school, but is this the best plan to follow? It seems not. Instead, they should be free to devote all their time to their investigations and to the task of reading deeply and thoroughly into the extensive literature which may bear upon science in general and their own research problems in particular.

What is the remedy? Two or three suggestions may be ventured. Perhaps the academic requirements respecting fundamental subjects for graduation from our agricultural colleges might be increased to some extent without too great a diminution of the strictly practical necessities. Horticultural faculties might place more emphasis on fundamental subjects, especially in advising any undergraduate students showing ability and inclination for advanced study. A third thing which might be more potent than any other measure would be the creation of an atmosphere more conducive to scholarly effort and a profound attitude regarding the proposition of realizing a college education. With such an atmosphere in existence in an institution of higher learning it would probably be possible to require students to take at least two years' work in the more general and fundamental subjects before being permitted to enter classes in the branches of applied knowledge where they wish to major. This would be better than having them enter these classes before they have acquired any knowledge to be applied, as is now the case in most instances.

JOHN W. CRIST

MICHIGAN STATE COLLEGE,
EAST LANSING, MICH.

IS THE AUTOMOBILE EXTERMINATING THE WOODPECKER? COMMENT.

IN the issue of SCIENCE for January 15, 1926, Professor Homer R. Dill, of the University of Iowa, makes the query, "Is the automobile exterminating the woodpecker?" and presents some very interesting data, which would indicate that one species (the red-headed woodpecker) has habits which put it at a distinct disadvantage to its motorized environment in Iowa. Of this species Chapman[1] states: "Indeed few birds seem better able to adapt themselves to their surroundings. They change their fare and habits with the season, and to the accomplishments of woodpeckers add those of flycatchers and fruit-eaters." However, this wonderful power of adaptation which enables them to dine from tourists' lunch boxes has not, alas, given them sufficient agility to escape from the automobile!

But, granting this to be the case with the red-headed, are woodpeckers in general in such danger?

In northern New York and New England, at least,

[1] Chapman, Frank M., "Handbook of Birds of Eastern North America," Revised, 1919, p. 328.