regarded only as preliminary and can only suggest the general nature and probable molecular size of these substances. Further work is in progress, the results of which will be described in detail elsewhere.

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THE FAUNA OF THE MIDDLE DEVONIAN BEAUVAIS SANDSTONE OF MISSOURI

THE complexly faulted Little Saline Creek area of Ste. Genevieve County, Missouri, has been the site of one of the University of Chicago's geological field camps for nearly twenty summers. During the course of detailed field mapping students and instructors alike have, from year to year, continued to find new structural and paleontological features, many of which have proved to be of more than local interest. One of the early discoveries was the fact that a brown, sugary sandstone, which had been called the St. Peter by some geologists, was in reality very much younger than that formation. This sandstone, which proved to be only one of a complete sequence of lower and middle Devonian formations preserved in a down-faulted block, was early designated by Weller as the Beauvais formation. His detailed description of the sandstone, however, did not appear until posthumously in 1928.[1]

The stratigraphic position of this sandstone between the Onondagan Grand Tower limestone and the Hamilton St. Laurent formation having been determined, its mid-Devonian age was established. Its exact correlation with other deposits of somewhat similar age, however, has been difficult because of its essential lack of well-preserved organic remains. According to Weller, fossils are rare in the formation and have been observed only at an outcrop on the Little Saline Creek near the Boarman School road. At this locality a number of species of invertebrates are represented by poorly preserved internal casts. The only species which is at all common is one identified as *Newberrya claypolei;* the condition of the others does not permit their identification. Branson and Williams,[2] however, five years earlier listed the following species from the Beauvais sandstone:

Atrypa reticularis (Linnaeus)
Chonetes vicinus (Castelnau)
Schizophoria striatula (Schlotheim)
Spirifer granulosus (Conrad)
Stropheodonta demissa (Conrad)
Tentaculites sp.

No locality is given for these species, but as Branson and Williams say that the specimens studied "were collected" and "most of the species were identified by Professor Weller's students before they were sent to the writers . . ." we may assume that they came from the locality mentioned above, and that Professor Weller felt that the identifications were none too certain.

One of the interesting discoveries of the field season of 1930 was the fact that the Beauvais sandstone is fossiliferous at other localities than that previously mentioned. One of these borders the old road on the south side of Peach Tree Ridge almost directly north of the Boarman School; a second is situated along the southern side of the triangular fault block of Beauvais near the top of the above-mentioned ridge, and the third occurs near the northern apex of the easternmost Beauvais fault block on Troublesome Hill, not far west of the Ozora-St. Mary's road. All three of these localities are at or near fault lines where the sandstone, as a consequence, is somewhat better cemented than usual. As a further result the fossils are more readily identifiable than is the case of those taken from Weller's locality, though it must be admitted that the preservation is not very good. A study of the material from these localities makes it possible to list the following assemblage as the known Beauvais fauna:

Favosites (several species)
Crinoid stems
Bryozoan (dichotomous branching)
Orbiculoides lodiensis var. *media?* (Hall)
Crania crenistriata Hall
Stropheodonta demissa Conrad
Leptaena rhomboidalis (Wilckens)
Chonetes vicinus (Castelnau)
Camarotoechia sp.
Cyrtina sp.
Schizophoria striatula (Schlotheim)
Atrypa reticularis (Linnaeus)
Athyris fultonensis Swallow
Spirifer granulosus (Conrad)
" *pennatus* (Atwater)
" *varicosus* Hall
" sp.
" n. sp.
Nucula sp. 1
" sp. 2
Nuculites oblongatus Conrad
Palaeoneilo maxima (Conrad)
Pterinea flabellum (Conrad)
Actinopteria boydi Hall
Leiopteria cf. *gabbi* Hall
Modiomorpha sp. 1
" sp. 2

[1] Missouri Bureau of Mines and Geology, 22 (1928): 148–50.

[2] E. B. Branson and J. S. Williams, Missouri Bureau of Mines and Geology, 17 (1923): 131.

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.

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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.