Paracyclas elliptica Hall
Platyceras cf. *reflexum* Hall
Tentaculites bellulus Hall
Nephriticeras (unnamed species found in Grand Tower)
Bactrites? aciculum? Hall
Proetus crassimarginatus Hall
" cf. *haldemani* Hall
Phacops cf. *cristata* Hall
Ostracodes (several species)
Onychodus sigmoides Newberry

No apology is made for the lack of specific identification in some instances and the indicated uncertainty in others, nor is the faunal list considered complete. The identification of most of the species given, however, is thought to be correct in spite of the imperfect preservation of much of the material upon which determinations were based.

Of the twenty-three forms specifically identified or referred to species, twelve are also found in the Grand Tower fauna, five are known from the St. Laurent, one is found in the Onondaga division of the Romney of Maryland, two in the Hamilton division of the Romney, and three in the Hamilton of New York. The paleontologic evidence, therefore, indicates a fauna transitional between the Grand Tower and the St. Laurent. In other words, the Beauvais fauna shows both Onondagan and Hamilton affinities. Thus the formation is doubly unique in that it has neither exact lithologic nor paleontologic equivalents in the Devonian of the North American interior, although its stratigraphic position is similar to that of the Marcellus shale of New York. The intermediate character of the fauna may be taken as proof of the fact that the Beauvais sandstone is essentially conformable with the enclosing formations, although the actual contacts have not been seen. The lithologic evidence also supports this conclusion, for the upper Grand Tower limestone contains sand grains of the Beauvais type in increasing amount upward, and the lower St. Laurent beds are also more arenaceous than the higher strata.

Because of the distinctly intermediate character of the fauna and the intricacies of the fault patterns, a natural question is: has the fauna described an intermediate aspect because of the fact that some of the material collected was actually taken from the more arenaceous phase of the Grand Tower and mixed with other material from the lower St. Laurent? The answer is that such a mixture is most improbable for (1) no St. Laurent has ever been identified near any of the three localities here described; (2) the matrix is in each locality entirely non-calcareous, which is not the case of either the arenaceous Grand Tower or St. Laurent, and (3) almost all the species listed above may be collected from a single large block of the sandstone at the locality near the top of Peach Tree Ridge.

CAREY CRONEIS
ARNOLD D. HOFFMAN

WALKER MUSEUM,
UNIVERSITY OF CHICAGO

RESPONSES OF SHEEP TO ZYGADENUS GRAMINEUS, "DEATH CAMAS"

MORE than a quarter of a century ago the symptoms produced in sheep after eating *Zygadenus gramineus* or "death camas," one of the most noxious plants growing upon the ranges of Colorado, Montana and Wyoming, were observed and recorded by Chestnut and Wilcox,[1] and quite similar responses were noted by Marsh and Clawson[2] during the forced feeding experiments conducted by them. Laboratory studies were made upon the alkaloidal principles of this plant and the reactions produced in laboratory animals following their administration by Reid Hunt,[3] Torald Sollmann[4] and by Mitchell and Smith.[5]

The annual loss of great numbers of sheep after having eaten of this plant has prompted a further study of the action of the active principles of this plant upon these animals in order to secure all data possible respecting the point and mode of action of these principles.

A fluid extract made from the dried herbage of this plant was dried upon spent marc and extracted with petroleum and ethyl ethers in order to remove resins present in the original extract. The remainder of the extract was percolated with 90 per cent. alcohol, which later was evaporated by means of gentle heat, and the semisolid residue was taken up in dilute alcohol and filtered. This filtrate, which was employed for intravenous injections, contained 0.004 gram of alkaloids per cubic centimeter in a solution of 21 per cent. alcohol.

The four sheep employed for these experiments were anesthetized with ether followed by a solution of amytal given intravenously. It was found necessary to supplement the dosage generally used for laboratory animals with a 20 per cent. solution of urethane in Locke's solution given intravenously or by chloretone in oil injected intraperitoneally. Chloretone in oil alone was unsatisfactory. The intravenous injections were made by way of one of the

[1] Chestnut and Wilcox, Bulletin No. 26, Division of Botany, U. S. Dept. of Agriculture, pp. 51–64, 1901.
[2] Marsh and Clawson, Bulletin No. 125, Professional Papers, U. S. Dept. of Agriculture, 1915.
[3] Reid Hunt, *Am. Jour. Physiol.*, 6: xix–xx, 1902.
[4] Torald Sollmann, see Marsh and Clawson, p. 3.
[5] Mitchell and Smith, *Am. Jour. Physiol.*, 28: 318, 1911.

veins located on the lateral aspect of the tibio-tarsal or hock joint.

After complete immobility was secured, these sheep were connected with the instruments generally used for making graphic records of circulatory and respiratory movements. Sheep of from 55 to 69 pounds weight recovered spontaneously after the intravenous injection of 0.4 to 0.8 cc of the extract despite the inhibition of respiration lasting from one to several seconds.

Almost immediately after the injection of one cubic centimeter of the extract there occurred an apnoea of 20 seconds followed in turn by a few irregular, shallow respiratory movements and another period of apnoea which was accompanied by an elevation of 50 mm in blood-pressure. This rise of blood-pressure was brought back to normal after a short period, 10 to 12 seconds, of artificial respiration only to be followed two minutes later by another period of apnoea enduring for a full minute. Altogether there occurred four asphyxia-like rises of blood-pressure, varying from 44 to 108 mm of Hg above the previous normal, whose inceptions were preceded by apnoea enduring from one third to one minute before the animal recovered. These asphyxia-like rises of blood-pressure were always reduced to normal by means of artificial respiration, following which, except in the fourth case, there occurred irregular respiratory movements, displaced in their turn by a succeeding apnoea.

The circulatory system of sheep responds to intravenous injections of the extracts of *Zygadenus gramineus* in one of several ways. In the majority of instances there is a rise of blood-pressure accompanied by an acceleration of the cardiac rate. Some of the responses showed little if any change, and still others showed a fall in blood-pressure. In two instances in which a depression of blood-pressure occurred there was very little change in heart rate, indicating a vasodilation. This condition was frequently seen in similar experiments performed upon dogs and rabbits. The latter asphyxial rises of blood-pressure are undoubtedly of a secondary nature.

Believing that the chief toxic action of *Zygadenus gramineus* for sheep was in its great power for depressing the respiration, thus causing asphyxia, the writer, after an hour had been allowed for the animal to recover from the effects of an intravenous injection of the extract, closed the tracheal cannula and produced a graph very similar to one of the asphyxial rises of blood-pressure described above. When extracts of *Zygadenus gramineus* have been injected intraperitoneally or given by means of the stomach tube to rabbits, evidence of asphyxia, such as gasping and convulsive struggles associated with oxygen want, have been observed.

In his experiments with the alkaloidal substances isolated from Zygadenus Reid Hunt[3] found that caffein or diuretin given to rabbits and sheep in conjunction with large amounts of the alkaloidal materials caused such a rapid excretion of these toxic substances that no symptoms of poisoning resulted. The writer has observed that, after intramuscular injection of one grain of caffein dissolved in physiological salt solution with the aid of sodium benzoate, five times as much of the extract of Zygadenus was required to elicit the same response to this extract from a rabbit as was needed before the injection of the caffein. A sheep, following an intravenous injection of an extract of Zygadenus, exhibited a respiratory rate and amplitude of 53.6 and 1.9, respectively. A recovery to 42.1 and 11.6 mm, respectively, was recorded three minutes after the injection of one grain of caffein sodio-benzoate. These results and others of a similar nature furnish supplemental evidence to the findings of Hunt relative to the value of caffein as an antidote for animals poisoned by this plant.

SUMMARY

An extract of *Zygadenus gramineus*, "death camas," from which most of the resins had been removed was given intravenously to sheep prepared for recording blood-pressure and respiratory movements.

Following the intravenous injection of this extract there occurred a respiratory inhibition which in the case of the injection of larger amounts of the extract was followed by asphyxia-like rises of blood-pressure.

The graphic record of this asphyxial condition was practically duplicated by closing the tracheal cannula for a short time following the recovery of the animal from the effects of the plant extract.

Although, from a field standpoint, no satisfactory antidote has been found, it has been demonstrated that caffein sodio-benzoate possesses marked powers of stimulation for the respiratory center affected by the depressive substances found in *Zygadenus gramineus*.

ALVAH R. MCLAUGHLIN

UNIVERSITY OF WYOMING

BOOKS RECEIVED

BOWEN, R. SIDNEY, JR. *Flying from the Ground Up.* Pp. vi + 234. McGraw-Hill. $2.00.

Carnegie Institution, Year Book, 1930. No. 29. Pp. xix + 454. Carnegie Institution.

COLE, F. J. *Early Theories of Sexual Generation.* Pp. x + 230. Illustrated. Oxford University Press. $6.00.

IMMS, A. D. *Recent Advances in Entomology.* Pp. viii + 374. Illustrated. Blakiston. $3.50.

LEITH, C. K. *World Minerals and World Politics.* Pp. xii + 213. McGraw-Hill. $2.00.

REICHE, FRITZ. *The Quantum Theory.* Pp. viii + 218. Revised edition. Dutton. $2.10.

SCARBOROUGH, JAMES B. *Numerical Mathematical Analysis.* Pp. xiv + 416. Johns Hopkins Press. $5.50.