

⁴ C. M. McCay and M. F. Crowell, *Anat. Rec.*, 57, No. 4, Suppl. p. 102 (1933); *Nutr. Abs. and Rev.*, 3, 1119 (1934); *Sci. Mo.*, November (1934).

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THE GRAPTOLITES OF THE SIMPSON GROUP OF OKLAHOMA*

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Communicated March 27, 1935

The older sedimentary formations of the Arbuckle Mountains of Oklahoma beginning with the oldest are: Reagan sandstone (Cambrian), Arbuckle limestone (Cambro-Ordovician), Simpson group, Viola limestone, Sylvan shale (all three Ordovician), Chimneyhill limestone and Henryhouse shale (both Silurian).

The Simpson group has been divided by the writer¹ into five formations, Joins, Oil Creek, McLish, Tulip Creek and Bromide. All five of these formations are present in the western part of the mountains, but the oldest and next to the youngest (Joins and Tulip Creek) wedge out in the middle part of the mountains, leaving only three formations in the eastern part.

In the formations named above, graptolites have been found in the Arbuckle, Joins, Bromide, Viola, Sylvan and Henryhouse. Considerable progress has been made recently on the study of the graptolites of these formations. They are listed by zones in a paper on the Viola limestone,² and thirty species and varieties from this formation have been described and illustrated.³ Two more papers have been sent to press recently on the graptolites of the Henryhouse and Sylvan shales. Yet much remains to be done on the graptolites of the Arbuckle Mountains and on those in other formations in the eastern part of the State. The study thus far has yielded excellent results in local and in widespread correlation.

In the Simpson group graptolites have been found in only two horizons, one near the base in the lower part of the Joins formation, and one near the top in the upper part of the Bromide formation. The lower zone was found and traced around the mountains by the writer and Rex McGehee in 1928. Earlier Chester A. Reeds had found *Didymograptus artus* in this zone and had sent them to E. O. Ulrich,⁴ who placed them provisionally in the upper part of the Arbuckle limestone.

As a rule *Didymograptus artus* was found in a zone only 2 inches wide, but in the Criner Hills it ranges through 8 feet of sediments. The zone was found to vary from 43 to 102 feet above the base of the Joins formation. It was found also 50 feet above the base of the Joins by D. A. McGee at

Oklahoma City at a depth of 6316 feet in the Williamson-Canfield well no. 1, and at 6302 in the Foster well no. 1. The presence of the *Didymograptus artus* zone at Oklahoma City proved that the Joins formation extends into that area, though some geologists had thought earlier that it was not present. Also, this species is very important for wider correlation, as it occurs definitely in the *D. bifidus* zone.⁵ An illustration of the latter is shown in plate 1, figures 10, 10a for comparison. The specimen illustrated came from shales in the Black Rock limestone near Black Rock, Arkansas. Because of the association of these two species of *Didymograptus*, the lower part of the Joins formation may be connected with the widespread *D. bifidus* zone. In this country outside of Arkansas, this zone occurs in the Quebec shales at Point Levis, three miles above the River St. Anne in Quebec.⁶ It is common in beds 3 to 5 in the Deep Kill section of eastern New York,⁷ and it has been listed from Nevada by Gurley.⁸ In Great Britain it occurs in England, Wales, Scotland and Ireland, where it has been found in the middle and upper Arenig beds, but chiefly in the latter.⁹ In Europe it occurs in Norway, Sweden, Bohemia and France, also in Victoria, Australia.¹⁰

Classification of Graptolites

GRAPTOLOIDEA AXONOLIPA (Frech) em Ruedemann

Genus DIDYMOGRAPTUS McCoy 1851

Didymograptus artus Elles and Wood.

GRAPTOLOIDEA AXONOPHORA (Frech)

Genus DIPLOGRAPTUS McCoy 1854

Diplograptus (Amplexograptus) maxwelli n. sp.

Description of Species

DIDYMOGRAPTUS ARTUS Elles and Wood¹¹

Plate 1, figures 8, 9, 9a

Didymograptus artus is a tiny form of the pendent type in which the two stipes diverge at the proximal end at an angle of 90°, then the stipes bend inward until they become nearly parallel. The stipes are 0.4 mm. wide at the proximal end, and soon increase to a width of 1.3 mm. A colony is commonly 8 mm. long, but the length may be increased to 3 times that amount. The thecae are very close set, 18 or 19 in 10 mm., and they slope at an angle of 50°. The thecae are long and narrow, about 3 times as long as wide, and they overlap one-half to two-thirds their length. The sicula is about 1.3 mm. long.

Didymograptus artus is much like the cosmopolitan *D. bifidus* in whose

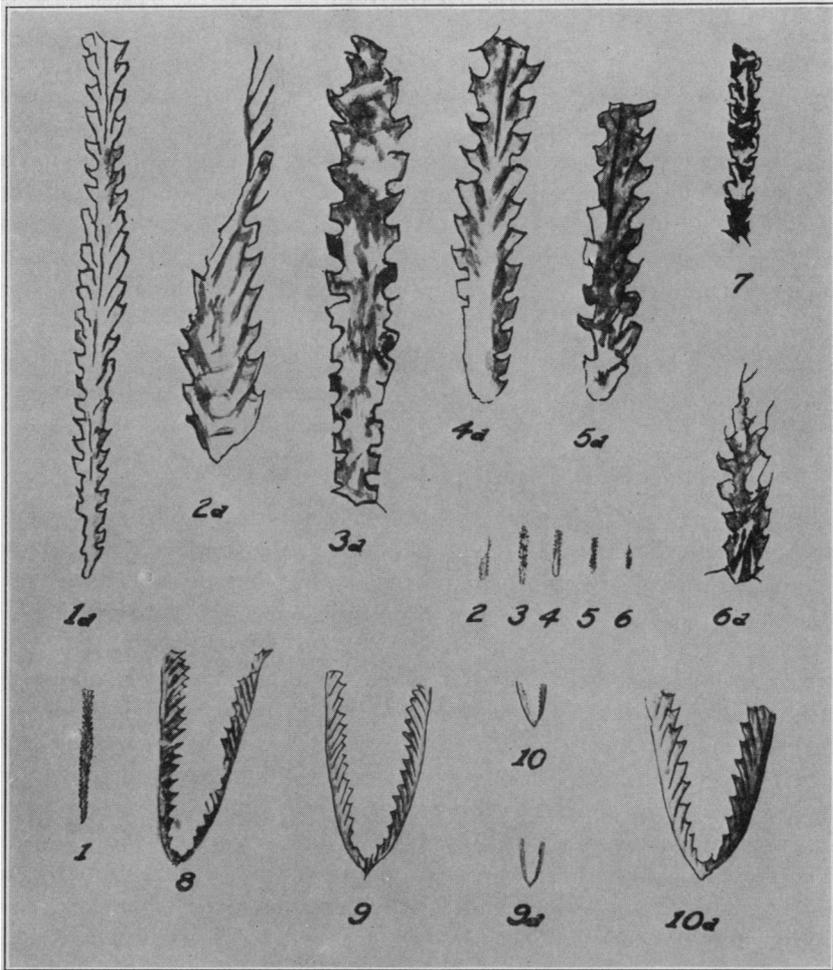


PLATE 1

Diplograptus (Amplexograptus) maxwelli n. sp.

Figures 1 to 7, cotypes nos. A2041 to A2047 are in Univ. of Oklahoma Invert. Paleon. Mus.

Figures 1, 1a, 2 miles west of Nebo Store; $\times 1$, $\times 4$.

Figures 2, 2a to 6, 6a, Rock Crossing, Criner Hills; $\times 1$, $\times 6$.

Figure 7, Rock Crossing, Criner Hills; $\times 4$.

Didymograptus artus Elles and Wood

Figures 8, 9, 9a, plesiotypes nos. A2048, A2049, Univ. of Oklahoma Invert. Paleon. Mus.

Figure 8, West side U. S. Highway 77, 3 miles north of Springer; $\times 4$.

Figures 9, 9a, Williamson-Canfield no. 1, 6316 feet, Oklahoma City; $\times 4$, $\times 1$.

Didymograptus bifidus Hall

Figures 10, 10a, half mile east of Black Rock, Ark.; $\times 1$, $\times 4$.

Illustrations given for comparison.

zone it occurs, but is smaller, has narrower stipes which become more nearly parallel, and has the thecae much more crowded, to the extent of about one-third more in 10 mm.

The finding of *Didymograptus artus* extensively developed in the lower part of the Joins formation near the base of the Simpson group in the Arbuckle Mountains and Criner Hills, and at a depth of over 6300 feet at Oklahoma City, has helped greatly in local correlation. Also, because of its association with *D. bifidus*, it has helped in the long range correlation noted above.

Genus DIPLOGRAPTUS McCoy 1851
DIPLOGRAPTUS (AMPLEXOGRAPTUS) MAXWELLI

Decker n. sp.

Plate 1, figures 1 to 7 and 1a to 6a

This new species of *Diplograptus* has the characteristics of the subgroup, *Amplexograptus*, described by Elles and Wood as follows:¹² "Mesograpti in which the thecae were semicircular in section, and the apertural margins undulate; excavations deep and conspicuous in the obverse aspect throughout."

No complete rhabdosome was secured, and no synrhabdosome was clearly distinguished. Yet the crowding of so many rhabdosomes together in a small area with some of them apparently radiating from a center, makes it seem probable that synrhabdosomes did exist. They occur generally in a tough limestone from which it was difficult to secure more than small fragments.

The specimens illustrated in plate 1, figures 2 to 7, were collected from Rock Crossing in the Criner Hills. The one illustrated in figures 1, 1a was collected 1½ miles west of Nebo Store southwest of Sulphur. This largest fragment measures 21 mm. in length, and the entire length to which the rhabdosomes grew is not known. The width at the sicular end is 1 mm. and this increases in the distance of 6 thecae to 2 mm. which is about the maximum width. A narrow line-like median depression occurs on the obverse side. The thecae number 10 to 14 in 10 mm. and overlap about one-half their length. Angle of slope is about 25°. The margins are deeply notched. Two delicate lateral spines occur on the proximal end. The sicula, a little over 1 mm. long, may be seen in figure 6a.

This new species occurs most abundantly at Rock Crossing in the Criner Hills, 8 miles southwest of Ardmore. The specimen illustrated in figure 1 was secured from 1½ miles west of Nebo Store, 11 miles southwest of Sulphur; a specimen was found on Cool Creek, 19 miles northeast of Ardmore; and some fragments were found on the West Branch of Sycamore Creek at the same horizon, though no certain identification was made.

This new species of graptolite is very important for local correlation, as it, with other definite horizon markers, relates the Bromide formation in the upper part of the Simpson group in the different regions in a very clear way, and helps to demonstrate in a significant manner the unity and individuality of the Bromide formation as developed in the Criner Hills and Arbuckle Mountains of Oklahoma.

* Acknowledgment is made to the NATIONAL RESEARCH COUNCIL for grants to meet part of the expenses of preparation of materials for this and four other papers, to Dr. Rudolf Ruedemann for assistance with the drawings, and to Rex McGehee and Ross Maxwell for field assistance.

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⁹ Elles, G. L., and Wood, E. M. R., *Op. cit.*, **43**, **44** (1901-1918).

¹⁰ Ruedemann, R., *Op. cit.*, 691 and *op. cit.*, 490 (1904).

¹¹ Elles, G. L., and Wood, E. M. R., *Op. cit.*, **48**, **49** (1901-1918).

¹² Elles, G. L., and Wood, E. M. R., *Op. cit.*, **221** (1901-1918).

THE LOCATION OF A GENE FOR DISEASE RESISTANCE IN MAIZE

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Communicated March 18, 1935

The inheritance of resistance to physiologic forms 1 and 3 of rust, *Puccinia Sorghi* Schw., of corn has been shown by Mains¹ to be dependent in each case on a single Mendelian factor. The inheritance of resistance in relation to various other Mendelian factors was studied but no indication of linkage was obtained.

The study reported here is concerned with the determination of the chromosomal location of the factor for resistance to physiologic form 3 of *Puccinia Sorghi*. The location of the factor was determined cytologically by means of x-ray induced deficiencies, following the method used by McClintock,² and then checked genetically by means of trisomic ratios.

Pollen from a plant homozygous for the dominant factor for resistance was treated with x-rays (dose 1000 or 2000 *r* units) and then used to pollinate susceptible plants. The seed obtained from these pollinations was grown