able the expedition to proceed even if an accident happens to its airplane.

AN expedition, under the auspices of the American Museum of Natural History, will leave this summer to collect specimens in Greenland. Captain Bob Bartlett, Peary's captain, will command the ship, the *Morrissey*. Knud Rasmussen, the explorer, will accompany the trip if his health permits. Arthur Young, who has shot big game in Africa and the Arctic with bow and arrows, will be a member of the party. In addition several scientific men will go with the expedition. The general advisory committee of the expedition will be composed of Harrison Williams, Junius S. Morgan and Cleveland E. Dodge, trustees of the American Museum of Natural History; Professor Henry Fairfield Osborn, president of the museum; Frederic C. Walcott, of the New York Zoological and American Geographical Societies; George H. Sherwood, of the American Museum of Natural History; Fitzhugh Green, Arctic explorer and author, and Colonel E. Lester Jones, chief of the Coast and Geodetic Survey. Pictorial records of the expedition's experience and accomplishments will be made with motion and still cameras, especially the wild life.

ACCORDING to an announcement by the U. S. Department of Agriculture, the Mexican government will send four forestry students to this country to study methods of the United States Forest Service as soon as arrangements now being negotiated by Senor Jose Alcarez, director of the Mexican forest service, and William B. Greeley, chief forester of the United States Department of Agriculture. The men being sent to this country by Mexico are from among the first graduates of the newly established forest school conducted by the Mexican government. They will pay special attention to reforestation, silviculture, forest administration and forest utilization policies and methods.

A MESSAGE from Vladivostok reports the return of the scientific expedition led by the geologist Dobrovsky in Inner Mongolia. The expedition has explored the district of the Okhrona River where large deposits of combustible clays were discovered, and the central part of Mongolia where large deposits of fossilized bones of marine animals were found. Many interesting discoveries were made by the expedition in the Gobi Desert. The work of the expedition will be resumed next year.

HONORING the state and the University of Illinois, the name "Illinium" has been given to the newly discovered chemical element No. 61 by its discoverer, Dr. B. S. Hopkins, of the department of chemistry of the University of Illinois.

THE American Society of Swedish Engineers, founded in 1888, has announced the establishment of an annual award of a gold medal for contributions to science and engineering by persons of Swedish birth or extraction. It will be known as the John Ericsson Medal, in honor of the engineer and scientist of that name.

UNIVERSITY AND EDUCATIONAL NOTES

THE University of California has announced gifts totaling approximately $2,000,000, including $1,000,000 from William Randolph Hearst for a women's gymnasium, as a memorial to his mother.

DR. JAMES NATHANIEL JENNE, Burlington, professor of clinical medicine and therapeutics at the college of medicine of the University of Vermont, has been appointed acting dean to succeed the late Dr. Henry C. Tinkham.

DR. VICTOR RAY, Sr., Cincinnati, has been appointed head of the department of ophthalmology of the University of Cincinnati College of Medicine, to succeed Dr. Robert Sattler, resigned. The trustees of the university voted unanimously to appoint Dr. Sattler, who has been head of the department since 1882, as emeritus professor of ophthalmology.

DR. GEORGE W. HUNTER, head of the department of biology at Knox College and author of the widely used text-book "Civic Biology," has resigned.

PROFESSOR CHARLES A. ISAACS, head of the department of mathematics at Washington State College, has resigned to enter business.

PROFESSOR W. W. RANKIN, head of the department of mathematics at Agnes Scott College, Decatur, Ga., has been appointed to a professorship in Duke University and will begin work there next September.

DR. A. L. MELANDER, professor of entomology at the State College of Washington and entomologist of the experiment station, has been appointed to a position at the College of the City of New York.

DR. E. C. EDGAR, head of the school of chemistry at the Polytechnic, London, has been appointed principal of the Rutherford Technical College, Newcastle.

PROFESSOR THEODOR MOLLISON, of Breslau, has been called as successor of Rudolf Martin at Munich.

DISCUSSION AND CORRESPONDENCE

SENSITIVE FLAMES

I HAVE recently happened on a means of obtaining a tall sensitive flame without using a pressure higher than that in the gas mains. The new part

of the apparatus is a bottle into which the gas from the main flows before passing to the nozzle at which it burns. With a pressure in the gas main of about 13 cm of water, a bottle of some 600 cc capacity, and a certain nozzle consisting of a piece of glass tubing drawn down at the orifice to an inside diameter of about 1.7 mm, the flame is from 60 cm to 70 cm tall, and when a high-pitched whistle is sounded or the letter *s* is spoken or keys jingled or paper crumpled, the flame responds by ducking to a height of 25 cm or 30 cm. If the bottle is taken away, the flame from the same nozzle is hardly sensitive at all.

I have examined the effects of bottles of three sizes, and of inserting between the bottle and the nozzle different lengths of rubber tubing. With a bottle which has a capacity of 250 cc the flame is less sensitive than with the 600 cc bottle, but a bottle which has a capacity of more than two liters is little, if any, better than the 600 cc bottle. When using the 600 cc bottle, putting increasing lengths of tubing between the bottle and the nozzle seems to be without effect on the sensitiveness—at any rate up to a length of about eight meters of tubing. But when using the 250 cc bottle, increasing the length of tubing between the bottle and the nozzle improves the sensitiveness—until the flame becomes as sensitive as the one from the 600 cc bottle.

This last fact suggested doing away altogether with the bottle, and simply using a long tube from the gas cock to the nozzle. This turns out to be possible. The flame begins to be sensitive before the tubing attains a length of two meters, and with several meters of tubing the flame is as sensitive as with the bottle.

The size of the orifice from which the flame burns is important. If the orifice is too small, the pressure in the mains does not bring the flame near enough to the point of flaring. If the orifice is too large, the cock has to be partly closed to prevent continuous flaring, and the flame proves not to be sensitive. The best nozzle that I have used has an orifice of such diameter that the flame is just on the point of flaring when the cock is wide open. With this nozzle the flame is sensitive without the bottle, and the bottle does not seem to add to the sensitiveness. But with another nozzle, which looks very much like the first, the cock has to be only partly open, and the difference in sensitiveness with the bottle and without it is very marked.

The possibility of obtaining a sensitive flame by the use of a bottle may have some bearing on the theory of sensitive flames. Tyndall[1] found "as an essential condition of complete success, that a free way should be open for the transmission of the vibrations from the flame, backwards, through the gas-pipe which feeds it. The orifices of the stopcocks near the flame ought to be as wide as possible." Tyndall's assistant, Mr. Barrett,[2] pointed out that the bad effect of a partly open gas cock may be obviated by "many feet of free tubing" between the cock and the nozzle, and he suggested that the partly open cock may produce a "ricochetting of the current of the gas from side to side of the pipe," thus leading at the orifice, he believed, to a narrowed stream of gas with an increased velocity. This increase in velocity he supposed would have the same effect as an increase in pressure—it would make the flame flare continuously. If Mr. Barrett's explanation were correct it would seem as if a slightly larger orifice or a further slight closing of the gas cock ought to make the flame sensitive. Very often this is not the case. Another possible cause for the bad effect of a partly open cock was suggested by Rayleigh:[3] A hissing of the gas as it passes the cock—the hiss being produced only when the cock is partly open, and the sound of the hiss being carried "to the burner along the supply-pipe acting as a speaking-tube." Rayleigh tried experiments "with various nozzles inserted in the supply-tube. These included holes in thin metal plates and drawn-out glass tubes. Even though the rubber tubes were so bent that the streams issuing from the nozzles were directed against the sides, no sound was heard, and no loss of sensitiveness was apparent." He concludes: "It would seem that mere irregularity of flow produced no marked effect, and that, provided no sound attended it, the full pressure could be borne without flaring."

If Rayleigh's explanation is correct it would hardly seem that the use of a bottle between the gas cock and the nozzle would make much difference. A hissing sound might well be considerably damped by traveling through the gas in several meters of rubber tubing, but it does not seem likely that it would be greatly damped by passing through the gas in a glass bottle. Moreover, if I connect to the cock a piece of tubing several meters long, and hold my ear close to the farther end of this tube, I find that the hiss at the cock is much dulled by transmission through the tube; whereas if I use a short piece of tubing to connect the bottle to the cock, and then hold my ear close to the opening in which I usually put the nozzle, I hear the hiss very distinctly.

Perhaps the hiss at the cock is not an important cause of the lack of sensitiveness. When an organ pipe is sounding Friedrich[4] detected vibrations which

[1] John Tyndall, *Phil. Mag.*, 33, pp. 92, 375, 1867.

[2] W. F. Barrett, *Phil. Mag.*, 33, pp. 216, 287, 1867.

[3] Rayleigh, *Phil. Mag.*, 13, p. 345, 1882.

[4] W. Friedrich, *Ann. der Physik*, 7, p. 97, 1902.

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

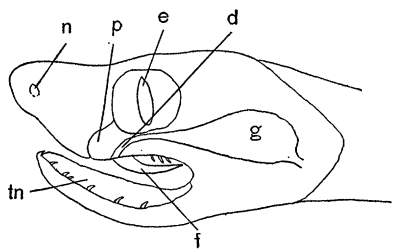
SMITH COLLEGE

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.