THE LATE CAMPANIAN (UPPER CRETACEOUS) CEPHALOPOD FAUNA OF THE COON CREEK FORMATION AT THE TYPE LOCALITY

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Abstract: There is an unusually rich, Late Campanian (Upper Cretaceous), molluscan fauna from the Coon Creek Formation at its type locality, 7 1/2 miles north of Adamsville, McNairy County, Tennessee. The ammonite fauna is a typical, late Campanian, Gulf Coast fauna consisting almost entirely of aberrant ammonites and only one tightly coiled, planispiral form. A few authors have published on the fauna from this locality, most notably Bruce Wade, who published on the entire known fauna; Norman Sohl, who published on the gastropods; Cobban and Kennedy who published on the ammonites; and Brister and Young, who published an overview on the fauna and history of Coon Creek at the type locality from the extensive collections made by the Pink Palace Museum.

Except for *Discoscaphites* the ammonite fauna from this locality compares both at a species level and stratigraphically with the fauna from the Nacatoch Sand in Kaufman and Navarro Counties of Texas (Stephenson, 1941). Except for *Discoscaphites* nearly all of the ammonite fauna also correlates to the *Baculites cuneatus* through *Baculites jenseni* Zones of the Pierre and Bearpaw Shales in the Western Interior, most notably to that from the Middle Park and Fort Collins area of Colorado as reported by Kennedy et al. (2000). Because the aragonitic shell of this cephalopod fauna is so well preserved at this locality it makes it possible to give a more complete description of some of the heteromorph ammonite species than had been previously done, most importantly the rib indexes.

Both invertebrate and vertebrate researchers have published that the fauna from the type locality of the Coon Creek Formation constitutes a lower Maastrichtian fauna. The presence of *Cirroceras conradi*, *Hoploscaphites reesidei*, *Solenoceras reesidei*, *S. texanum*, and *Nostoceras* (*Nostoceras*) *hyatti* places the age of the Coon Creek Tongue at the type locality at upper Late Campanian (72-71.5 MYA), the equivalent age of the *Baculites reesidei* through *B. jenseni* Zones of the Western Interior. This is the first reported occurrence for *Pachydiscus arkansanus*, *Lewyites*, *Hoploscaphites* cf. *H. brevis* and *Discoscaphites* from the Coon Creek Formation at its type locality.

KEY WORDS: cephalopods, Coon Creek Formation, heteromorphs, Gulf Coast, Late Campanian

INTRODUCTION

The Coon Creek Fossil Site in southwestern Tennessee is world renowned for its well-preserved, invertebrate fossils. Several authors have published on this fauna, primarily the molluscan fauna which is preserved in almost pristine condition. The first collection of ammonites from the site appears to be by Bruce Wade of the United States Geological Survey (USGS) in the 1910's and 1920s, when the farm belonged to David Weeks. Bruce Wade (1917), made the first record of cephalopods from Coon Creek. Wade (1926) later published a nearly complete monograph on the entire known invertebrate fauna from this locality in *The fauna of the Ripley Formation on Coon Creek, Tennessee*. Norman Sohl and Glenn Scott collected at the site for the USGS in the 1950s and 1960s. Sohl (1960, 1964) described the gastropods that they collected while Cobban and Kennedy (1994a) described the ammonites. Brewster and Young (2007) did an extensive report on the site regarding the history, collecting, geology, paleontology and the ongoing science investigations and research of the site.

The current Coon Creek Science Center was formerly known as the Coon Creek Fossil Farm. Mr. A. Z. Smith operated the Coon Creek Fossil Farm in the 1970s and 1980s as a 'pay to collect' fossil site. It was at this farm that A. Allen Graffham, and Roger Van Cleef first took Black Hills Institute to collect fossils in 1978. From nearly 10 separate trips, Black Hills Institute staff has since collected more than 180 taxa from the site. The Coon Creek Fossil Farm was sold in 1988 to the Memphis Pink Palace Museum that had the foresight to purchase the site in order to preserve its fantastic paleontological treasure. The Memphis Pink Palace Museum has since assembled the most extensive and comprehensive collections of the fauna and flora from this site to date. They have also developed unique collecting and preparation techniques to preserve large incredibly prepared blocks of the fauna. They continue to actively collect the site and have kept it open to researchers ever since. The collections at the Pink Palace Museum include many new, undescribed bivalves, gastropods and other invertebrates that are still unknown from anywhere else in the Gulf Coast Region.

Coon Creek, at its type locality, is renowned for its extensive, heteromorph ammonite fauna. There have been 6 families, 11 genera and 16 species of cephalopods reported to date from this single locality and more than 200 other taxa of mostly invertebrates (Wade, 1926; Sohl, 1960, 1964; Cobban and Kennedy, 1994a; Brewster and Young, 2007). The cephalopod fauna consists of the ammonites *Pachydiscus* (*Pachydiscus*) *arkansanus* (Stephenson, 1941); *Baculites claviformis* Stephenson, 1941; *B. undatus* Stephenson, *Lewyites oronensis* (Lewy, 1969), *Parasolenoceras pulcher* Cobban and Kennedy, 1985a; *Solenoceras reesidei* Stephenson 1941; *S. texanum* (Shumard, 1861), *Cirroceras conradi* (Morton, 1841); *Didymoceras* cf. *D. aurarium* Kennedy et al. 2000; *Nostoceras* (*Nostoceras*) *approximans* (Conrad, 1855); *N.* (*N.*) *helicinum* (Shumard, 1861); *N.* (*N.*) *hyatti* Stephenson, 1941; *Hoploscaphites* (*Jeletzkytes*) *reesidei* (Wade, 1926); *Hoploscaphites* cf. *H. brevis* (Meek, 1876), *Discoscaphites* sp. and the nautiloid *Eutrephoceras planoventer* Stephenson, 1941. This is the first reported occurrence for *Pachydiscus arkansanus*, *Lewyites*, *Hoploscaphites* cf. *H. brevis* and *Discoscaphites* from the

site. Of great importance is that this is the earliest known occurrence of *Discoscaphites* from anywhere in the world. The presence of *Cirroceras conradi*, *Hoploscaphites* (*Jeletzkytes*) *reesidei*, *Solenoceras reesidei*, *S. texanum*, and *Nostoceras* (*Nostoceras*) *hyatti* more places the age of the Coon Creek Tongue at the type locality in the equivalent age of the *Baculites reesidei* through *B. jenseni* Zones of the Western Interior, or upper Late Campanian, 72-71.5 million years ago (Cobban, et al., 2006).

COLLECTIONS, MATERIAL AND METHODS

Black Hills Institute of Geological Research (BHI), the Memphis Pink Palace Museum (MPPM), and the University of Tokyo collected all of the cephalopods utilized in this paper. BHI collections were made during several trips to the area in the 1970's through the 1990's. MPPM has acquired an extensive collection from the site since purchasing the property in the late 1980s. Most of the BHI ammonites were collected from the hard, sandy, limestone concretions that periodically erode out in the creek bottom and creek banks, though some were not associated with any concretions. There appears to be no single concretionary zone, rather, most of the concretions are scattered throughout the lower stratigraphic layers at the type locality. The cephalopods in the MPPM collections and a few in the BHI collection (most commonly *Baculites* and occasional *Nostoceras* and *Eutrephoceras*) were made from the isolated specimens found in poorly lithified sandstone, along with abundant gastropods and pelecypods in the creek bottom near the Coon Creek Science Center. Stephenson et al. (1940) classified the poorly consolidated sandstone at the type locality as 'friable, very fine, micaceous, light grey sand'.

Most specimens of cephalopods exhibit signs of breakage and/or predation. Very few specimens are complete and many are merely portions of phragmocones or partial body chambers. There were a host of predators (fish, reptiles, and other cephalopods) in the sea that would prey on the ammonites while they were alive, and a variety of scavengers (crabs, lobsters, and other cephalopods), along with the high energy of the sea, that would cause postmortem damage. It is for these reasons that it is rare for complete ammonite shells to be found. Healed pathologies, due to bites, are quite common in much of the ammonite fauna from the Western Interior (Larson, 1998; Landman et al. 2010) yet at Coon Creek there is only a single specimen of *Nostoceras hyatti* (MPPM 1972. 46.414) that exhibits healed pathologies in the shell.

The format of this paper follows that of the US Geological Survey Professional Paper series, the Journal of Paleontology and the American Museum of Natural History Bulletins and Novitates as presented by various ammonite researchers such as W. A. Cobban, W. J. Kennedy and N. H. Landman.

Institutional abbreviations: BHI = Black Hills Institute of Geological Research, Hill City, South Dakota; MPPM = Memphis Pink Palace Museum, Memphis, Tennessee; UMUT = University Museum, University of Tokyo, Tokyo, Japan.

SYSTEMATIC DESCRIPTIONS

Class Cephalopoda Cuvier, 1797
Order Ammonoidea Zittel, 1884
Suborder Ammonitina Hyatt, 1899
Superfamily Desmoceratoidea Zittel, 1895
Family Pachydiscidae Spath, 1922
Genus and Subgenus *Pachydiscus* (*Pachydiscus*) Zittel, 1884

Name Derivation: *Pachydiscus* = (pachy = thick) + (discus = disc) = thick disc (Zittel, 1884).

Type species: The type species for the genus *Pachydiscus* is *Ammonites neubergicus*, as described by Hauer (1858, p. 12, plate 1, figures 1-3; and plate 2, figures 1, 2), through subsequent designation by de Grossouvre (1894, p. 177).

Diagnosis: The genus is composed of broad, rounded, planispiral whorls with a deep, moderately involute umbilicus. The flanks are rounded; they can be smooth, or ornamented with strong, widely spaced ribs. Microconchs are generally one-half to one-fourth the size of the macroconchs, and are typically ornamented with ventrolateral and umbilical tubercles. Macroconchs may also have umbilical tubercles. The suture pattern is very complex, and consists of auxiliary lobes, saddles, and folials.

species *Pachydiscus* (*Pachydiscus*) *arkansanus* (Stephenson, 1941)
Plate 1, Figures 1, 2.

as *Parapachydiscus arkansanus* Stephenson, 1941; p. 418-419, plate 84; plate 85, figures 1-3; plate 86, figures 1-5; plate 87, figures 1-3
Pachydiscus (*Pachydiscus*) *arkansanus* (Stephenson). Cobban and Kennedy, 1985b; p. F2-F4, plate 1, figure 4; plate 2-4; text figure 2.
Pachydiscus (*Pachydiscus*) *arkansanus* (Stephenson). Emerson, et al., 1994; p. 78, 358.
Pachydiscus (*Pachydiscus*) *arkansanus* (Stephenson). Larson et al., 1997; p. 61.

Name Derivation: *arkansanus* = named after the state of Arkansas (Stephenson, 1941), where the type specimen was collected.

Type Specimen: The holotype of *Pachydiscus* (*Pachydiscus*) *arkansanus*, as described by Stephenson (1941, p. 418-419,plate 84, plate 85, figure 1; plate 86, figure 1; and plate 87, figures 1-2), is USNM 77286, from the Nacatoch Sand, near Washington, in Hempstead County, Arkansas. Paratypes, USNM 20962, and USNM 21094 (plate 85, figures 2, 3; plate 86, figures 2-5; and plate 87, figure 3) are from the Nacatoch Sand near Kaufman, Texas.

Material: There are two specimens in the collections of the Memphis Pink Palace Museum. One (MPPM 1972.46.431) is a portion of the body chamber (Plate 1, Figure 1), and the second (MPPM 1972.46.432) is a section of phragmocone (Plate 1, Figure 2). Both specimens depict the ribs typical of the species, as Stephenson (1941) described them. Based on similar specimens, the

larger specimen (a small portion of the body chamber) would have measured perhaps as much as 25 cm across.

Diagnosis: *Pachydiscus* (*P.*) *arkansanus* is a moderately large planispiral ammonite with an involute, broadly rounded venter, slightly rounded flanks, and a deep, moderately involute umbilicus. Umbilical shoulder is steep and rounded; the species has broad, moderately strong ribbing visible only when the shell is preserved. Ribs bend back toward the earlier whorls, then become fairly straight (rectiradiate) on the middle portion of the flanks, and bend towards the aperture (prorsiradiate) on the ventral shoulder. Sutures are typical of the genus.

Occurrence: *Pachydiscus* (*P.*) *arkansanus* has been found at the Coon Creek Formation, McNairy County, Tennessee. The species has also been found in the Nacatoch Sand, near Washington, in Hempstead County, Arkansas; the Nacatoch Sand and Neylandville Marl near Kaufman, Texas; the *Exiteloceras jenneyi* Zone of the Pierre Shale in Larimer County, Colorado; the *Baculites compressus* Zone of the Bearpaw Shale in Rosebud County, Montana; and doubtfully from the DeGrey and Gregory Members of the Pierre Shale in Lyman County, South Dakota.

Discussion: This is the first recorded occurrence of *Pachydiscus* (*P.*) *arkansanus* from the type locality of the Coon Creek Tongue of the Ripley Formation. It had previously been found from rocks of stratigraphically the same age with similar fauna, so it was only a matter of time before specimens were discovered from this site. Sutures are typical of the genus, and because they are not present, or at least visible, in any of the specimens found at Coon Creek, they will not be discussed any further.

Suborder Ancyloceratina Wiedmann, 1966
Superfamily Turrilitoidea Gill, 1871
Family Baculitidae Gill, 1871
Genus *Baculites* Lamarck, 1799

Name Derivation: *Baculites* = (baculum = staff) + (ites = stone) = stone staff (Lamarck, 1799).

Type species: The type for the genus of *Baculites* is *Baculites vertebralis* Lamark (1799), by subsequent designation in Meek (1876, p. 391).

Diagnosis: The genus is composed of a mostly straight to slight dorsally curved shell, except for the ammonitella which has a minute, planispiral coil. Cross section can be round, to ovate, to very compressed. Flanks can be smooth to coarsely ribbed. The venter may have large ribs or corrugations, or it can be smooth. Adults often have large, broad, concentric ribs, and a low degree of taper. Juveniles often have little ornamentation and more taper due to rapid growth. The dorsal lappet on the aperture is generally short (the length is nearly equal to the whorl height of the *Baculite* from flank to flank); the ventral lappet is about twice the length of the dorsal lappet.

species *Baculites claviformis* Stephenson, 1941

Plate 2, Figures 1-6.

as *Baculites asper* Morton. Whitfield, 1892, p. 278, plate 46, figures 10-11.
as *Baculites asper* Morton?. Weller, 1907, p. 823, plate 109, figures 6, 7.
as *Baculites grandis* Hall and Meek. Wade, 1926. p. 182, plate 60, figures 8, 12.
Baculites claviformis Stephenson, 1941, p. 403, plate 77, figs 6-8, plate 78 figures 1-6.
as *Baculites* sp. Reeside, p. 117, plate 68, figure 9.
Baculites claviformis Stephenson. Cobban and Kennedy, 1991; E4, plate 3, figures 1-9.
Baculites claviformis Stephenson. Cobban and Kennedy, 1994a, plate 8, figures 1-8, plate 10, plate 11, text figure 3.
Baculites claviformis Stephenson. Emerson, et al., 1994; p. 322, 394.
Baculites claviformis Stephenson. Klinger and Kennedy, 2001; p. 148, figure 109.

Name Derivation: *claviformis* = (clava = club) + (formis = form) = club form (Stephenson, 1941), named as such because it is shaped like a club.

Type Specimen: The holotype of *Baculites claviformis,* USNM 77241, was designated by Stephenson (1941, p. 403, plate 77, figures 1-3, plate 78, figures 1,2). The paratypes consist of two figured (USNM 77242, plate 78, figures 1-6) and five unfigured specimens (identified as USNM 77243, and USNM 77244). All types are from the Nacatoch Sand, near Kaufman, Texas.

Material: Three partial specimens were studied from the Memphis Pink Palace collection (MPPM 1972.46.403, MPPM 1972.46.404, MPPM 1972.46.405), and three specimens from the collection of Black Hills Institute of Geological Research (BHI 2022, BHI 2028, BHI 5298).

Amended Diagnosis: *Baculites claviformis* have broad concentric ribs or undulations on the flanks throughout the shell growth spaced about two per shell diameter. Mature forms taper slowly, and have a compressed cross section. Venter is rounded, dorsum is rounded to flat and flanks are slightly rounded. Large adult body chambers have a highly ribbed shell with small fine ribs. Sutures are typical for Gulf Coast Campanian baculitids.

Description: Juvenile specimen (BHI 2028, Plate 2, Figure 6) has smooth flanks with indistinct ribs and an ovate to slightly compressed cross section. Adult forms have broad concentric swellings or undulations on the flanks (primarily on the body chamber), the shell tapers slowly, and has a compressed cross section. Venter is rounded, the dorsum is rounded to flat; the flanks are slightly rounded. Large adult body chambers also have a highly ribbed, outer layer shell. These ribs are thickened growth lines that parallel the shape of the aperture. The ribs, present on BHI 5298 (Plate 2, Figure 1), show that *Baculites claviformis* has a rib index of 8 (the number of ribs per whorl height, at the portion of the shell where the height is measured). Broad thickened undulations on the flanks of the body chambers of mature specimens occur about once for every two times the whorl height (or an index of 1/2 when the whorl height of the ammonite is measured at its thickest points, between the broad undulations on the flanks).

Occurrence: The species *Baculites claviformis* Stephenson is Late Campanian, Late Cretaceous in age. It has been reported from the Coon Creek Formation in McNairy County,

Tennessee; the Neylandville Marl in Delta, Rockwall, Kaufman, and Navarro Counties, Texas; Nacatoch Sand in Kaufman and Navarro Counties, Texas; and the Nacatoch Sand in Hempsted County, Arkansas. It has not yet been identified or found from the Western Interior, or from the Navesink Formation in New Jersey so it may be restricted to only the Gulf Region.

Discussion: *Baculites claviformis* is quite common in the Coon Creek Tongue of the Ripley Formation in the creek bed near the Coon Creek Science Center. It is easy to distinguish from the associated *Baculites undatus* by its compressed form versus the very ovate and almost nodded form of *Baculites undatus*.

species *Baculites undatus* Stephenson, 1941

Plate 3, Figures 1-9.

as *Baculites ovatus* Say, Wade. 1926. p. 181-182, plate 60, figure 9.
Baculites undatus Stephenson, 1941; p. 405, plate 79, figures 5-10.
Baculites undatus Stephenson. Owen, et al. 1970; p. 32.
Baculites undatus Stephenson. Cobban, 1973; p. 459, figures 2-5.
Baculites undatus Stephenson. Cobban, 1974; p. 5, figure 3.
Baculites undatus Stephenson. Cobban et al. 1992; p. A7.
Baculites undatus Stephenson. Kennedy and Cobban, 1993; p. 424, 426, figures 12.2,14.8, 14.19, 14.21, 15.13, 15.25-15.27.
Baculites undatus Stephenson. Kennedy and Cobban, 1994a; p. 1297, figures 14.31-14.32, 15.5-15.7.
Baculites undatus Stephenson. Cobban and Kennedy, 1994b; p. B8, plate 8, figures 9-11, plate 9, figures 1-6.
Baculites undatus Stephenson. Emerson, et al., 1994; p. 323, 394.
Baculites undatus Stephenson. Kennedy, et al., 1995; plate 5, figures 22, 23.
Baculites undatus Stephenson. Larson, et al., 1997; p. 31, 3 figures
Baculites undatus Stephenson. Klinger and Kennedy, 2001; p. 212, figures 158, 159.

Name Derivation: *undatus* = "wavy" for its wavy flanks (Stephenson, 1941).

Type Specimen: The holotype of *Baculites undatus*, USNM 77245 and two paratypes, USNM 77246 and 77247 were figured by Stephenson (1941, plate 79, figures 5 -10). All the types came from the Nacatoch Sand. The holotype and one paratype were found near Chatfield, Texas, the other paratype was collected near Corsicana, Texas.

Material: Six partial specimens were utilized from the Memphis Pink Palace collection (four are illustrated here: MPPM 1972.46.398, MPPM 1972.46.401, MPPM 1972.46.406, MPPM 1977.22.3), and eight specimens from the collection of the Black Hills Institute of Geological Research (eight are illustrated herein, BHI 2017, BHI 2018, BHI 2023, BHI 5310,).

Diagnosis: *Baculites undatus* have broad concentric ribs or undulations on the flanks throughout the shell growth spaced about one per shell diameter. Mature forms taper slowly, and have a very ovate cross section. Venter and the dorsum are rounded, and flanks are moderately

rounded. Large adult body chambers have a highly ribbed shell with small fine ribs. Sutures are typical for Gulf Coast Campanian baculitids.

Amended Description: Juvenile specimen (BHI 2017, Plate 3 Figure 4) has smooth to broadly ribbed flanks, and a round to ovate cross section. All forms have broad concentric ribs or undulations on the flanks throughout the shell growth spaced about one per shell diameter. Mature forms taper slowly, and have a very ovate cross section. Venter and the dorsum are rounded, and flanks are moderately rounded. Large adult body chambers have a highly ribbed shell with small fine ribs. Like *Baculites claviformis*, the ribs appear to be thickened growth lines that parallel the shape of the aperture. Fine ribs are visible on MPPM 1977. 22.3 (Plate 3, Figure 1a, 1b) and occur on and between the undulations, indicating that *B*. *undatus* a rib index of 8.

Occurrence: *Baculites undatus* Stephenson is Late Campanian in age. From the Gulf Coast region, it is known from the Coon Creek Formation, McNairy County, Tennessee, the Saratoga Chalk in central Arkansas, and the Nacatoch Sand of Navarro County, Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey, and the Mount Laurel Sand in Delaware. In the Western Interior, *Baculites undatus* is known from the *Didymoceras cheyennense* through the *Baculites reesidei* Range Zones in northern New Mexico and Colorado, and from the *Baculites compressus* and *Baculites cuneatus* Range Zones in Meade and Pennington Counties, South Dakota.

Discussion: *Baculites undatus* has strong affinities to *B*. *baculus* of the Lower Maastrichtian from the Western Interior. *B*. *baculus* most likely descended from this Gulf Coast species. There is not a complete enough sequence of ammonites identified from the Gulf Coast region to fully understand their impact on the Late Cretaceous faunas of the Western Interior but it is understood that its impact was immense. Many forms of Campanian and Maastrichtian ammonites appear to have had their origins in the Gulf Coast region and migrated into the Western Interior. *Baculites undatus* was not successful in its colonization of the Western Interior during the Late Campanian, but after the demise of the endemic *B*. *eliasi*, its descendent, the Gulf Coast migrant *B*. *baculus*, became the dominant baculitid in the Western Interior.

Family Diplomoceratidae Spath, 1926

Genus *Lewyites* Matsumoto and Miyauchi, 1984

Name Derivation: *Lewyites* = after Zeev Lewy (Matsumoto and Miyauchi, 1984), paleontologist and stratigraphic geologist with the Geological Survey of Israel. Dr. Lewy is responsible for describing and correlating much of the Late Cretaceous ammonite fauna of Israel to the Western Interior and to Europe.

Type Species: Holotype of *Lewyites* by designation, is the original of Lewy, *Idiohamites* (?) *oronensis* HU30021a (1969, p. 127, plate 3, figures 10, 11), and is located in the collection of the Hebrew University, Jerusalem. It was originally described from the Mishash Formation at the Oron phosphate field in Israel.

Diagnosis: *Lewyites* is characterized as two to three, non-helical, loosely coiled, compressed whorls, with gently tapering, moderately straight to curved shafts. Ribs are generally strong, rectiradiate, and end in tubercles on the ventral shoulder. *Lewyites* is generally small but it attains a much larger size than many of the other members of the Family Diplomoceratidae.

Discussion: Wright, et al. (1996), thought that *Lewyites* should be a subgenus of *Pseudoxybeloceras*. No current systematic paleontologist has ever included it as such, and the author sees no reason to follow Wright in this decision either.

species *Lewyites oronensis* (Lewy, 1969)

Plate 1, Figures 3, 4a, 4b.

as *Idiohamites* (?) *oronensis* Lewy, 1969; p. 127, plate 3, figures 10, 11.

as *Exiteloceras oronensis* (Lewy). Cobban, 1974b; p. 15, plate 10, figures 2-35, text figure 12.

Lewyites oronensis (Lewy). Matsumoto and Miyauchi, 1984; p. 64.

Lewyites oronensis (Lewy). Kennedy and Cobban, 1993; p. 424, figures 5.1-5.18, 5.22-5.26, 7.19, 7.20, 9.4, 9.7.

?*Lewyites* sp. Cobban and Kennedy, 1994a; p. B6, plate 3, figures 7, 8.

as *Didymoceras navarroensis* (Shumard). Cobban and Kennedy, 1994a; plate 5, figures 6-12.

Lewyites oronensis (Lewy). Emerson, et al., 1994; p. 316, 317, 393.

as *Pseudoxybeloceras* (*Lewyites*) *oronensis* (Lewy). Wright, et al., 1996; p. 253, figure 196 (3).

Lewyites oronensis (Lewy). Kennedy, et al., 2000a; p. 16-17, plate 1, figures 17, 18, 21-28; plate 4, figures 8-11; text figure 12.

Name Derivation: *oronensis* = named for the Oron phosphate field in Israel (Lewy, 1969).

Type Specimen: Holotype of *Lewyites oronensis* by designation, is the same as for the genus, and is the original of Lewy, *Idiohamites* (?) *oronensis* HU30021a (Lewy, 1969; p. 127, plate 3, figures 10, 11), in the collection of the Hebrew University, Jerusalem. It was described from the Mishash Formation at the Oron phosphate field in Israel.

Material: Four specimens (BHI 2016, BHI 2009, USNM 449406, and USNM 449407) found in concretions in the creek bed near the Coon Creek Science Center. BHI 2016 is a very incomplete portion of the body chamber. BHI 2009 [originally described as *Didymoceras navarroensis* (Shumard). Cobban and Kennedy, 1994a] is a juvenile with a section of one of the shafts and a partial whorl preserved. USNM 449406, USNM 449407 are portions of shafts that were figured by Cobban and Kennedy (1994a). USNM 449406, USNM 449407 [also originally described as *Didymoceras navarroensis* (Shumard). Cobban and Kennedy, 1994a] were not borrowed for the investigation of this paper, but were identified through their photos as illustrated by Cobban and Kennedy (1994a).

Diagnosis: The description of *Lewyites oronensis* follows the genus. It is characterized by two to three, non-helical, loosely coiled, compressed whorls, with gently tapering, moderately straight to curved shafts. Ribs are generally strong, rectiradiate, and end in tubercles on the ventral shoulder and a rib index of 5.

Description: BHI 2009 (Plate 3, Figure 4a, 4b) is a juvenile that has a straight shaft followed by a partial coil. Whorl section is compressed, with the flank width about one and one-half times the ventral width. Ribs are weak on the dorsum, to strong and slightly curved (prorsiradiate) on the flanks. Dorsum and flanks are slightly rounded with a flat venter bordered by ventrolateral tubercles. Two to three flank ribs that join together on the ventrolateral shoulder form ventrolateral tubercles. The tubercles originally were probably bases of tall spines, but they are now represented as low nodes that project nearly straight out from the venter.

BHI 2016 (Plate 3, Figure 3) is a fragment of a body chamber with part of the aperture. It has broad, flexuous ribs that all have ventrolateral tubercles. The whorl section measures 56 mm high x 34 mm wide (estimate). One row of ventrolateral tubercles is missing, so the width of the specimen is conjecture. Flanks and venter are slightly rounded. Flexuous, prorsiradiate ribs extend across the flanks, each one culminating in an elongated tubercle at either side of the venter. Rectiradiate ribs stretch between the tubercles across the slightly rounded venter. Rib crests are steeply rounded, and rib valleys are broad. Each rib on the flank of the body chamber near the aperture is about 5 mm across, but these vary with the crowding near the aperture, with wider ribs farther up on the flank. The specimen exhibits some holes on the shell and at the aperture. Because it is so incomplete and the holes are quite distinct, it is probably all that is left from some fish's lunch.

Occurrence: Besides being found at the type locality of the Coon Creek Formation, *Lewyites oronensis* (Lewy) has been found in the Mishash Formation in Israel; the Nacatoch Sand in Texas; the Saratoga Chalk in Arkansas; the Navesink Formation in New Jersey; the *Baculites cuneatus* Zone of the Pierre Shale in Middle Park, Colorado; and the *B*. *reesidei* Zone, Larimer Sandstone Member of the Pierre Shale near Fort Collins, Colorado.

Discussion: BHI 2009, USNM 449406, and USNM 449407 (Cobban and Kennedy, 1994a) are identical in ribbing and form as those specimens figured and assigned to *Lewyites oronensis* by Kennedy and Cobban (1993), and Kennedy, Landman, Cobban and Scott (2000). This author believes that the North American *Lewyites* is a unique species and is not synonymous with that from Israel.

BHI 2016 (Plate 3, Figure 3) is not complete enough to unconditionally assign it to the species *Lewyites oronensis*. The specimen also resembles the apertural portion of *Didymoceras nebrascense* from the Western Interior. It may be possible that it could be the aperture of *Didymoceras*, a genus that is found at this locality. The specimen does not compare with *Nostoceras*, or *Cirroceras* from the site, and thus is obviously not from either of those genera. Cobban and Kennedy (1994a), assigned this fragment to the genus *Lewyites*, because of its

comparison with a specimen from the Navesink Formation of New Jersey, assigned by Cobban (1974), to *Exiteloceras oronensis* and later identified as *Lewyites oronensis*. *Exiteloceras rude* Kennedy, Landman, Cobban and Johnson, (2000), was recently described from the Navesink Formation in New Jersey, and the Coon Creek fragment may be that species. However, unless some other specimens are found to dispute Cobban and Kennedy's 1994 decision, this aperture fragment is assigned to the species *Lewyites oronensis*.

Genus *Parasolenoceras* Collignon, 1969

Name Derivation: *Parasolenoceras* = (para = alongside or resembles) + (solen = pipe) + (ceras = horn) = alongside, or resembling a pipe horn (Collignon, 1969). Named for the two shafts that bend or fold alongside of each other, or for the two shafts which resemble each other.

Type Species: Collignon (1969, p. 44, plate 530, figures 2087, and 2088) described the type of *Parasolenoceras splendens* from the Upper Campanian of Madagascar.

Diagnosis: Two widely separated, non-touching, small, nearly parallel (or oblique) shafts connected by an elbow or curved section of shell. The elbow and larger shaft comprise the body chamber in adult forms, the initial shaft consists of the phragmocone.

Discussion: Wright, et al. (1996), thought that *Parasolenoceras* should be a subgenus of *Pseudoxybeloceras*. Neither Kennedy nor Cobban have ever ascribed to that interpretation, and the author also sees no reason to follow Wright's classification for this genus. *Parasolenoceras* somewhat resembles a small or early form of *Lewyites* and also looks remarkably like a juvenile *Didymoceras nebrascense* (see Figure 8B & 8D in Kennedy et al. 2000c, p. 13) but whether the two are synonymous remains to be proven.

species *Parasolenoceras pulcher* Cobban and Kennedy, 1985

Plate 1, Figures 5-9; Plate 4, Figure 12, 13.

Parasolenoceras pulcher Cobban and Kennedy, 1985a; p. C4, plate 1, figures 7-9.

Parasolenoceras pulcher Cobban and Kennedy. Cobban and Kennedy, 1994a; p. B7, plate 7, figures 3, 29.

Parasolenoceras pulcher Cobban and Kennedy. Larson, et al., 1997. p. 48, unnumbered figure.

Name Derivation: *pulcher* = beautiful (Cobban and Kennedy, 1985).

Type Specimen: The holotype of *Parasolenoceras pulcher*, as described by Cobban and Kennedy (1985, p. C4, plate 1, figures 7-9), is USNM 442107, and the four paratypes (all designated by the number USNM 442108), are all from the Nacatoch Sand, near the town of Washington, Hempstead County, Arkansas.

Material: Two specimens from the Memphis Pink Palace Museum collection (MPPM 1972.46.429, MPPM 1972.46.430), and four specimens from the Black Hills Institute of Geological Research collections (BHI 1986, BHI 2032, BHI 5295). BHI 5295 is a multiple

specimen, with two *Parasolenoceras pulcher*, four *Solenoceras texanum*, and one *Cirroceras conradi*.

Amended Diagnosis: The description of *Parasolenoceras pulcher* follows the genus. Two widely separated, small, nearly parallel, compressed initial shaft and an ovate body chamber shaft, connected by a slightly curved elbow. Flanks are slightly rounded to moderately rounded on the body chamber. The elbow and second shaft comprise the body chamber in adult forms. Shafts are finely ribbed, with nearly straight inclined ribs that dip from the dorsum to the venter (prorsiradiate on the initial shaft, rursiradiate on the body chamber shaft). According to Cobban and Kennedy (1985a), the rib index is 6 to 8 for the species. Small ventrolateral tubercles or spines are present on either side of the venter on the body chamber shaft. Whorl section is ovate to rectangular compressed. Occasional constrictions may be present, especially on the initial shaft.

Description: On BHI 2032 and BHI 5295 (Plate 1 Figure 6, 7, the ribs are straight to prorsiradiate, and small tubercles or spines are present on each rib on either side of the venter. Ribs are prorsiradiate on the flanks, straight (rectiradiate) on the venter, stretching between the ventrolateral tubercles. The rib index throughout is 6 per whorl height. The whorl width is approximately the same as the whorl height. Whorl section is ovate to circular. Venter is flat to slightly rounded; flanks and dorsum are rounded.

MPPM 1972.46.430 (Plate 1, Figure 5) has a length of 32.5 mm. It consists of two incomplete shafts with a rib index of 6 on the larger shaft. Cross section is ovate. Ventrolateral tubercles consist of tiny spines on every rib. The dorsum and flank are somewhat rounded, venter is flat. MPPM 1972.46.429 and BHI 1986 (Plate 1, Figure 8, 9) are both ovate to slightly compressed in cross section. The rib index on these specimens is 6 on MPPM 1972.46.429 and 8 on BHI 1986. The two most complete *Parasolenoceras* (with phragmocone, body chamber, and aperture) occur on BHI 5295 (Plate 1, Figure 7), with the most complete specimen lying underneath the *Cirroceras*.

Occurrence: *Parasolenoceras pulcher* is known from the Coon Creek Formation in Tennessee, the Nacatoch Sand in Arkansas, and the *B. reesidei* Zone, Pierre Shale, northern Colorado.

Discussion: *Parasolenoceras* seems to be closely related to *Solenoceras*, specimens of juvenile *Solenoceras* greatly resemble juvenile *Parasolenoceras*. It is difficult to determine the genus when only the phragmocone is present. The main determining factors are the cross section, the shafts in contact with each other, constrictions in *Solenoceras*, and the rib index.

Genus *Solenoceras* Conrad, 1860

Name Derivation: *Solenoceras* = (solen = pipe) + (ceras = horn) = pipe horn (Conrad, 1860).

Type Species: Conrad (1960, p. 284) designated *Hamites annulifer* Morton (1842, p. 213), as the type for the genus *Solenoceras*.

Diagnosis: Two parallel shafts in contact with each other connected by a tight elbow leaving a small opening at the inside of the elbow. Ribs are distinct, generally straight to prorsiradiate. Whorl section is ovate to circular. Small ventrolateral tubercles or spines are present on either side of the generally flat venter. In mature specimens the two parallel shafts are of nearly equal length. The ammonitella and initial whorls is yet unknown.

species *Solenoceras reesidei* Stephenson, 1941

Plate 4, Figures 1-7, 13.

Solenoceras reesidei Stephenson, 1941; p. 401, plate 77, figures 1-3.
Solenoceras cf. *S. reesidei* Stephenson. Lewy, 1969; p. 126, plate 3, figures 7a, 7b.
Solenoceras reesidei Stephenson. Cobban, et al., 1992; p. A6.
Solenoceras reesidei Stephenson. Cobban and Kennedy, 1994a; p. B6-B7, plate 7 figures 1-9, 11, 12, 14, 15, 18, 25.
Solenoceras reesidei Stephenson. Emerson, et al., 1994; p. 311, 392.
Solenoceras reesidei Stephenson. Larson, et al., 1997. p. 47.
Solenoceras cf. *S. reesidei* Stephenson. Kennedy, et al., 2000a; p. 15-16.

Name Derivation: reesidei = named in honor of John B. Reeside, Jr. (Stephenson, 1941). John B. Reeside, Jr. was a mid 1900's USGS geologist, and paleontologist. He was one of the first to subdivide the marine Cretaceous strata of the Western Interior into ammonite Range Zones.

Type Specimen: The holotype of *Solenoceras reesidei* (USNM 77238), as designated by Stephenson (1941, p. 401, plate 77, figures 1-3), and four unfigured paratypes (USNM 77239) are from the Neylandville Marl near the town of Corbett, Navarro County, Texas.

Material: Two partial specimens (one illustrated MPPM 1972.46.424), from the Memphis Pink Palace collection, six specimens (BHI 1987, BHI 1988, BHI 1989, BHI 1990, BHI 1991, BHI 1993) from the collection of Black Hills Institute of Geological Research (two of these specimens are multiples).

Amended Diagnosis: Two parallel, circular, slightly expanding shafts in contact with each other folded at an elbow. In mature individuals, the initial shaft forms a sharp elbow and the straight body chamber shaft bends back against the initial phragmocone shaft and both shafts are of nearly equal length. The shafts are finely ribbed, with nearly straight inclined ribs that dip from the dorsum to the venter (prorsiradiate on the initial shaft, rursiradiate on the body chamber shaft). Rib index on the flanks is 6 ribs per whorl height. On the initial shaft, the ribs occasionally bear minute spines on either side of the venter. On the body chamber shaft, the ribs all bear minute ventrolateral spines that are connected by fine ribs across the venter. There are widely spaced constrictions present throughout both shafts.

BHI 1988, BHI 1989, and MPPM 1972.46.424, are microconchs, BHI 1987, and BHI 1993 are juvenile macroconchs, and BHI 1990, and BHI 1991 are macroconchs. The diameter of both whorls just above the elbow is 6.25-6.3 on the microconchs, and 8.5 to 9.8 on the macroconchs.

Occurrence: From the type locality of the Coon Creek Formation, McNairy County, Tennessee; the Nacatoch Sand and Neylandville Marl of Kaufman and Navarro Counties, Texas; and from the *B*. *compressus* and *B*. *reesidei* Zones of northern Colorado.

Discussion: *Solenoceras reesidei* differs from *Solenoceras texanum* by its finer ribbing and smaller size, particularly in the microconch.

species *Solenoceras texanum* (Shumard, 1861)

Plate 1, Figure9, Plate 4, Figures 8-12.

as *Ptychoceras texanum* Shumard, 1861; p. 189.

as *Ptychoceras texanum* Shumard. Hyatt, 1894; p. 580.

as *Oxybeloceras texanum* (Shumard). Adkins, 1928. p. 213.

Solenoceras texanum (Shumard). Stephenson, 1941; p. 399, plate 77, figures 4, 5; plate 79, figures 1-4.

Solenoceras cf. *S*. *texanum* (Shumard). Lewy, 1969; p. 127, plate 3, figures 8.

Solenoceras texanum (Shumard). Cobban and Kennedy, 1985a; p. C3, plate 1, figures 1, 6.

Solenoceras cf. *S*. *texanum* (Shumard). Kennedy and Cobban, 1993; p. 424.

Solenoceras texanum (Shumard). Emerson, et al., 1994; p. 311, 392.

Solenoceras texanum (Shumard). Cobban and Kennedy, 1994a; p. B6, plate 7, figures 10,16, 17, 19-24, 26-28, 30, 31.

Solenoceras texanum (Shumard). Kennedy, et al., 2000a; p. 14-15, plate 1, figures 10-16; plate 4, figures 1-7; text figures 11.

Name Derivation: *texanum* = named for the state of Texas (Shumard, 1861).

Type Specimen: The type of *Solenoceras texanum*, described by Shumard from the Nacatoch Sand, near Chatfield Point and Corsicana in Navarro County, Texas, is lost, this prompted Stephenson (1941) to designate a lectotype (p. 399, plate 79, figures 1,2) from specimens that were collected from the same area as the type. The lectotype, designated as USNM 21092a, is also from the Nacatoch Sand, near Chatfield, Navarro County, Texas.

Material: Five partial specimens in the Memphis Pink Palace collection with one illustrated (MPPM 1972. 46 .423), and nine specimens from the collection of Black Hills Institute of Geological Research with five illustrated (BHI 1986 (with *Parasolenoceras*), BHI 1992, BHI 1994, BHI 1995, BHI 1996).

Amended Diagnosis: The description follows as for the genus with two parallel, slightly compressed, expanding shafts in contact with each other. The initial, smaller shaft (phragmocone) forms a sharp elbow and bends back against itself with a second, larger shaft (body chamber). Shafts are heavily ribbed, with nearly straight ribs that are inclined from the

dorsum to the venter (prorsiradiate on the initial shaft, rursiradiate on the body chamber shaft). The rib index on the flanks is 4 to 5 ribs per whorl height. All ribs bear ventrolateral spines on either side of the venter and are connected by strong ribs across the venter. There are periodic irregular constrictions present throughout the shafts.

Description: BHI 1996 is the most complete of all of the *Solenoceras* collected from the site to date. Both shafts measure 67 mm, and the rib index is 5. Small ventrolateral spines are present on the entire body chamber. The body chamber shaft, and the diameter of the elbow, has a much smaller diameter than other specimens of *S. texanum*; it is believed to be a microconch. BHI 1994, BHI 1995, and BHI 1992 all have much larger body chamber diameters than BHI 1996. Diameter of the shafts just above the elbow on BHI 1996 is 7.6 mm and 7.8 mm on MPPM 1972.46.423 indicating that both are most likely microconchs. The diameter of the two shafts just above the elbow on BHI 1994, BHI 1995, and BHI 1992 is and 10.5 mm, indicating that they are probably macroconchs. The rib index on all specimens of *Solenoceras texanum* from Coon Creek seems to be 5; that also follows the description of the species.

Occurrence: From the Gulf Coast region, *Solenoceras texanum* (Shumard) is known from the Coon Creek Formation, McNairy County, Tennessee; the Saratoga Chalk in central Arkansas; and the Nacatoch Sand, and Neylandville Marl in Navarro County, Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey. From the Western Interior, it is known from the *Baculites cuneatus*, and *B. reesidei* Zones in Colorado. Outside the US, it has been reported from the Mishash Formation in Israel.

Discussion: *Solenoceras texanum* differs from *Solenoceras reesidei* by its larger size and its fewer number of ribs per whorl width (rib indices). In *Solenoceras texanum*, ribs are wider, shafts are larger, whorl section is more compressed, and the ventrolateral spines are larger. Macroconchs are much wider at the elbow than microconchs in both species.

Family Nostoceratidae Hyatt, 1894

Genus *Cirroceras* Conrad, 1868

Name Derivation: *Cirroceras* = (cirros = curl) + (ceras = horn) = curl horn (Hyatt, 1894).

Type Species: The genus *Cirroceras* was named by Conrad (1868, p. 730), for the specimen of *Ammonceratites conradi* described by Morton (1841, p. 109). The type specimen was collected near Arneytown, New Jersey from the Navesink Formation, and is in the collections of the Philadelphia Academy of Sciences.

Diagnosis: Helical whorls, often widely separated from each other, with a body chamber that curves like the other whorls but turns up at the aperture. Whorl section is somewhat rounded with a wide, flattened venter. Large ventrolateral tubercles, or spines border the venter, and are joined together by broad ribs. Tubercles on the lower portion of the whorls are larger and often fewer than those on the upper side. Two or three broad rounded ribs join together on the flanks to form the ventrolateral tubercles. Ribs on the dorsum are usually weak.

Discussion: *Cirroceras* probably had its origin from *Didymoceras*. On some specimens, the initial whorls are similar, but other specimens show a great difference in cross section, ribbing, and tubercles. The body chamber on *Cirroceras* does not extend as far below the initial whorls as that of *Didymoceras*. There are two distinct forms of large, loosely coiled whorls found at Coon Creek. The form with the flat venter, and fewer ribs is assigned to *Cirroceras*, the form with the round venter and higher rib index is assigned to *Didymoceras*. Species within the genus *Cirroceras* coil both left handed (sinistral) and right handed (dextral).

species *Cirroceras conradi* (Morton, 1841)

Plate 4, Figure 13; Plate 5, Figures 1-8b; Plate 6, Figure 4; Plate 13, Figures 1a, 1b.

as *Ammonceratites conradi* Morton, 1841; p. 109.
as *Ammonceratites conradi* Morton. Morton, 1841; p. 212, plate 10, figure 1.
as *Heteroceras navarroensis* Shumard, 1861; p. 190.
Cirroceras conradi (Morton), Conrad, 1868; p. 730.
as *Heteroceras conradi* (Morton). Whitfield, 1892; p. 269, plate 45, figures 9-11, 14.
as *Helicoceras navarroensis* Shumard. Boyle, 1893; p. 146
as *Heteroceras conradi* (Morton). Johnson, 1905; p. 27.
as *Turrilites* (*Heteroceras*) *conradi* (Morton). Deiner, 1925; p. 90.
as *Helicoceras navarroense* Shumard. Wade, 1926; p. 184, plate 61, figures 8-11, plate 62, figures 1, 2.
as *Helicoceras navarroense* Shumard. Adkins, 1928; p. 210.
as *Helicoceras navarroense* Shumard. Stephenson, 1941; p. 417, plate 83, figures 9-13.
as *Helicoceras navarroense* Shumard. Shimer and Shrock, 1944; plate 246, figure 10.
as *Didymoceras* sp. ind. Sorney, 1959; p. 222, plate 7, figures 3a, 3b.
Cirroceras conradi (Morton). Reeside, 1962; p. 120, plate 70, figures 1-6.
as *Didymoceras* cf. *navarroense* (Shumard). Lewy, 1969; p. 115, plate 1, figure 1.
as *Didymoceras navarroensis* (Shumard). Cobban, 1974a; p. 16, plate 11, figures 1-4; text figures 13.
as *Didymoceras navarroense* (Shumard). Cobban and Kennedy, 1994a; p. B4-B5, plate 3, figures 6; plate 4; plate 5, figures 1-5, 13-23; plate 6, figures 4-6. text figure 1.
as *Didymoceras navarroense* (Shumard). Emerson, et al., 1994; p. 312, 313, 4 unnumbered figures, p. 392.
as *Nostoceras* (*Didymoceras*) *conradi* (Morton). Wright, et al., 1996; p. 247.
Cirroceras conradi (Morton). Larson, et al., 1997; p. 51, unnumbered figure.
Cirroceras conradi (Morton). Kennedy, et al., 2000a; p. 11-13, plate 1, figures 29-37; plate 5, figures 1-6; text figure 9.

Name Derivation: *conradi* = named for T. A. Conrad (Morton, 1841), an 1800s invertebrate paleontologist, and a colleague of Morton at the Philadelphia Academy of Sciences.

Type Specimen: The holotype of the species *Cirroceras conradi*, is the same as that for the genus, and was designated by Morton (1841, p. 109), for the specimen of *Ammonceratites conradi* collected in the Navesink Formation near Arneytown, New Jersey.

Material: One specimen from the University of Tokyo (UMUT MM 28422), five specimens from the Memphis Pink Palace Museum (four illustrated: MPPM 1972. 46 .409, MPPM 1972. 46 .410, MPPM 1972. 46 .411, MPPM 1972. 46 .412), and thirteen specimens from the collection of the Black Hills Institute of Geological Research (five illustrated: BHI 2012, BHI 2013, BHI 5293, BHI 5294, BHI 5296).

Amended Diagnosis: Early whorls are typically rounded, low spired, open helical whorls that are not in contact with each other. Dorsum is rounded, flanks are slightly rounded, and the venter is slightly rounded to flat. Flanks are ornamented with broad ribs. The venter exhibits ribs between the ventrolateral tubercles or spines. Every other wide rib on the flanks forms ventrolateral tubercles, ventral ribbing is prorsiradiate and widely spaced, located between offset tubercles. Larger whorls have 20 to 23 tubercles per whorl; smaller widely open whorls have many more ribs per whorl. The rib index is 4 per whorl height throughout the growth on nearly all specimens, no mater what the size of the shaft. There are four ribs and two ventrolateral tubercles per whorl height. The small rib index on *Cirroceras* distinguishes it from the other heteromorph ammonites found at Coon Creek.

Description: BHI 2016, and BHI 5293 are two nearly complete specimens, missing primarily the early whorls. BHI 2013, and BHI 2012 show the early whorls, but are missing the body chambers. Whorls are nearly equal in size on the flanks, venter, and dorsum. UMUT MM 28423 (Plate 13, Figure 1a, 1b) is the most complete, consisting of two full whorls (partial phragmocone and nearly complete body chamber). BHI 5294 is important, because it is the only known specimen that shows the initial whorls of *Cirroceras (*minus the ammonitella and first partial coil).

Occurrence: From the Gulf Coast region, *Cirroceras conradi* (Morton) is known from the Coon Creek Formation, McNairy County, Tennessee; the Saratoga Chalk in central Arkansas; and the Nacatoch Sand, and Neylandville Marl of Kaufman and Navarro Counties in Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey. From the Western Interior, it is known from the *Baculites cuneatus*, and *B*. *reesidei* Zones in Colorado. From outside the US, it has been reported only from the Mishash Formation in Israel.

Discussion: *Cirroceras conradi* differs greatly from *Didymoceras* of the Western Interior. The whorl section of *Didymoceras* is typically round, versus almost square for *Cirroceras*. *Didymoceras* ribs are not as wide or broad, the tubercles are usually not as massive, and the venter is not flat. Also, *Didymoceras* is typified with a long, distended, hook-like body chamber, *Cirroceras* has a body chamber that does not separate from the other coils very much and bends up at the aperture. The different specimens of *Cirroceras* and *Didymoceras* from this site exhibit large differences in their shape, cross section, and ribbing on the earlier whorls.

BHI 5293 (Plate 6, Figure 4) is a multiple, the ribbing on one of the heteromorphs becomes much more fine on the first coil of the phragmocone. This is the only specimen that exhibits this feature, and it cannot be explained, unless it is a different species, or a coil of *Didymoceras*.

Genus *Didymoceras* Hyatt, 1894

Name Derivation: *Didymoceras* = (didymos = double) + (ceras = horn) = double horn (Hyatt, 1894).

Type Species: The type for the genus *Didymoceras* is the specimen of *Ancyloceras*? *Nebrascensis* Meek and Hayden (1856, p. 71), from designation by Hyatt (1894, p. 574).

Diagnosis: Helical whorls in close contact, or separated. The whorl section of *Didymoceras* is typically round, the ribbing is fine to coarse, ventrolateral tubercles are common in all stages of growth, ribs are generally broad and distinct, and the venter is slightly rounded. *Didymoceras* is typified with a long, distended, hook-like or U-shaped body chamber. Species within the genus *Didymoceras* coil both left handed (sinistral) and right handed (dextral).

species *Didymoceras* cf. *D.* aurarium Kennedy et al., 2000

Plate 6, Figures 1a-6.

as *Didymoceras hornbyense*, *(*Whiteaves, 1895). Cobban and Kennedy, 1994a; p. B5-B6, plate 6, figures 1-3.

Material: Five specimens, BHI 2014, one-half of a whorl; just before the body chamber makes its downward U-shape; BHI 5289, one-third of whorl and pathological; BHI 5290 is a small section of phragmocone; MPPM 1972.46.412 and MPPM 1972.46.413 are early whorls of *Didymoceras*.

Description: BHI 2014 (Plate 6, Figure 1a, 1b) has sub-circular whorls, with narrow ribs and ventrolateral tubercles. The ribs follow the description of the genus but are very prorsiradiate on the upper portion of the whorl, slightly rursiradiate to rectiradiate across the venter, and rursiradiate on the underside of the whorl. Tubercles on this specimen occur on the upper ventrolateral shoulder as paired ribs join together to form bullae. Ribs (sometimes pairs of ribs) across the venter join again to form tubercles on the lower ventrolateral shoulder. Whorls are rounded on the dorsum and slightly rounded on the flanks and almost flat on the venter. Rib index is 7 per whorl height on the early whorls, averaging 40 to 50 ribs per whorl. The whorl sections were apparently widely separated in early whorls and close together to almost touching in latter and larger whorls (Plate 6, Figure 2a, 2b). The *Didymoceras* fragments exhibit a few possible constrictions that are present sometimes from the dorsum sometimes from the venter.

Occurrence: Until more complete specimens are discovered this species is only known from the Coon Creek Formation at its type locality.

Discussion: Cobban and Kennedy (1994a) assigned a single specimen of *Didymoceras* to the species of *D. hornbyense* (a Pacific Coast Cretaceous ammonite) because there were no other *Didymoceras* found in any of the ammonite zones from the same approximate age as the sediments of Coon Creek. These specimens differ greatly from *D. hornbyense* with the width of the venter, the shape of the ribs, and the ribs across the venter, and the placement of tubercles.

This specimen differs from *Didymoceras draconis* Stephenson (1941), found in rocks of equivalent age in Texas, Colorado, and New Jersey, further described and illustrated by Kennedy, Cobban, and Scott (2000); and Kennedy, Landman, Cobban, Johnson (2000). It differs by the extreme curvature in the ribbing, the placement of tubercles on the ventral shoulders, expanding widely helical whorls, and the shape of the venter.

The cephalopod fauna from the *Baculites reesidei* Zone in Larimer County, Colorado compares very favorably with the fauna of Coon Creek. *Didymoceras aurarium (*Kennedy, Cobban, and Scott, 2000) has three to four very deep constrictions per whorl bordered by high ribs, but this feature is variable; early whorls have five or more constrictions, latter whorls three, and the constrictions are shallower. Predictably there may be only a few to no constrictions on the body chamber. In as much as there are no deep constrictions anywhere on any of these specimens, they cannot be positively assigned to this species.

Of the specimens collected to date, none can be assigned to a named species of *Didymoceras*. There are almost enough specimens from different parts of the shell to describe a species, but without the presence of a body chamber, or a nearly complete specimen, further collecting of more specimens would be advised before giving it a formalized name.

Genus and Subgenus *Nostoceras* (*Nostoceras*) Hyatt, 1894

Name Derivation: *Nostoceras* = (nostos = return) + (ceras = horn) = return horn (Hyatt, 1894). Named as such, because it bends back on itself.

Type Species: The type for the genus *Nostoceras* is the specimen of *Nostoceras stantoni* Hyatt (1894, p. 569); which is the same as *Ancyloceras*? *approximans* Conrad (1855, p. 266).

Diagnosis: *Nostoceras* is typified by a tightly coiled helical spire on a large U shaped body chamber with the aperture, in mature individuals, nearly touching and lying underneath the spire. There are fine ribs on the initial whorls, and coarser ribbing on the body chamber, and periodic constrictions primarily on the phragmocone. Small spines may exist on the initial whorls, and large tubercles are present on the body chamber. Species within the genus *Nostoceras* coil both left handed (sinistral) and right handed (dextral).

species *Nostoceras* (*Nostoceras*) *approximans* (Conrad, 1855)

Plate 7, Figures 1-7.

as *Ancyloceras*? *approximans* Conrad, 1855; p. 266.
as *Ancyloceras*? *approximans* Conrad., Conrad 1860; p. 47, figure 4.
as *Nostoceras stantoni* Hyatt, 1894; p. 570.
as *Nostoceras stantoni* var. *aberrans* Hyatt, 1894; p. 572..
as *Nostoceras stantoni* var. *prematurum* Hyatt, 1894; p. 572.
as *Nostoceras stantoni* var. *retrorsus* Hyatt, 1894; p. 579.
as *Nostoceras stantoni* (Hyatt). Roman, 1938; p. 445.

as *Nostoceras stantoni* (Hyatt). Stephenson, 1941; p. 407, plate 80, figures 1-5.
as *Nostoceras stantoni prematurum* Hyatt. Stephenson, 1941; p. 409, plate 80, figures 6-8.
as *Nostoceras stantoni aberrans* Hyatt. Stephenson, 1941; p. 409, plate 80, figures 9-10.
as *Nostoceras* cf. *N. stantoni* Hyatt. Cobban, 1974b; p. 12, plate 9, figures 23-31.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Kennedy and Cobban, 1993; p. 414, figures 6.1-6.33, 7.21-7.23, 7.25-7.29, 8.1-8.5.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Cobban and Kennedy, 1994a; p. B2-B3, plate 1, figures 4-9, 18, 19, 22-24; plate 2, figures 1-6, 11; plate 3, figures 1-3.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Emerson, et al., 1994; p. 304, 391.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Kennedy, et al., 1995; plate 6, figures 9-12.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Wright, et al., 1996; p. 247, figure 191(6).
Nostoceras (*Nostoceras*) *approximans* (Conrad). Kennedy, et al., 2000a; p. 6-7, plate 1, figures 1-4.
Nostoceras (*Nostoceras*) *approximans* (Conrad). Kennedy, et al., 2000b; p. 10-12, figures 4S, 4T, 5A-5E, 5K-5O.

Name Derivation: *approximans* = approximate = close together (Conrad, 1855). Named as such for the initial whorls, which are connected and close together.

Type Specimen: The holotype of *Nostoceras* (*Nostoceras*) *approximans* is the original specimen described by Conrad (1855, p. 266); and illustrated by Conrad (1860, plate 47), from the Nacatoch Sand, White River, Arkansas, currently in the collection at the Philadelphia Academy of Sciences.

Material: Two partial specimens from the Memphis Pink Palace collection (MPPM 1972. 46 .417, MPPM 1972. 46 .419), and five specimens from the collection of Black Hills Institute of Geological Research (BHI 2003, BHI 2008, BHI 5301a, BHI 5311, BHI 5312).

Amended Diagnosis: Adult specimens of *N.* (*N.*) *approximans* have four to five whorls of increasing size on top of a thick U or J shaped body chamber. Whorl section is round, thick or fat, with round flanks and a round dorsum, and a slightly rounded venter. Diameter of the whorls remains small, giving the species a tall, high spire. Ventrolateral tubercles are small prominent on the last whorl before the body chamber, and weak on the body chamber itself. Initial whorls have a high spire angle of 53 to 92 degrees, 45 to 55 ribs per whorl, up to four constrictions per whorl (Cobban and Kennedy, 1994a). The rib index (number of ribs per whorl diameter) is normally 6.

Occurrence: From the Gulf Coast region, *Nostoceras* (*Nostoceras*) *approximans* is known from the Coon Creek Formation, McNairy County, Tennessee, the Saratoga Chalk in central Arkansas, and the Nacatoch Sand of Navarro County, Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey. In the Western Interior, it has been found in

the *B*. *reesidei* Zone, Larimer Sandstone Member of the Pierre Shale, near Fort Collins, Colorado.

Discussion: *N*. (*N*.) *hyatti*, is a larger species with much coarser distinct ribs with widely separated ventrolateral spines or tubercles *N*. (*N*.) *helicinum* is also much larger, with the most abundant and finer ribs on the initial whorls. Neither of the other two species have the high spire typical of *N*. (*N*.) *approximans*. Along with the high spire, *N*. (*N*.) *approximans* has the thickest whorls in proportion to any of the species of *Nostoceras*, and is much smaller, making it fairly easy to distinguish from the other species.

species *Nostoceras* (*Nostoceras*) *helicinum* (Shumard, 1861)

Plate 7, Figure 10; Plate 8, Figures 1-6.

as *Turrilites helicinum* Shumard, 1861; p. 191.
as *Turrilites helicinum* Shumard. Boyle, 1893; p.293.
Nostoceras helicinum (Shumard). Hyatt, 1894; p. 573.
Nostoceras helicinum (Shumard). Stephenson, 1941; p. 410, plate 80, figures 11, 12.
Nostoceras helicinum crassum Stephenson, 1941; p. 412, plate 81, figures 7, 8.
Nostoceras helicinum humile. Stephenson, 1941; p. 412, plate 81, figures 4, 5, 6.
Nostoceras helicinum (Shumard). Haas, 1943; p. 2, figures 1a, 6, 7.
Nostoceras helicinum var. *crassum* Stephenson. Easton, 1960; figure 11.26-1.
?*Nostoceras helicinum* (Shumard). Howarth, 1965; p. 383, plate 8, figures 3a, 3b, 5a-5c.
?*Nostoceras helicinum* (Shumard). Sornay, 1969; p. 86, plate 2-5.
?*Nostoceras helicinum* (Shumard). Lewy, 1969; p. 120, plate 2, figures 1a, 1b.
Nostoceras helicinum (Shumard). Cobban, 1974b; p. 8, plate 4, figures 1-21, text figure 6.
Nostoceras (*Nostoceras*) *helicinum* (Shumard, 1861). Kennedy and Cobban, 1993; p. 414, 417, figures 8.6-8.12, 9.1, 10.1-10.23.
Nostoceras (*Nostoceras*) *helicinum* (Shumard). Cobban and Kennedy, 1994a; plate 1, figures 1-3, 13-15.
Nostoceras (*Nostoceras*) *helicinum* (Shumard). Emerson, et al., 1994a; p. 304, 391.
Nostoceras (*Nostoceras*) *helicinum* (Shumard). Kennedy, et al., 1995; plate 6, figures 1-3.

Name Derivation: *helicinum* = helical = named for its whorls which ascend, or descend in a helical manner (Shumard, 1861).

Type Specimen: The type specimen of *Nostoceras* (*Nostoceras*) *helicinum*, described by Shumard from the Nacatoch Sand, near Chatfield, Navarro County Texas, is lost, prompting Stephenson (1941), to designate a new type (p. 410, plate 80, figures 11, 12). The lectotype (USNM 21103a) is also from the Nacatoch Sand, near Chatfield, Navarro County, Texas.

Material: Three partial specimens in the Memphis Pink Palace collection (two figured: MPPM 1972. 46 .418, MPPM 1958.37.21), and eight from the collection of Black Hills Institute of Geological Research (five figured: BHI 1999, BHI 2002, BHI 2141, BHI 5301b, BHI 5314).

BHI 2141 is the only complete *N*. (*N*.) *helicinum* identified from the site, a microconch and a macroconch (Plate 8, Figure 1a, 1b).

Amended Diagnosis: *N*. (*N*.) *helicinum* consists of about four whorls located on top of a larger U-shaped body chamber. *N*. (*N*.) *helicinum* has a low spire angle of 92 to 115 degrees, 68 ribs per whorl, up to four constrictions per whorl, and every third rib has a sharp tubercle (Cobban and Kennedy, 1994a). Rib index (number of ribs per whorl height) is 7 to 9 on the phragmocone whorls, and 6 to 7 on the body chamber. The phragmocone whorl diameter on this species is smaller and more slender than on either of the other species. There are occasional and somewhat indistinct umbilical bullae on *N*. (*N*.) *helicinum*, and this is the only species of *Nostoceras* that has them. Ribs on the body chamber are slightly prorsiradiate to rectiradiate and somewhat widely spaced. Ventrolateral tubercles are quite large and distinct.

Occurrence: From the Gulf Coast region, *Nostoceras* (*Nostoceras*) *helicinum* is known from the Coon Creek Formation, McNairy County, Tennessee, the Saratoga Chalk in central Arkansas, and the Nacatoch Sand of Navarro County, Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey. From outside the US, it has been reported from the Mishash Formation in Israel, and from Angola, France and Spain.

Discussion: *Nostoceras* (*Nostoceras*) *helicinum* has the lowest spire, narrowest, or most slender whorls, is finer ribbed, and has more non-tuberculate ribs than either *N*. (*N*.) *hyatti*, or *N*. (*N*.) *approximans*. *N*. (*N*.) *helicinum* also has umbilical bullae on the body chamber the other species do not. Cobban and Kennedy (1994a) described *N*. (*N*.) *helicinum* as the least common species of *Nostoceras* at Coon Creek but this author does not agree; it appears to be as common as *N*. (*N*.) *hyatti*. Cobban and Kennedy (1994a) described both *N*. (*N*.) *hyatti* and *N*. (*N*.) *helicinum* as being much larger than *N*. (*N*.) *approximans*. With all of these differences, it is believed that the best diagnosis for characters in species identification is that *N*. (*N*.) *helicinum* has the most-narrow whorls of any described species.

Howarth (1965) illustrated two specimens as *Nostoceras helicinum* (Shumard). The major differences seem to be a different rib index, and the more rectiradiate ribbing, and bifurcated ribs emanating from the tubercles on the Coon Creek specimens but not on the Angola ones. Lewy (1969) noted that *N*. *helicinum* from Israel are too few and incomplete, and may only represent a subspecies of *N*. *helicinum*, or a different species. The best way to determine if these specimens are indeed the same as the North American species would be to compare the sutures. There do not seem to be any suture drawings published, except for Howarth (1965) and the Angola specimens. None of the specimens from Coon Creek are suitable for determining their sutures.

species *Nostoceras* (*Nostoceras*) *hyatti* Stephenson, 1941

Plate 7, Figure 8, 9; Plate 9, Figures 1-7.

as *Heteroceras conradi* (Morton). Whitfield, 1892; figures 12, 13.

Nostoceras hyatti Stephenson, 1941; p. 410, p. 81, figures 9-12.

? *Nostoceras hyatti* Stephenson. Howarth, 1965; p. 378-381, plate 9, figures 1, 2, plate 10, figures 1, text figure 16.

Nostoceras cf, *N. hyatti* Stephenson. Lewy, 1969; p. 118, plate 1, figures 4a, 4b.

Nostoceras hyatti Stephenson. Cobban, 1974b; p. 10, plate 5, figures 1-21; plate 6, figures 1-12; plate 7, figures 1-10; plate 8, figures 1-30; text figure, p. 10.

Nostoceras pozaryskii Blaszkiewicz, 1980; p. 26, plate 10, figures 1-5, 8, 9, 11-15.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Kennedy, 1986; p. 90, plate 20, figures 7-9.

Nostoceras (*Nostoceras*) *pozaryskii* Blaszkiewicz. Kennedy, 1986; p. 92, text figures 31A.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Kennedy and Cobban, 1993; p. 417, figures 9.2, 11.1-11.27.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Kennedy et al., 1995; plate 6, figures 7, 8; plate 7, figures 9, 10.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Cobban and Kennedy, 1994a; plate 1, figures 10-12, 16, 17, 20, 21, 25-27; plate 2, figures 7-10, 12-15; plate 3, figures 4, 5, 9-11.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Emerson, et al., 1994; p.304, 305, plus 4 unnumbered figures, p. 391.

Nostoceras (*Nostoceras*) *hyatti* Stephenson. Kennedy, et al., 2000b; p. 12, figures 6, 7G-I.

Name Derivation: *hyatti* = After Alpheus Hyatt (Stephenson, 1941), a late 1800s ammonite paleontologist, who is responsible for many of our modern views regarding the phylogeny and development of ammonites. He also published much regarding the different ammonites from the Late Cretaceous of North America.

Type Specimen: The holotype of *Nostoceras* (*Nostoceras*) *hyatti* was designated by Stephenson (1941, plate 81, figure 9), is USNM 77258. It is from the Nacatoch Sand on Postoak Creek, near Corsicana, Navarro County, Texas. Two paratypes (USNM 77259) are illustrated in the same publication and on the same plate, figures 10-12.

Material: Five partial and two nearly complete specimens in the Memphis Pink Palace collection (four figured: MPPM 1972.46.414, MPPM 1972.46.415, MPPM 1972.46.416, MPPM 1972. 46 .420), and ten partial and three nearly complete from the collection of Black Hills Institute of Geological Research (three figured: BHI 2000, BHI 2002, BHI 5313).

Amended Diagnosis: *Nostoceras* (*N.*) *hyatti* has a moderate spire angle of 65 to 80 degrees, 43 to 60 ribs per whorl, 20 to 25 of the ribs per whorl have tubercles (Cobban and Kennedy, 1994a). The rib index (number of ribs per whorl diameter) is 6 on the early whorls, and 3 to 4 on the body chamber per whorl section. There are four to five initial whorls of increasing size, on top of a large U-shaped body chamber. Ribs are widely spaced on the body chamber, and become narrower towards the early stages. There appear to be irregular, periodic, weak constrictions that are somewhat disguised, because of its very high ribs. Constrictions on *N.* (*N.*) *hyatti* are much weaker and less distinct than on *Nostoceras helicinum*.

Five complete specimens utilized for this paper: BHI 2141a, BHI 2000, BHI 5300, MPPM 1972. 46.414 and MPPM 1972.46.420. The species show a host of varieties, some specimens are three-fifths the size of others, probably a result of sexual dimorphism.

Occurrence: From the Gulf Coast region, *Nostoceras* (*Nostoceras*) *hyatti* is known from the Coon Creek Formation, McNairy County, Tennessee, the Saratoga Chalk in central Arkansas, and the Nacatoch Sand of Navarro County, Texas. From the Atlantic Coast, it is known from the Navesink Formation in New Jersey. From the Western Interior, it is only known from the *Baculites jenseni* Zone of the Pierre Shale in southern Colorado. Elsewhere, it has been reported from Poland, France, Spain, Israel, and Angola.

Discussion: *N*. (*N*.) *hyatti* has coarser ribs (especially on the body chamber), lack of lateral bullae, weak constrictions instead of prominent constrictions, high prominent ribs on the whorls, and lack of delicate or fine ribs on the hook to differentiate it from *N*. (*N*.) *helicinum*, and *N*. (*N*.) *approximans*. Both *N*. (*N*.) *hyatti* and *N*. (*N*.) *helicinum* are much larger than *N*. (*N*.) *approximans*, and *N*. (*N*.) *hyatti* is the largest. Whorl diameter of *N*. (*N*.) *helicinum* is more slender than *N*. (*N*.) *hyatti*, or *N*. (*N*.) *approximans*.

Howarth (1965) collected ten specimens of *Nostoceras hyatti* from Barra do Dande, Angola. The sculpturing of these shells compares favorably with those from the Atlantic and Gulf coast regions of North America. There are, however, a number of minor differences in the sculpting of the ribs, the rib index, and the shape and placement of the tubercles, which could be interpreted as a different species. Except for *N*. (*N*.) *helicinum*, other species of ammonites from the North American upper Campanian among the fauna from Barra do Dande, Angola, are absent. Kennedy (1986) considered that there were enough similarities between *N*. (*N*.) *pozaryskii* and *N*. (*N*.) *hyatti* to be considered as synonyms; the author has not examined these, or the specimens from Angola, or Israel. The best way to tell if the *Nostoceras* from the other countries are indeed *N*. (*N*.) *hyatti* would be a comparison of the sutures, and the same rib index. Since the specimens of *Nostoceras* from Coon Creek are not suitable to take a suture sample from, there cannot be any further postulation as to whether or not they are the same.

The *N*. (*N*.) *hyatti* fauna from the Navesink Formation of the Atlantic Highlands was directly correlated with the uppermost Campanian fauna from Europe (Kennedy, Landman, Cobban and Johnson, 2000). This correlation would put the Coon Creek fauna at the top of the Campanian. The correlation of the Coon Creek fauna with the Western Interior fauna also places it at the top of the Campanian in the *Baculites jenseni* Zone. The *Baculites jenseni* Zone (the ammonite Zone directly above *B*. *reesidei*) has been designated, and is accepted by researchers worldwide, as the uppermost Campanian (Gill and Cobban, 1966).

Family Scaphitidae Gill, 1871
Genus *Discoscaphites* Meek, 1870

Name Derivation: *Discoscaphites* = (disco = flat) + (scaphe = boat) + (ites = stone) = a flat stone boat (Gill, 1871).

Type Species: The type for the genus *Discoscaphites* as designated by Meek (1870, p. 429), is *Ammonites conradi* Morton (1834, p. 39, plate 16, figure 3), from the Prairie Bluff Chalk of Alabama. The type was also figured by Jeletzky and Waage (1978, plate 1, figures 1-4.), and Wright, et al. (1996, p. 264, figures 3a, 3b).

Amended Diagnosis: *Discoscaphites* is a multinodose scaphitid form, usually with four rows of tubercles on the flanks, all nearly equally spaced starting from above the umbilical margin and extending to the edge of the venter. Venter is typically narrow, bordered on either side by a row of ventrolateral tubercles There is a second row of nearly equivalent sized tubercles set in on the flank from the ventrolateral tubercles about the same distance as the width of the venter, a third row of tubercles is located between the second row of tubercles and the umbilical margin, and a fourth row of tubercles is located on the umbilical shoulder. Robust macroconchs are usually one and one-half to two times as large as the smaller more gracile microconchs. Ribs are fine to coarse, but not as distinct as on the other scaphitid forms. Body chambers are short with recurved hooks.

species *Discoscaphites* sp.
Plate 10, Figures 1a, 1b.

Material: The material consists of only one incomplete anterior portion of the body chamber (MPPM 1972.46.433). It is only a fragment of body chamber, from the last septa to just before the hook, with umbilical swelling on the mid portion of the shaft.

Description: The overall specimen is 32.6 mm in height, 20 mm across the widest part of the flank, and 19 mm thick at the widest part. There are four rows of tubercles (and bullae) present on either flank. The outer, or ventrolateral tubercles are short and thick, between 5 to 6 mm apart. The next set of tubercles are the same size as the ventrolateral tubercles, and are offset between the ventrolateral tubercles about 4 mm down on the flank. A third row of tubercles (slightly smaller) is located between the second row of tubercles and the umbilical tubercles. There are large umbilical bullae located above the umbilical margin, on the umbilical shoulder; they number one for every two of the second and third row of midflank tubercles. Ribbing is fairly indistinct, seemingly located between tubercles, and extending from the umbilical bullae to pairs of midflank tubercles. It looks much like one of the specimens of *Discoscaphites gulosus* from the Prairie Bluff Chalk of Alabama, as described by Morton (1834), and figured by Jeletzky and Waage (1978, plate 2, figures 8-10).

Occurrence: This *Discoscaphites* sp. (Late Campanian) is only known from the Coon Creek Formation, at its type locality, McNairy County, Tennessee. However, *Discoscaphites* of Late

Maastrichtian age are known from the Prairie Bluff Chalk of Alabama and Mississippi, the Owl Creek Formation in Mississippi, the Kemp Clay and Corsicana Marl of Texas, the Monmouth and Severn Formations of Maryland, the Navesink Formation in New Jersey, and the Fox Hills Formation of North and South Dakota.

Discussion: This specimen was collected from the creek bed at the Coon Creek Science Center. Roy Young (and other members of the MPPM staff) were present when it was found and they verify that it was found in place from the same zone where most of the ammonite fauna is collected (low in the creek bed). Because the specimen was found in situ, there are no formations of a Maastrichtian age present anywhere near the site, and the matrix in the body chamber and the preservation of the shell matches other ammonites from the type locality, it does not appear possible that this was washed in or came from anywhere else.

This specimen differs from *Trachyscaphites* with its shortened and abbreviated body chamber length. Even though there is not a complete body chamber preserved, there is enough to classify this specimen as *Discoscaphites*. Because of its position in the geological record, this particular specimen would constitute the closest missing link between *Discoscaphites* and *Trachyscaphites*.

This is the earliest known, recorded occurrence for *Discoscaphites*, by almost 3 million years. It should constitute a new species of *Discoscaphites*, but it would be better if more specimens, and preferably a more complete specimen, were found. More extensive collecting should result in the discovery of more specimens from this site, and with more specimens, the description of a new species can then take place.

Genus *Hoploscaphites* Nowak, 1911

Name Derivation: *Hoploscaphites* = (hoplo = tool, shield, or armor) + (skaphe = boat) + (ites = stone) = an armored stone boat (Nowak, 1911).

Type Species: The type is, by original designation, *Ammonites constrictus* described by Sowerby (1817, p. 189, plate 184A, figure 1).

Amended Diagnosis: *Hoploscaphites* is defined as small to large scaphitid form with a broad range of compression in cross section ranging from robust (fat, round) to almost flattened with a tightly coiled phragmocone. *Hoploscaphites* has a nearly straight shaft on microconchs, and a more robust, shorter shaft on the macroconchs; the shafts can be long or short. *Hoploscaphites* generally has abundant fine to coarse ribs on the phragmocone, wider ribs on the body chamber shaft, and finer ribs on the hook like body chamber. Ventrolateral tubercles (from small to generous in size) are generally present on the last part of the phragmocone and on most of the body chamber. Small umbilical bullae may occur above the umbilical shoulder on the body chamber shaft but not in all forms.

As for the family, macroconchs are robust, with broad ribs, and prominent tubercles on either side of the venter and around the umbilicus on the umbilical shoulder, and a slight swelling near

the umbilicus in the middle portion of the body chamber. Microconchs are smaller more compressed and have a body chamber with a much straighter shaft. Ribs may be fine to coarse. Tubercles occur mid flank, and on either side of the venter and are commonly small on the later portion of the phragmocone, larger on middle portion of the body chamber, and smaller again near the aperture.

Discussion: The genus *Hoploscaphites* has undergone many name changes throughout its history. Owen (1852) named the type *Scaphites nodosus* after a specimen collected in the *Baculites compressus* Zone of the Pierre Shale from Sage Creek, in present day South Dakota. Nowak (1911) included the *nodosus* form under the junior synonym name for *Scaphites* that he called *Hoploscaphites*. Later, Nowak (1916) placed the "*nodosus*" group under the name of *Acanthoscaphites*. Both the genus *Acanthoscaphites* and *Scaphites* were used interchangeably until Gill and Cobban (1966) placed the "*nodosus*" group back under the genus name *Hoploscaphites*.

Depending on the author, the names of *Hoploscaphites*, *Acanthoscaphites*, and *Scaphites* were all used indiscriminately until 1983. It was at this time, that Riccardi (1983) created the genus *Jeletzkytes* for the robust Campanian and Maastrichtian North American scaphitid forms, and reserved the name *Hoploscaphites* for the compressed Campanian and Maastrichtian scaphitid forms. The width of the flank (whorl width) of *Jeletzkytes* was described as generally one to one and one-half times that of the width of the venter (whorl height), versus the width of the flank of *Hoploscaphites* that was described as generally two to three times the width of the venter.

Wright, et al. (1996), made *Jeletzkytes* synonymous with *Hoploscaphites*. Landman et al. 2010 also agreed with that determination and placed those robust late Campanian scaphite forms from North America under the genus *Hoploscaphites*. This author agrees that there are good reasons to eliminate *Jeletzkytes* as a genus but believes that *Jeletzkytes* should be preserved as a subgenus to further describe the robust forms of *Hoploscaphites*. Both *Acanthoscaphites* and *Hoploscaphites* are currently still used for the Campanian and Maastrichtian scaphitid forms in Europe although a revision may be in progress.

species *Hoploscaphites* cf. H. brevis.

Plate 10, Figures 2a, 2b.

Material: The material consists of only one incomplete phragmocone, BHI 1982. Roy Young of the Memphis Pink Palace Museum is also convinced that they have found a more complete specimen of *Hoploscaphites*, but at the time of writing this paper that specimen could not be located.

Diagnosis: Compressed scaphitid form, with numerous, fine, flexuous ribs. Some of the ribs originate from the umbilical region, while others originate as intercalatory ribs at mid flank. Tubercles are absent on the phragmocone, but ventrolateral tubercles may have existed on the

body chamber. Flank width (whorl width) is two to three times that of the ventral width (whorl height) at its largest point.

Occurrence: This particular undescribed species is probably the same species as from the upper *Baculites cuneatus* and lower *Baculites reesidei* Zones of the Western Interior. The genus is known world wide, from Russia to northern Europe, Greenland, North America, Israel, Chile, South Africa, and elsewhere.

Discussion: This phragmocone is too crushed and incomplete for species determination. Further collecting at the site should eventually result in the collection of some nearly complete individuals. Because of the lack of tubercles anywhere on this fairly large phragmocone, it does not appear to be the species *Scaphites pumilus* as described by Stephenson (1941) and redescribed as *Hoploscaphites pumilus* by Kennedy and Cobban (1993), and Kennedy, Landman, et al. (2000). Although *H. pumilus* occurs at the same time period from the Saratoga Chalk in Arkansas, and the Nacatoch Sand in Texas, there is nothing about this specimen to suggest that it is that species. The species of *H. pumilus*, although quite variable, also differs from this specimen in the shape of the ribs which give rise to ventrolateral tubercles, umbilical margin tubercles, and occasionally inner ventrolateral tubercles.

Subgenus *Jeletzkytes* Riccardi, 1983

Name Derivation: *Jeletzkytes* = After Von J. (Jeorgi) A. Jeletzky, a 20th century Canadian geologist and cephalopod paleontologist who published on much of Canada's Jurassic and Cretaceous ammonites, belemnites and stratigraphy (Riccardi, 1983).

Type Species: As designated by Riccardi (1983), the type *Jeletzkytes* is the specimen of *Scaphites nodosus* described by Owen (1852, p. 581, plate 8, figures 4, 4a).

Amended Diagnosis: *Jeletzkytes* is defined as a larger and more robust form within the genus *Hoploscaphites*. The width of the flank (whorl width) of *Jeletzkytes* is generally one to one and one-half times that of the width of the venter (whorl height), versus the width of the flank of the compressed form (*Hoploscaphites* (*Hoploscaphites*)) that is generally two to three times the width of the venter. Macroconchs are robust, with broad ribs, and prominent tubercles on either side of the venter and around the umbilicus on the umbilical shoulder, and a slight swelling near the umbilicus in the middle portion of the body chamber. Microconchs are smaller more compressed, and have a body chamber with a much straighter shaft. Ribs may be fine to coarse. Tubercles occur mid flank, and on either side of the venter. They are commonly small on the later portion of the phragmocone larger on middle portion of the body chamber, and smaller again near the aperture.

Discussion: As previously stated, Riccardi (1983) created the genus *Jeletzkytes* for the robust Campanian and Maastrichtian North American scaphitid forms and reserved the genus *Hoploscaphites* for the compressed Campanian and Maastrichtian scaphitid forms. This author believes that *Jeletzkytes* should be preserved as a subgenus to further describe the robust forms

of the genus *Hoploscaphites* and also use *Hoploscaphites* as a subgenus (ie *Hoploscaphites* (*Hoploscaphites*)) to describe the more compressed scaphitid forms.

species *Hoploscaphites* (*Jeletzkytes*) *reesidei* (Wade, 1926)

Plate 10, Figures 3a-8b.

as *Scaphites reesidei* Wade, 1926. p. 183-184, plate 61, figures 3-7

as *Scaphites rugosus* Stephenson, 1941; p. 425-426, plate 89, figures 15-18.

as *Jeletzkytes* cf. *nodosus* (Owen). Riccardi, 1983; p. 18, plate 3, figure 1.

as *Jeletzkytes* aff. *nodosus* (Owen). Riccardi, 1983; p. 18, plate 3, figures 2-6; plate 4, figures 1-2.

as *Jeletzkytes nodosus* (Owen, 1852). Cobban and Kennedy, 1994a; p. B8-B10, plate 9, figures 7-11.

as *Jeletzkytes nodosus* (Owen). Emerson, et al., 1994; p. 334, 396.

as *Jeletzkytes* cf. *J. nodosus* (Owen, 1852). Kennedy, et al., 2000b; p. 20-24, figures 9J-9P, 10, 11, 12C-12F.

as *Jeletzkytes reesidei* Larson, 2009. p. 209, figure b.

Hoploscaphites aff. *H. nodosus* (Owen, 1852). Landman, et al., 2010; p. 133, 162 fig.81 A-D.

Name Derivation: *reesidei* = after John B. Reeside Jr. (Wade, 1926). Dr. Reeside was an early to mid 1900's USGS geologist, and invertebrate paleontologist who was one of the first to recognize differences in the successive species of baculites within the marine Cretaceous strata of the Western Interior. His work with W. A. Cobban led to the recognition and creation of the many ammonite Range Zones in the Western Interior.

Type Specimen: As designated by Wade (1926), the type is USNM 73112 from the Coon Creek Formation, at the type locality of Coon Creek, McNairy County, Tennessee.

Material: The material consists of six specimens. Two large, nearly complete macroconchs (BHI 1981, and MPPM 1972.46.407), a phragmocone of the microconch (MPPM 1972.46.408), plus three other partials (BHI 5291, BHI 1983, and BHI 1984). All of the specimens exhibit signs of predation, or breakage to the aperture of the body chamber. None of the specimens found at this site have been found with a complete body chamber. Wade (1926) illustrated the phragmocone of a macroconch (plate 61, figures 3-5) and what appears to be an incomplete microconch phragmocone (plate 61, figures 7).

Diagnosis: Wade (1926) described the species as such: "…sharp, narrow ribs with relatively wide, flat interspaces, the position of the inner row of nodes, the compressed form of the septate whorl, the high arched venter, and the abrupt swelling of the living chamber. It is closest among American species to some forms of *Scaphites nodosus* Owen var. *quadrangularis* Meek and in fact might be included under nodosus in the extremely wide sense in which that name has been applied…. From *Scaphites quadrangularis* our species may easily be separated by the arched

venter, the position of the inner nodes, which lie farther out on the flank, and the compressed form".

Description: BHI 1981 (Plate 10, 8a, 8b) is a nearly complete macroconch missing its aperture, and a portion of the anterior portion of its body chamber. The initial whorls of the phragmocone are crushed, but the posterior phragmocone and the body chamber are not deformed. Broad ribs, on the phragmocone and the early portion of the body chamber, originate from the umbilical area, and extend over the slightly rounded and broad umbilical shoulder until they form bullae at about midflank. On the remaining two thirds of the body chamber, only one in two of the ribs form bullae midflank. Ribs branch (bifurcate) or become intercalatory midflank, and flex a little between the bullae and the ventrolateral tubercles. The ribs then continue over the venter with a slight curvature towards the aperture midventer. Two midflank bullae near the middle portion of the body chamber are twice as large as any of the other midflank bullae. Ventrolateral tubercles, although large on the entire body chamber, are much larger in the same portion, and emanate from the same ribs, as the largest umbilical bullae.

MPPM 1972.46.407 is also nearly a complete macroconch but is missing the entire hook portion of the body chamber. It follows the description of BHI 1981 closely, but the ribs are much wider, and the overall width and size is larger. MPPM 1972.46.407 measures 42.4 mm across the widest portion of its body, BHI 1981 measures about 34 mm in the same place. On the body chamber of both specimens, the venter is quite wide with the whorl height is nearly equal to the whorl width. With careful preparation, MPPM 1972.46.407 could have an excellent suture pattern exposed across the flanks and venter.

MPPM 1972.46.408 (Plate 10, 6a, 6b) is possibly a microconch, and possibly a juvenile. The phragmocone is well inflated, the body chamber is mostly gone, probably a result of predation. Whorl height is about twice the whorl width. 1972.46.408 has only a few ribs in the umbilical area, and they arise just before the body chamber. Most of the ribs originate midflank, several are intercalatory, and are not necessarily associated with any midflank bullae. Ribs are very flexuous, except across the venter, where they are quite straight. Ventrolateral tubercles are small, and occur in no particular pattern (some on every other rib, some on every third, fourth, or fifth).

BHI 5291 and BHI 1983 both exhibit additional features that add to the description of the species. BHI 5291 is a broad, phragmocone, ventral, fragment from a macroconch. With careful preparation, it could have an excellent suture pattern. BHI 1983, a macroconch phragmocone, shows the broad coarse ribs and ventrolateral and midflank tubercles typical of *H. reesidei*. Both rows of tubercles originated early in the growth of this ammonite.

Occurrence: In the Western Interior, *Hoploscaphites reesidei* is found in uppermost *Baculites cuneatus*, and throughout the *B. reesidei* Range Zones, Late Campanian (72 MYA). It is found within those Zones in the Pierre Shale from Colorado and South Dakota and the Bearpaw Shale of Montana. *H. reesidei* is also known to occur in the Navesink Formation of New Jersey, the

Nacatoch Sand in Texas, and the Coon Creek Formation in Tennessee. It probably also exists in the Saratoga Chalk and the Nacatoch Sand in Arkansas.

Discussion: Cobban and Kennedy (1994a) made *Hoploscaphites reesidei* synonymous with *H. nodosus*. Landman, Cobban and Larson have been conducting exhaustive research on the Campanian and Maastrichtian scaphitids of the Western Interior of North America, and their association with the scaphitids from the Gulf Coast and Atlantic Coast regions. Landman and Larson have determined that there are enough morphological and stratigraphical differences, to justify their separation. A more complete synopsis with descriptions on most Campanian and Maastrichtian scaphitids of North America is forthcoming from these researchers.

Order Nautilidea Agassiz, 1847
Superfamily Nautiloidea de Blainville, 1825
Family Nautilidae de Blainville, 1825
Genus *Eutrephoceras* Hyatt, 1894

Name Derivation: *Eutrephoceras* = (eu = begin or good) + (trepho = nourish or eat) + (ceras = horn) = a good nourishing horn (Hyatt, 1894).

Type Species: The type species for the genus was assigned by Hyatt (1894, p. 555-558) to Morton's original of *Nautilus dekayi* (1834, plate 8, figure 4); the type was also figured by Whitfield (1892, plate 37, figures 2, 3; and plate 38, figures 1).

Diagnosis: The shell of *Eutrephoceras* is smooth and very subglobose in shape, whorl section is kidney shaped, and broadly rounded on the flanks and venter. The umbilicus is very involute, aperture is sinuous shaped, suture is slightly flexuous.

Discussion: Stephenson (1941, p. 397) noted that Hyatt (1894) had described the genus based on specimens collected from the "Pierre group" of the Western Interior, and not from the Navesink Formation, where Morton had originally described the type species. Stephenson knew that the type came from the Lower Green Marl (Navesink Formation) of New Jersey, Hyatt apparently didn't. Stephenson further stated that nothing in Hyatt's text indicated that Hyatt ever saw any of the material from New Jersey. Hyatt (1894) assumed that Morton's type came from the Cretaceous of Dakota, when in fact it came from the middle part of the Navesink Formation of New Jersey. Hyatt thus described the genus *Eutrephoceras* from specimens collected from the Late Campanian of the Pierre Shale of South Dakota, yet he assigned the type species of the genus (*E. dekayi*) to a specimen that he never saw that came from nearly two thousand miles away (New Jersey), from a different formation (Navesink Formation), from a different biostratigraphic age (Lower Maastrichtian), and from a different Cretaceous sea (Atlantic).

Stephenson (1941, p. 398) noted that the specimens from the Western Interior and the Atlantic Coast are very similar, and must be congeneric, but that the "well preserved shells from the Pierre group of the Western Interior, ... should be treated as specifically distinct". Larson, et al. (1997), attempted to differentiate the species of *Eutrephoceras* from the Western Interior

Campanian, but stopped short of elevating varieties (subspecies) to species status. According to Neil Landman (personal communication), *Eutrephoceras dekayi* is more ovate, and obtuse, when compared with its nearly equivalent aged counterpart, *E. dekayi montanaensis,* from the *Baculites baculus* Zone of the Western Interior.

The rediscovery of the type locality of *E. dekayi* necessitates the revision of the Late Cretaceous nautiloids from the Western Interior, as well as those from the Gulf and Atlantic Coast regions. For over one hundred and seventy-five years, *Eutrephoceras dekayi* has seemingly been the 'garbage can' name for all North American Cretaceous nautiloids. Describing and differentiating the different species of *Eutrephoceras* is difficult. It is safe to assume that an individual cephalopod species would not last for millions of years, but yet all of the *Eutrephoceras* species look very similar. The siphuncle placement and height of whorl verses the whorl width seems to be the most diagnostic features for species determination within the genus *Eutrephoceras*. This again is deferred to another paper.

species *Eutrephoceras planoventer* Stephenson, 1941

Plate 11, Figures 1-8b; Plate 12, Figures 1, 2; Plate 13, Figure 2.

as *Eutrephoceras dekayi* Morton. Wade, 1926; p. 180-181, plate 61, figures 1, 2.

Eutrephoceras planoventer Stephenson, 1941; p. 397-398, plate 75, figures 1-3, 4-6; plate76, figures 9-11.

as *Eutrephoceras dekayi* Morton. Emerson, et al., 1994; p. 45, 46, 354.

Eutrephoceras planoventer Stephenson. Emerson, et al., 1994; p. 45, 354.

Name Derivation: *planoventer* = (plano = planus = flat) + (venter = belly) = flat belly (Stephenson, 1941).

Type Specimens: The holotype of *Eutrephoceras planoventer* is from the Nacatoch Sand near Chatfield, Texas. The type was designated as USNM 77223 by Stephenson 1941 (p. 397-398, plate 75, figures 1-3). Paratypes assigned were USNM 77224 (plate 75, figures 4-6), and USNM 77225 (plate 76, figures 9-11), also from the Nacatoch Sand near Chatfield, and Kaufman, Texas.

Material: The specimens consist of eight *Eutrephoceras* from MPPM (MPPM 1972. 46 .434, MPPM 1972. 46 .435, MPPM 1972. 46 .436, MPPM 1972. 46 .437, MPPM 1972. 46 .438, MPPM 1972. 46 .439, MPPM 1972. 46 .440, MPPM 1972. 46 .441), one from the University of Tokyo (UMUT MM 28422), and four from BHI (two figured: BHI 5292, BHI 5299). These specimens represent all sizes, all ages, and most likely both sexes of *Eutrephoceras*. None of the specimens is complete, yet eight of them are preserved with most of their body chambers intact and some of these even have considerable portions of their apertures. All of the specimens of *Eutrephoceras* exhibit shell damage and breakage, probably the result of predation. The large portion of the body chamber (UMUT MM 28422, Plate 13, Figure 2) examined from the University of Tokyo, measures an incredible 16 by 17 cm. Another large, sutured *Eutrephoceras*

portion (, MPPM 1972.46.435, Plate 12, Figure 2) indicates evidence of limpets or some other parasite that was originally attached to the shell.

Diagnosis: According to Stephenson (1941) "the adult shell is large, subglobose, broadly rounded on the sides and noticeably flattened on the venter, closely coiled, umbilicus imperforate. Aperture much broader than high, reniform. Siphuncle a little dorsal of the center of the septum. Sutures rather widely space and gently sinuous with a gentle lateral lobe at the edge of the umbilicus with a broad lateral lobe, ventrolateral saddle and ventral lobe."

Description: The specimens of *Eutrephoceras* from the Coon Creek Tongue at its type locality all follow the description of the species *E. planoventer* as described by Stephenson 1941. All specimens exhibit the typical subglobose shell, and nearly all of them have a rounded to somewhat flattened venter, although in juveniles the venter is broadly rounded. The siphuncle is located dorsal side of center of the septum in MPPM 1972.46.436 (Plate 11, Figure 2a), which follows for the species. Overall width of the venter is much wider than its height, which is also described for the species (72 mm W x 52 mm H, MPPM 1972.46.441; and 68 mm W x 47 mm H, MPPM 1972.46.436). The aperture is characterized by a hyponomic (recessed) sinus, in the middle portion of the venter is visible in several of the specimens (Plate 11, Figures 3, 5a, 8b) that have their aperture preserved. Ribbing is fine, and quite distinct, depicted by growth lines following the shape of the aperture. Ribs form a sinusoidal curve from the umbilicus towards the aperture, and back around the recessed sinus. Septal walls have a slight curve to them, giving the suture a slightly sinuous pattern, typical for the genus.

Occurrence: Late Campanian, from the Coon Creek Formation in Tennessee; the Nacatoch Sand in Navarro and Kaufman Counties of Texas, and Hempstead County, Arkansas; probably from the Saratoga Chalk in Arkansas, and possibly also present in the *Baculites reesidei* and *B. jenseni* Zones of the Western Interior.

Discussion: *Eutrephoceras dekayi* comes from the lower Maastrichtian part of the Navesink Formation. As mentioned earlier, nearly everyone has called every occurrence of Late Cretaceous *Eutrephoceras* from North America *Eutrephoceras dekayi*. Because of the difference in age between the two outcrops, and since the description of *Eutrephoceras planoventer* does not match with that of *Eutrephoceras dekayi* or any of the described species from the Western Interior (Larson, et al. 1997), *Eutrephoceras planoventer* is determined to be a unique species. The type of *Eutrephoceras planoventer* is found with a similar fauna as at Coon Creek, and the description of the *Eutrephoceras* from Texas and Coon Creek is identical.

CONCLUSIONS

Eleven genera and sixteen species of cephalopods have been found to date from the site near the Coon Creek Science Center. Since 1994, three new genera have been added to the list from the previously known and recorded fauna. As more fossils are excavated and uncovered from the site, new discoveries will undoubtedly take place. Equivalent aged fauna from Gulf Coast

deposits also include *Anaklinoceras reflexum* Stephenson (1941), *Belemnitella americana* Stephenson (1941), *Hoploscaphites pumilus* Stephenson (1941), *Gaudryceras* sp., *Pseudokossmaticeras galicianum* (Favre 1869, see also Kennedy and Cobban, 1993), among others; these species, and several others, could eventually be found at this site.

The discovery of *Discoscaphites* presents some interesting problems. Is this is the earliest known *Discoscaphites*, that predates all other known species by about 3 million years, or is this the latest known *Trachyscaphites* a similarly ornamented genus described by Cobban and Scott 1964, or could this specimen possibly be the transitional form between the two genera? This specimen represents the only cephalopod genus from Coon Creek that has not been found in any other equivalent aged fauna in either the Gulf Coast or the Western Interior.

It is determined that the type locality along Coon Creek, near the Coon Creek Science Center, McNairy County, Tennessee is equivalent of the lower *Baculites reesidei* Range Zones from the Western Interior. This determination is based on correlating the Coon Creek fauna ammonite fauna (primarily the species *Cirroceras conradi*, *Hoploscaphites reesidei*, *Solenoceras reesidei*, and *S. texanum*) with the ammonite fauna from the Western Interior (see Table 1). Thus the age of the Coon Creek fauna at the type locality should be classified as Late Campanian, approximately 72 million years ago (derived from Argon/Argon dating, based on currently accepted dates by Obradovich, 1993 and Cobban, et al. 2006). But the occurrence of *Nostoceras* (*Nostoceras*) *hyatti* however, makes this age less certain. The presence of *N.* (*N.*) *hyatti* from the Atlantic Highlands directly correlates with the *N.* (*N.*) *hyatti* Zone from the highest Campanian fauna of Europe; and because *N.* (*N.*) *hyatti* is also found only in the *Baculites jenseni* Zone of the Western Interior, this too would place it at the top of the Campanian. The use of *N.* (*N.*) *hyatti* as an indicator would thus position the age of the Coon Creek fauna in the uppermost Late Campanian, or approximately 71.5 million years ago. Thus the age for the Coon Creek fauna at its type locality should then be recorded between 72-71.5 million years ago.

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