DISCUSSION

THE DIVING HABITS OF THE BEAVER

THERE are many interesting accounts of the habits of the beaver, but we have not yet seen any report of a critical examination of the behavior of beavers during submergence. During a recent visit to Algonquin Park, Ontario, through the courtesy of Mr. F. A. Macdougall, superintendent, we were enabled to make some observations on a living animal. The beaver was caught by ranger George Heintzman in a live trap near Opeongo Lake. It was in excellent condition and weighed about 40 pounds.

Its movements were slow and deliberate, but when it once reached the water it swam and dived violently. When returned to an open-topped box it soon became quiet. Within fifteen minutes one of us had firmly placed one hand on the nape of the beaver's neck and with the other hand could feel the heart beating regularly and strongly at 100 per minute.

The box was then placed at the edge of the lake, so that the animal was just awash. With its nostrils just above the water, the heart-beat after a half hour of rest was 50 and irregular, while respiration went on regularly and gently at about 16 per minute. This was the usual resting condition of heart and respiration.

The head of the beaver was then pressed under water. There was no resistance, and as soon as the head was immersed the animal relaxed and lay with its head resting on the bottom. It made no effort to raise its head until about five minutes had passed, when, after some brief struggling, it was impossible to hold it down longer. Upon emerging, the breathing movements were only slightly increased in amplitude and frequency. The observation was repeated four more times at intervals.

While the beaver was submerged the heart-beat could not be detected, although the position of the animal's thorax was not altered. It is unlikely that the heart entirely stopped, but it certainly diminished greatly in vigor. It is known that in the duck, seal and muskrat the heart is slowed during apnoea.

The docility of our beaver also allowed us to observe the animal's heart while one of us compressed the animal's trachea with his hands. After respiratory movements had completely ceased, from 6 to 10 normal heart-beats were distinctly felt, and then no further movement within the thorax. This observation, which was repeated three times, showed that there was no change in the thorax during apnoea, which made it impossible to detect the normal heart-beat, and that the inhibition of cardiac activity was a regular accompaniment of apnoea.

When it is considered how violent the struggles of an asphyxiated land animal are and how savagely even man combats interference with his process of respiration, it is remarkable that the wild beaver should have submitted so readily to forced submergence and violent closure of its trachea. The observed muscular relaxation and the inhibition of the action of the heart are probably part of the physiological adjustment of the beaver to submergence, as Paul Bert and Richet demonstrated them to be in the duck.

Apparently metabolism is by no means suspended during diving, for after the five-minutes apnoea the beaver's heart beat more strongly at from 75 to 90 per minute during several minutes. It was evidently repaying the oxygen debt which was incurred during the period of apnoea. That the heart showed such a slight acceleration after 5 minutes of asphyxia suggests that the limit of its endurance had by no means been reached. We received reports from three experienced rangers who had observed beavers resting on the bottom while submerged for 15 minutes, and we feel convinced that the capacity of the beaver for resisting asphyxia is exceptional when contrasted with the ability of a land mammal.

LAURENCE IRVING
M. D. ORR
UNIVERSITY OF TORONTO

LATEX TEST FOR MATURITY OF PAPAYA FRUITS

THE immature fruit of the papaya (*Carica papaya*) contains the enzyme papain.[1] The concentration of this enzyme in the juice reaches its maximum when the green fruit is fully grown in size, and then decreases as the fruit matures, apparently disappearing when full maturity is reached.[2] As the papaya fruit matures the following changes are readily apparent—the color of the flesh and placentae changes to orange or peach pink, depending on variety character, the seeds turn black, the flesh softens and its sweet taste increases with a decrease in effective acidity (increase in pH). The color of the juice also changes with maturity. When the immature green fruit is punctured a milky juice is exuded. The milkiness of the juice becomes less and less as maturity proceeds until the stage is reached when the fruit matures on the tree and the juice exuded is colorless and finally ceases to exude at all. When fruits capable of exuding juice are cut in half, the exudation following punc-

[1] A. Wurtz and E. Bouchut, *Compt. Rend. Akad. Sci. Paris*, 89: 425–429, 1879.

[2] Ellis Thomas and V. A. Beckly, *Jour. Dept. Agric. So. Africa*, 6: 357–360, 1923. F. A. Stockdale, *Dept. Agric. Ceylon. Leaflet*, 44, 1926. V. A. Pease, "Papaya and Papain." (A mimeographed publication of the Bur. Chem. and Soils, U. S. Dept. of Agric.) 1933.

turing rapidly declines, beginning near the cut end and ending finally on the ridge farthest from the cut surfaces.

Preliminary observations indicate that the change in color of the exuded juice may be used as a maturity test and that the best time to harvest the fruit is when the exuded juice has become almost or wholly colorless. Earlier picking results in an inferior product and later picking reduces the keeping quality. The complete results will be published later when the experiments now in progress are concluded.

HAMILTON P. TRAUB
T. RALPH ROBINSON
H. E. STEVENS
BUREAU OF PLANT INDUSTRY
U. S. DEPARTMENT OF AGRICULTURE

BALLOONING OF AN ADULT BLACK WIDOW SPIDER

IT is generally known among workers that the young of the black widow spider (*Latrodectus mactans* Fabricius) are dispersed by means of ballooning. Illingworth (1931)[1] states that in Hawaii black widow spiderlings are dispersed by the wind blowing them along with their thin, light ballooning threads; even going out to sea.

However, on September 16, 1935, at about 11 A.M. I was walking across a vacant lot in East Denver. The day was fair and slightly breezy. When I was about half-way across the lot, I happened to look up and see a mature black widow spider ballooning. The spider had its appendages contracted, and it was about eight feet above the ground; as I watched, it continued to rise higher and finally disappear. The several threads of silk supporting the spider in mid-air were about seven to eight feet long. Further observations of like occurrences may possibly bring out the significance of this phenomenon.

ALBERT MILZER
UNIVERSITY OF COLORADO

[1] J. F. Illingworth, *Proc. Hawaiian Ent. Soc.*, 7: 410–414, 1 pl., 1931 (cited by Charles E. Burt).

AIR-MASS AND FRONTAL ANALYSIS BY TELETYPE AND RADIO

TRANSMISSION by teletype and radio of the analysis of the morning weather map, in accordance with the air-mass system employed in the Division of Meteorological Physics of the Central Office of the Weather Bureau, Washington, D. C., was begun last October 15. The data, in code form, are placed on the teletype circuit daily at Washington, except Sundays and holidays, at 11:36 A. M. (E. S. T.) and are relayed to all airway communication circuits for entry on the manuscript maps at the various airports and for subsequent study and use of persons consulting them. City offices of the Weather Bureau receive the information by teletype, telephone or mail from nearby airports. Data for Sundays and holidays are transmitted the next working day immediately following the current day's analysis.

SNOWDEN D. FLORA

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

LOCAL BRANCHES

IT is almost a year since the first Local Branch of the American Association for the Advancement of Science was organized. Six such branches are now operating, and several added groups have held preliminary meetings, looking toward organization. It is too early to discuss the success of these branches, but a descriptive statement about their operation and suggestions may be given that will be useful to those who plan other branches. The idea of local branches was discussed at length by Dr. J. McKeen Cattell in SCIENCE for December 21, 1934.[1] Reprints of that discussion may be had by application to the general secretary of the American Association for the Advancement of Science.

The six branches already approved by the Council of the American Association for the Advancement of Science, in the order of their organization, are: The Lancaster (Pa.) Branch of the A. A. A. S., the Kingston (R. I.) Branch of the A. A. A. S., the South Florida (Miami) Science Association, the Phoenix (Ariz.) Branch of the A. A. A. S., the Westchester (Yonkers) Institute of Sciences, and the Mobile Academy of Science. Each of these branches is autonomous in its procedures. Each elects a president or chairman, a secretary and a treasurer. Some also have one or more vice-presidents, an executive committee, a program committee and other committees on special needs relating to place of meeting, research, publicity, membership and luncheons or dinners. In most cases the organization is simple, the officers serving as the executive committee, with authority to appoint temporary special committees, as occasion may make desirable. In some branches there is an honorary president or chairman. This plan permits the branch to recognize and gain help from an outstanding citizen who can hardly be expected to attend committee meetings regularly.

Membership in the branches includes persons with

[1] J. McKeen Cattell, SCIENCE, Vol. 80, 1934.