American Journal of Science
JUNE 1941

THE MIDDLE PERMIAN OF CHIAPAS, SOUTHERNMOST MEXICO, AND ITS FAUNA.

F. K. G. MULLERRIED, A. K. MILLER AND W. M. FURNISH.

ABSTRACT. The distribution and general lithology of the Late Paleozoic limestone in southern Chiapas is discussed. Also, notes are given in regard to all of its known fauna, and a detailed study of two species of ammonoids belonging in the genera *Perrinites* and *Peritrochia* is included. It is concluded that the limestone is Middle Permian in age and that at least the ammonoid-bearing portions of it belong in the Leonard series.

PART 1, STRATIGRAPHY AND FAUNAL SUMMARY.

F. K. G. MULLERRIED.

UPPER Paleozoic strata were first observed in southern Chiapas and adjacent portions of Guatemala by Sapper (1894, 1896, 1899). The lower portions of the sequence there consist of sandstones, conglomerates, and shales, which are in part red and green in color. In Guatemala these clastic strata have been termed the Santa Rosa beds by Dollfus and de Montserrat (1868). According to Waibel (1933) they rest unconformably on the "basement complex" and are overlain by limestone. The writer has found that this limestone outcrops in southern Chiapas in the area between La Nueva, Sabinal, and La Vainilla (Text Fig. 1). It also extends east-southeast into Guatemala and probably west-northwest in Chiapas. Only detailed mapping in the future will establish the extent of the Upper Paleozoic formations of Chiapas and Guatemala and eliminate the uncertainties that exist because of the discrepancies in the published maps (Schuchert, 1935, and Sapper, 1937).

The limestone that overlies the Santa Rosa beds is several hundred meters thick and it is well stratified, being in part medium- and in part thin-bedded. It is dark gray to dark

bluish gray in color and for the most part is crystalline. It contains numerous calcite veins and some gray chert nodules. At a few localities the limestone is conglomeratic and at others it is dolomitic. The beds strike west-northwest and dip about 30-50 degrees to the north-northeast. As Quaternary deposits

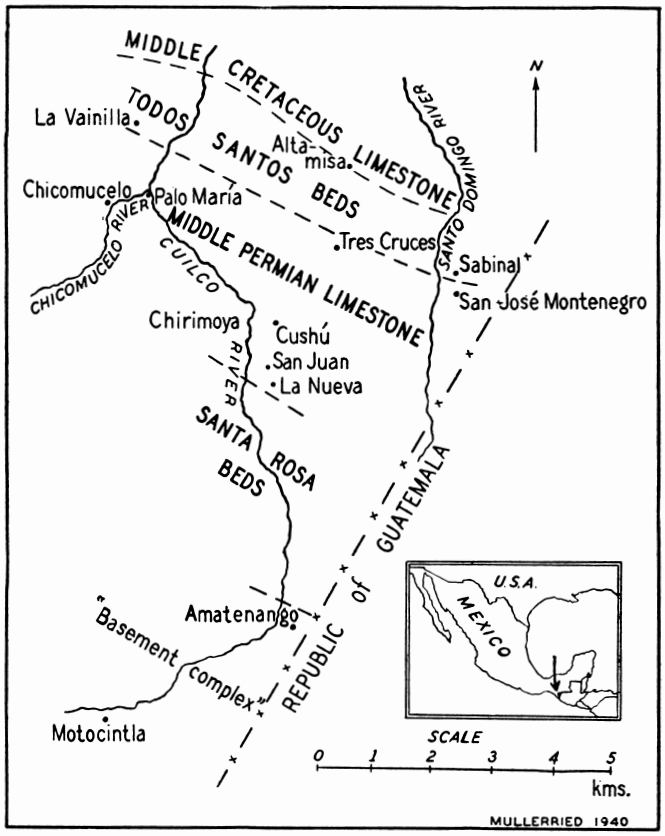


FIG. 1. Reconnaissance geologic map of part of southern Chiapas, Mexico.

are widespread and fairly thick in this area, outcrops of the limestone formation are not abundant, and therefore a complete section is not available.

In Chiapas fossils have not been found in the Santa Rosa beds, but they are not rare in the overlying limestone. They were originally discovered by Sapper and Goyzueta. Sapper's collections were studied by Stolley, von Zittel, and Roemer

(Sapper, 1899), but unfortunately a precise locality is given for only one species, *Lonsdaleia floriformis*, which was found at Palo María. Aguilera (1897) reported on Goyzueta's collections and listed four forms from La Nueva, La Vainilla, Tres Cruces, and Palo Amarillo:

Fusulina granumavenae Roemer?
Fenestella? sp.
Productus semireticulatus Martin
Pleurotomaria? sp.

In 1905 Böse apparently restudied at least part of the specimens collected by Sapper and Goyzueta and identified them as follows:

Nummulina sp. [La Vainilla]
Crinoids [La Nueva]
Productus semireticulatus Martin [La Vainilla and La Nueva]
Productus sp. [Laja Colorado]
Dielasma sp. [Tres Cruces]
Fenestella sp. [La Nueva]
Bivalves [Cuilco River]
Pleurotomaria sp. [La Nueva]

Two years later Aguilera published another list of Late Paleozoic fossils from southern Chiapas and probably adjacent portions of Guatemala:

Fusulina cf. *F. granumavenae* Roemer
Zaphrentis sp.
Spirifer cameratus Morton
Martinia lineata Sowerby
Spirigera (*Athyris*) *subtilita* Hall
Productus rogersi Norwood and Pratten
Productus semireticulatus Martin
Productus scabriculus Martin
Productus nodosus Newberry
Productus occidentalis Newberry
Productus mexicanus Shumard

Then in 1927 the writer collected numerous fossils, including ammonoids for the first time, in the triangular area between La Nueva, Sabinal, and La Vainilla. He also restudied those collections of Goyzueta and Sapper which are at the Instituto de Geología of the Universidad Nacional Autónoma in Mexico City. It is evident from a comparison of the latter collections

with the lists published by Aguilera and Böse that only part of the original material is now available, and furthermore a few of the specimens and the labels may have been interchanged.

Since these fossils came from a remote area, about which little information is available, the following notes seem to be worth recording:

Fusulinids were collected by Mullerried from pebbles in the higher part of the Todos Santos beds along Cuilco River northeast of La Vainilla, and from the basal conglomerate of the Todos Santos beds north of San José Montenegro, and on the left side of Santo Domingo River to the west of Sabinal. Also, Sapper obtained specimens near La Vainilla and south of La Nueva.

A sponge, *Stromatidium* cf. *S. typicale* Girty, is abundant in pebbles in the upper part of the Todos Santos beds along Cuilco River to the northeast of La Vainilla. Crinoid stems are numerous at many localities in the Permian limestone, as well as in pebbles in the overlying Todos Santos beds. Also, Mullerried found serpularian worm tubes east of La Vainilla, and Goyzueta or Sapper collected *Fenestella* cf. *F. capitanensis* Girty near La Nueva.

A few specimens of productids and gastropods were also collected from several localities in pebbles in the Todos Santos beds and from the limestones beneath; the most significant are *Dictyoclostus* aff. *D. semireticulatus capitanensis* (Girty) from near Tres Cruces, *Pleurotomaria?* cf. *P.? carinifera* Girty from La Nueva, and *P.* cf. *P. neglecta* Girty from east of La Vainilla. Fragmentary pelecypods were obtained at several localities, but the most important fossils are the three specimens of *Perrinites hilli* and the new species of *Peritrochia* described in this communication by Miller and Furnish. These ammonites were found by Mullerried in the limestones below the Todos Santos beds about three hours ride to the north-northeast of Cushú on the road to San José Montenegro.

The writer's collections and determinations confirm the occurrence of foraminifera, crinoids, bryozoans, brachiopods, pelecypods, and gastropods in the Late Paleozoic strata of southern Chiapas, and show that sponges, worms, and ammonoids are also present. Furthermore, the limestone formation there is Permian, rather than Carboniferous as was believed by Aguilera and Böse, as well as by Stolley, von Zittel, and Roemer. Certain of the fossils can be said to indicate a Middle Permian age

for the formation, particularly the ammonoids and such forms as *Pleurotomaria* cf. *P. neglecta*, *P.?* cf. *P? carinifera*, *Fenestella* cf. *F. capitanensis*, *Stromatidium* cf. *S. typicale*, and *Dictyoclostus* aff. *D. semireticulatus capitanensis*. Miller and Furnish's study of the ammonoids have shown that the beds which yielded them are to be correlated with the Middle Permian Leonard formation of west Texas and equivalent beds in southwestern Coahuila. A few of the fossils identified by the writer, particularly *Dictyoclostus* aff. *D. semireticulatus capitanensis*, *Fenestella* aff. *F. capitanensis*, and *Pleurotomaria* cf. *P. neglecta*, seem to indicate a correlation with the Capitan, and *Pleurotomaria?* cf. *P.? carinifera* and *Stromatidium* cf. *S. typicale* are similar to forms that are characteristic of the Delaware Mountain formation. It should of course be emphasized that with the exception of *Dictyoclostus* aff. *D. semireticulatus* and *Pleurotomaria* cf. *P. neglecta*, the forms mentioned last were found in pebbles of the Todos Santos beds, which overlie the Permian limestone and are of Lower to Middle Jurassic age. These pebbles may, however, have come from strata of Delaware Mountain or Capitan age. It should perhaps be mentioned in this connection that Sapper (1896) found "Carboniferous" fossils in pebbles of the Tertiary deposits near San Vicente, to the northwest of Chicomucelo.

The writer's age determination of the Late Paleozoic limestone in southern Chiapas coincides well with that recently made by Dunbar (1939a). That is, Dunbar's restudy of part of the Guatemalan fusulinids collected by Sapper, as well as additional material collected by Powers, led him to the conclusion that the Late Paleozoic limestone of Guatemala is Middle Permian in age and is to be correlated with the Leonard, or possibly the Word, of west Texas. Contrary to the opinion expressed by Girty (1908), the Middle Permian fossils of southern Chiapas are closely related to forms that occur in west Texas; this statement rests on the discovery in southern Chiapas of the following species: *Perrinites hilli* (Smith), *Stromatidium* cf. *S. typicale* Girty, *Dictyoclostus* aff. *D. semirecticulatus capitanensis* (Girty), *Fenestella* cf. *F. capitanensis* Girty, *Pleurotomaria?* cf. *P.? carinifera* Girty, and *P.* cf. *P. neglecta* Girty.

It should be stated clearly that a detailed study of the triangular area located between La Vainilla, Sabinal, and La

Nueva may show that Lower Permian and Carboniferous strata, as well as Middle Permian, are present in southern Chiapas. Some of the fusulinids suggest to the writer that the Pennsylvanian as well as the Permian is represented in this area, but the identifications need to be verified by a specialist before too much significance is attached to them.

For the present, then, it will be best to conclude that the Late Paleozoic limestone of southern Chiapas, like that of Guatemala, is Middle Permian in age and is equivalent to the Leonard and possibly the Word and Capitan formations of west Texas. Permian strata have also been recognized at several other localities in Mexico. Baker (1930) recorded the occurrence of "Anthracolitic" fossils in the southern part of the Isthmus of Tehuantepec; since the specimens he obtained are too poorly preserved to be identified specifically adequate comparisons with the Chiapas fauna cannot be made, but the containing beds in both places may well be of the same age. Abundantly fossiliferous Middle Permian strata are known also from southwestern Coahuila; they were reported first by Haarmann (1913) and Haack (1914) and have since been restudied by Böse (1921) and particularly King (1934)—King's final report on them has not yet been published. Representatives of the genus *Parafusulina* have been found in Tamaulipas northwest of Ciudad Victoria. According to Dunbar (in Muir, 1936) they can be tentatively placed in *Parafusulina sapperi* (Staff), the holotype of which came from Guatemala, and presumably the beds that yielded them are of approximately the same age as the Middle Permian limestone of southern Chiapas and Guatemala and the Leonard of west Texas and its equivalent in southwestern Coahuila. Also, the Middle Permian is widespread in Sonora; in the northeastern part of that state Imlay (1939) collected fusulinids which according to Dunbar (1939) are quite different from those that occur in Texas and Coahuila, and in central Sonora King (1939) found limestone beds which carry, in addition to corals and pelecypods, fusulinids that indicate a Leonard age.

PART 2, AMMONOIDS.

A. K. Miller and W. M. Furnish.

In 1927 Mullerried discovered ammonoids in the upper part of the Late Paleozoic near the Mexican-Guatemalan border.

These beds had previously been regarded as Carboniferous (Sapper, 1899), but in 1930 and 1936 Mullerried correctly reported that they are Permian in age. The ammonoids were found in limestone east-southeast of Chicomucelo, that is, north-northeast of Cushú on the road to San José Montenegro, in the state of Chiapas, Mexico. Numerous other fossils, including foraminifera, worms, crinoids, bryozoans, brachiopods, pelecypods, and gastropods occur in association with the ammonoids. Recently Schuchert (1935, pp. 340-341) and Dunbar (1939, p. 344), after restudying some of Sapper's "Carboniferous" collections from several localities in Guatemala, have recorded that the beds which yielded them are Middle Permian in age.

In 1939 Dr. C. C. Branson called our attention to Mullerried's discovery. Through the courtesy of Ing. Manuel Santillán, director of the Instituto de Geología of the Universidad Nacional de México, we were permitted to study the ammonoids in question, and Doctor Mullerried has written us at length in regard to them. Although only two species are represented in the available collections, they belong in significant genera and enable us to confirm Mullerried's age determination and to show that, as Dunbar believed, the Leonard series is represented in this area. Both of the ammonoid genera known from Chiapas occur widespread; one of them, *Perrinites*, is confined to the Leonard horizon whereas the other is not known to occur above that series. The representatives of *Perrinites* appear to belong in *P. hilli* (Smith), a species which is characteristic of the Leonard series in Texas and Coahuila. The single specimen of *Peritrochia* that was obtained represents a new species which we are naming in honor of its discoverer; closely similar forms are widespread and fairly abundant in the Leonard.

Perrinites hilli (Smith).

Plate 1, Figs. 1-6.

This species is represented in the collections we are studying by three small immature specimens, the largest of which is only about 14 mm. in diameter. None of them is well preserved, but all retain at least portions of the sutures. The sutures (Text Fig. 2), as well as the general physiognomy of the conch, do not differ from those of equal-sized representatives of typical *P. hilli* in our collections from Texas and Coahuila.

The surface ornamentation of the test of both of the figured specimens consists of moderately prominent transverse growth-lamellae. The umbilicus is rather small.

Mullerried recognized that these specimens resemble *Waagenoceras*, to which *P. hilli* was formerly referred. *P. hilli* oc-

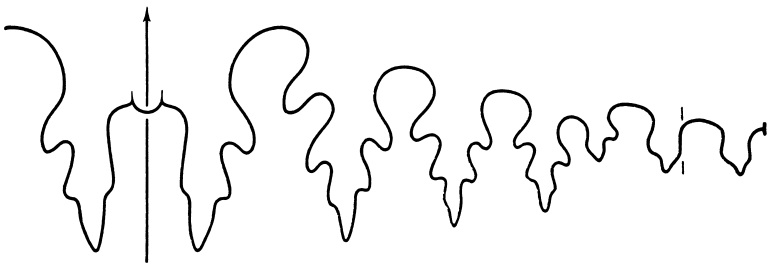


FIG. 2. Adolescent suture of *Perrinites hilli* (Smith) at a diameter of about 9 mm. x 12; based on the specimen represented by Figs. 1-3 on Plate 1.

curs also in the Leonard series of Texas, New Mexico, and Coahuila, and congeneric forms have been found in the Bitauni beds of Timor and probably in the Bouz-téré beds of the Pamir Highlands in central Asia. At all of these widely separated localities, the containing beds are believed to be of approximately the same age.

Occurrence.—Limestone north-northeast of Cushú, on the road to San José Montenegro, Chiapas.

Figured specimens.—Instituto de Geología, Universidad Nacional de México.

Peritrochia mullerriedi, n. sp.

Plate 1, Figs. 7-10.

This species is being based on a single specimen. It is about 16 mm. in diameter and about 9 mm. wide, and a fragment of an additional septate volution adheres to it. The conch is subdiscoidal in shape. The umbilicus is small. No trace of surface markings is visible on the specimen.

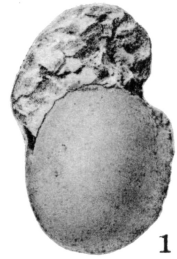
As shown by Text Fig. 3B, each suture forms a bifid ventral

Plate 1.

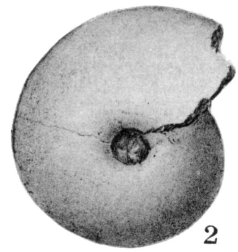
All specimens illustrated on this plate are from Permian limestone north-northeast of Cushú, Chiapas, Mexico, and all are deposited in the Instituto de Geología, Universidad Nacional de México.

1-6. *Perrinites hilli* (Smith). Three views of each of two immature specimens, x 3.

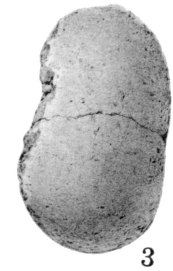
7-10. *Peritrochia mullerriedi*, n. sp. Four views of the holotype, x 2½.



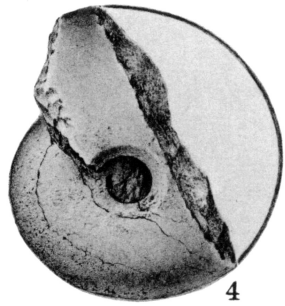
1



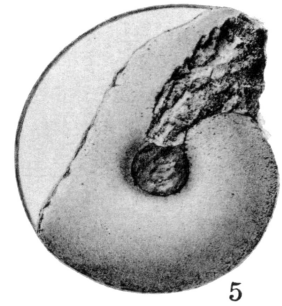
2



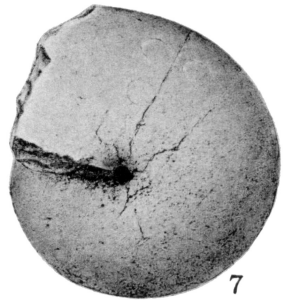
3



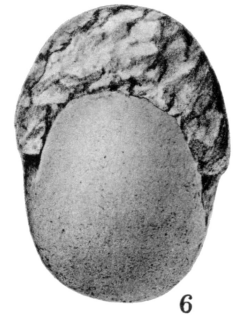
4



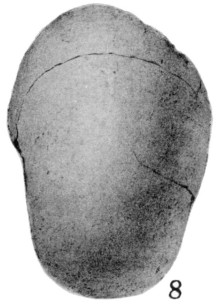
5



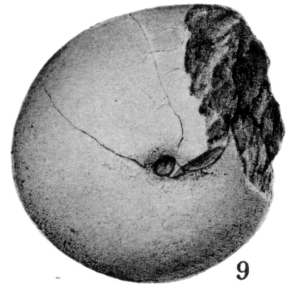
7



6



8



9

10

lobe, three pairs of external lateral lobes, a pair of trifid umbilical lobes, three pairs of internal lateral lobes, and a dorsal lobe. The prongs of the ventral lobe are bifid. The external first lateral lobe is prominently bifid, the second is trifid, and the third is bifid.

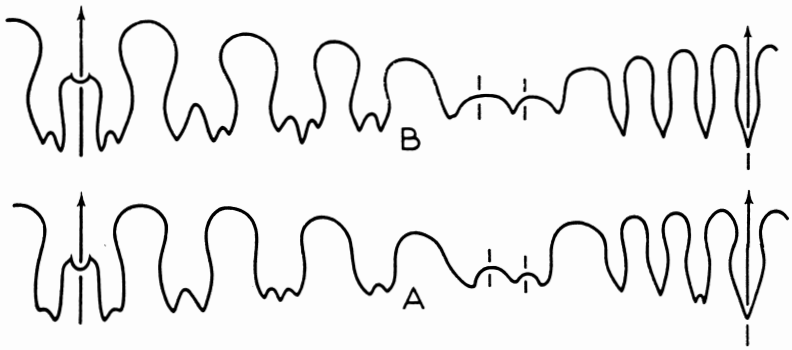


FIG. 3. Complete sutures of (A) *Peritrochia typica* (Ruzhencev) at a diameter of about 12 mm. x 4; based on a specimen from the Artinskian of the Ural region; and (B) *Peritrochia mullerriedi,* n. sp., at a diameter of about 15 mm. x 5; based on the holotype from the Permian limestone north-northeast of Cushú, Chiapas.

Remarks.—This species differs only slightly from *P. dunbari* Miller and Furnish of the Leonard formation of west Texas, in which the prongs of the ventral lobe are not divided and all of the external lateral lobes are regularly trifid. The sutures of *P. mullerriedi* are strikingly similar to those of *P.* ["*Kargalites*"] *typica*[1] (Ruzhencev) of the Artinskian of the Ural region and to those of *P. timorensis* (Haniel) of the Bitauni beds of Timor; both of these species came from strata that are generally regarded as of Leonard age.

Occurrence.—Limestone north-northeast of Cushú on the road to San José Montenegro, Chiapas.

Holotype.—Instituto de Geología, Universidad Nacional de México.

REFERENCES.

Aguilera, J. G.: 1897, Sinopsis de geología mexicana: Inst. Geol. México Bols. 4-6, pp. 187-250.

————: 1907, Aperçu sur la géologie du Mexique . . . : Cong. Géol. Intern., Xème, Mexico, C. R., pp. 227-248.

Baker, C. L.: 1930, Geological cross-section of Isthmus of Tehuantepec: Pan-Am. Geol., Vol. 53, pp. 161-174.

[1] This specific name may be invalid.

Böse, Emil: 1905, Reseña acerca de la geología de Chiapas y Tabasco: Inst. Geol. México Bol. 20, pp. 5-100.

————: 1921, On the Permian of Coahuila, northern Mexico: Amer. J. Sci., Vol. 1, pp. 187-194.

————: 1923, Vestiges of an ancient continent in northeast Mexico: Amer. J. Sci., Vol. 6, pp. 127-136, 196-214, 310-337.

Dollfus, Auguste, and Montserrat, E. de: 1868, Voyage géologique dans les républiques de Guatemala et de Salvador: France, Miss. Sci. Mexique et l'Am. Cent., Géol., pp. 1-539.

Dunbar, C. O.: 1939, Permian fusulines from Sonora: Geol. Soc. Am. Bull., Vol. 50, pp. 1745-1760, pls. 1-4.

————: 1939a, Permian fusulines from Central America: Jour. Pal., Vol. 13, pp. 344-348, pls. 35, 36.

Girty, G. H.: 1908, The Guadalupian fauna: U. S. Geol. Survey Prof. Paper 58, pp. 1-651, pls. 1-31.

————: 1926, A new area of Carboniferous rocks in Mexico: Science, n. ser., Vol. 63, pp. 286-287.

Haack, Wilhelm: 1914, Über eine marine Permfauna aus Nordmexiko nebst Bemerkungen über Davon daselbst: Deutsch. geol. Gesell. Zeitschr., Bd. 66, Abh., pp. 482-504, pls. 38, 39.

Haarmann, Erich: 1913, Geologische Streifzüge in Coahuila: Deutsch. geol. Gesell. Zeitschr., Bd. 65, Monatsb. 1, pp. 18-47.

Imlay, R. W.: 1939, Paleogeographic studies in northeastern Sonora: Geol. Soc. Am. Bull., Vol. 50, pp. 1723-1744, pls. 1-4.

King, R. E.: 1931 [1930], The geology of the Glass Mountains, Texas, Part 2, Faunal summary and correlation of the Permian formations with description of Brachiopoda: Texas Univ. Bull. 3042, pp. 1-245, pls. 1-44.

————: 1934, The Permian of southwestern Coahuila, Mexico: Amer. J. Sci., Vol. 27, pp. 98-112.

————: 1939, Geological reconnaissance in northern Sierra Madre Occidental of Mexico: Geol. Soc. Am. Bull., Vol. 50, pp. 1625-1722, pls. 1-9.

Muir, J. M.: 1936, Geology of the Tampico region, Mexico, pp. 1-280, pls. 1.15. [Published by the American Association of Petroleum Geologists.]

Mullerried, F. K. G.: 1930, Informe preliminar de la exploración geológica del Estado de Chiapas, durante los años de 1927, 1928, y 1929: Inst. Geol. México Foll. divulg., no. 36, pp. 1-16.

————: 1936, Estratigrafía preterciaria preliminar del Estado de Chiapas: Soc. Geol. México Bol., tomo 9, no. 1, pp. 31-41.

Sapper, K. T.: 1894, Informe sobre la geografía física y la geología de los Estados de Chiapas y Tabasco: Agr. Min. é Ind. Bol. 3, no. 9, pp. 187-211.

————: 1896, Sobre la geografía física y la geología de la Península de Yucatán: Inst. Geol. México Bol. 3, pp. 1-57.

————: 1899, Über Gebirgsbau und Boden des nördlichen Mittelamerika: Petermanns Mitt., Erg., nr. 127, pp. 1-119, pls. 1-5.

————: 1937, Mittelamerika: Handb. region. Geol., Bd. 8, 4a, Heft 29, pp. 1-160, pls. 1-10.

Schuchert, Charles: 1935, Historical geology of the Antillean-Caribbean region . . . , pp. 1-811.

Sellards, E. H.: 1932, The pre-Paleozoic and Paleozoic systems in Texas: Texas Univ. Bull. 3232, pp. 15-238, pls. 1-6.

Waibel, Leo: 1933, Die Sierra Madre de Chiapas: Geog. Gesell. Hamburg Mitt., Bd. 43, pp. 12-154.

Universidad Nacional de México, State University of Iowa, and Oklahoma Agricultural and Mechanical College.