TABLE 5. Ammonite Zones of the Volgian
(W. J. ARKELL)

<table>
<thead>
<tr>
<th>Stages</th>
<th>Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volgian (upper)</td>
<td>Riasanites riasanensis</td>
</tr>
<tr>
<td></td>
<td>Craspedites nodiger</td>
</tr>
<tr>
<td></td>
<td>Craspedites subditus</td>
</tr>
<tr>
<td></td>
<td>Craspedites fulgens</td>
</tr>
<tr>
<td>(lower)</td>
<td>Lomonosovrella blakei</td>
</tr>
<tr>
<td></td>
<td>Epivirgatites nikifini</td>
</tr>
<tr>
<td></td>
<td>Virgatites virgatus</td>
</tr>
<tr>
<td></td>
<td>Zaraiskites scythicus</td>
</tr>
<tr>
<td></td>
<td>Dorsoplanites dorso-planus</td>
</tr>
</tbody>
</table>

postulating that the ammonites suddenly cast away their shells and that their descendants are to be found at the present day as the Octopoda or other Dibranchiata, has no evidence to support it.

Nor is this the place for a discussion of the nature and scope of ammonoid zones or ages; that is a stratigraphical matter. The principal zones, and the stages in which they are grouped for purposes of the Treatise, will be found in Tables 1-5. It should be noted in connection with the tables that the zones of the Paleozoic are not comparable with Mesozoic zones but are more in the nature of the “ages” sometimes distinguished in the Mesozoic, namely, periods dominated by certain genera or families. The distribution of genera in time is shown in Fig. 161.

SYSTEMATIC DESCRIPTIONS
By W. J. ARKELL, BERNHARD KUMMEL, and C. W. WRIGHT

INTRODUCTION

AUTHORSHIP

The systematic descriptions of all Triassic taxa in following pages have been prepared by BERNHARD KUMMEL. In general, W. J. ARKELL is the author of all Jurassic ammonoid taxa and C. W. WRIGHT of all Cretaceous genera, but because some families contain both Jurassic and Cretaceous genera, contributions to the text by ARKELL and WRIGHT are intermixed in some places. In the section mainly devoted to description of Jurassic forms, WRIGHT is author of the text on Protetragonitidae (p. L199), Macrosccaphitidae (p. L204), Cicatritidae (p. L205), Aconeceratinae (p. L285), as well as diagnoses of Cretaceous genera assigned to otherwise Jurassic families of Phylloceratina and Lytoceratina. Descriptions of the Neocomitinae (p. L356), Oosterellidae (p. L362), and Spiticeratinae (p. L345) are the product of collaboration by ARKELL and WRIGHT.

Because of placement in the predominantly Triassic suborder Prolecanitina, the Triassic family Sageceratidae has been described by MILLER & FURNISH in the preceding section of this volume on Paleozoic Ammonoidea, and conversely, Permian genera of the Xenodiscidae and Otoceratidae, included in the predominantly Triassic Ceratitina, have been described by KUMMEL.

ACKNOWLEDGMENTS

Special appreciation is expressed here for help furnished by L. F. SPATH in connection with KUMMEL’s work on Triassic ammonoid taxa, both during studies at the British Museum in 1951-1952 and through subsequent correspondence.

Valuable help with Liassic families and genera was received at all stages of preparation from Dr. D. T. DONOVAN, University of Bristol. Assistance in connection with Cretaceous units by providing important specimens for study, by furnishing advance copies of manuscripts, or by advancing publication of their own work on various ammonoids was given by Vicomtesse ELIANE BASSE DE MENORVAL (Paris), G. Botero-Arango (Colombia), RAYMOND CASEY (London), W. A. COBBAN (Colorado), J. P. CONLIN (Texas), TATSURO MATSUMOTO (Japan), R. A. REYMENT (Nigeria), and Comtesse DE VILLOUTREYS (Monaco). All illustrations that accompany systematic descriptions of Mesozoic ammonoids have been prepared by RAYMOND C. MOORE. Appreciation of the aid furnished by these individuals and various others who are unnamed is expressed here.
SPECIAL FEATURES OF STYLE

For the most part, systematic descriptions of Mesozoic Ammonoidea conform precisely in style to those given in other sections of the Treatise, but some deviations which have been allowed call for explanation.

ABBREVIATION OF GENERIC NAME AmMONITES

Very many Mesozoic genera of Ammonoidea are based on type species that originally were assigned to the very widely inclusive genus named Ammonites. This generic name is indicated by the abbreviation "Am."

DESIGNATION OF SUBGENERA

In parts of the text devoted to Jurassic ammonoids (but not in parts describing Triassic and Cretaceous ammonoids), genus-group taxa (genera, subgenera) are treated as co-ordinate units, except that those considered to be of subgeneric rank are indicated by the abbreviation "Subgen." and those postulated to have such rank by "?Subgen." Genus-group taxa so marked are construed to belong with the next preceding taxon which is not indicated as having subgeneric status; a consequent of this arrangement is omission of all nominate (sensu stricto) subgenera. The chief reason for this mode of treatment is the very great difficulty in deciding on the appropriate taxonomic rank of a large number of generic names, especially of many introduced by S. S. Buckman. Hundreds of these names have been reduced to the rank of subjective synonyms, although some are likely to be promoted from this status when the families to which they belong come to be monographed. In the light of present knowledge it is not possible to evaluate all available generic names satisfactorily. Accordingly, the author (Arkell) of text describing Jurassic ammonoids declines to formalize subgenera, because to do so would, in his opinion, give a spurious appearance of finality in classification and certainly would beg many questions. Much unevenness in the relative size of families is due to nothing more than the publication by Buckman or some other author of numerous available generic names in some family groups and lack of such publication in others.

DESIGNATION OF SYNONYMS

The names of genus-group taxa which are classed as synonyms are cited in manner conforming to Treatise plan as explained in the Editorial Preface, except that the equals sign (=) is reserved for subjective synonyms of a certain kind, namely, junior synonyms based on a type species that is closely allied to or perhaps conspecific with the type species of the senior synonym but not nominally identical (in which case the names would be objective synonyms). The distinction here explained is employed in Jurassic and Cretaceous parts of systematic descriptions but not in the Triassic part of the text.

Suborder CERATITINA Hyatt, 1884

[nom. correct. KumMEL, 1952 (pro suborder Ceratitinae Hyatt, 1884; non subfamily Ceratitinae MOJSISOVICS, 1879)]

Derivatives of Daraelitidae which underwent extensive evolutionary radiation in development of numerous new adaptive types. Characterized by greater elaboration of suture and acquisition of ornamentation in many groups. Adaptive range of this suborder, which includes most Triassic ammonoids, is very much larger than that shown by Paleozoic groups. Perm.-Trias.

Superfamily OTOCERATEACEAE Hyatt, 1900

[nom. transI. MILLER & FURNISH, 1954 (ex Otoceratidae Hyatt, 1900)] [=Xenodiscaceae Frech, 1902 (nom. transl. KummEL, 1952, ex Xenodiscidae Frech, 1902)]

Evolute to involute descendants of Daraelitidae with suture increasingly more ceratitic (488). Perm.-Trias.

Family XENODISCIDAE Frech, 1902

 [=Paraceltitidae, Paralecanitidae Spath, 1930; Cibolitidae PLUMMER & SCOTT, 1937]

Conch compressed, discoidal, evolute; venter rounded to acute; lateral ribs commonly present. Suture goniatitic or weakly ceratitic, with 2 lateral lobes. Group derived from Daraelitidae and is itself the ancestral stock of the Lower Triassic Ophiceratidae. M. Perm.-U.Perm.

Xenodiscus Waagen, 1879 [*X. plicatus; SD Waagen, 1895] [=Proceratites KITTL, 1903 (obj.) (type X. plicatus Waagen; SD KUmmEL, herein)]. Venter low, arched, shoulders abruptly rounded, sides flattened and with radial ribs. Suture ceratitic (547). U.Perm., SalR.-Timor.—Fig. 162, 1. *X. plicatus, U.Perm., SalR.; 1a,b, x0.7; 1c, x1.5 (547*).
Xenodiscites Miller & Furnish, 1940 [*X. waageni*]. Like *Xenodiscus* but periphery acute, suture more primitive, lobes only slightly denticate (291). U.Perm., Mex.-Tex.—Figs. 162,4; 163D. *X. waageni*; suture, ×2 (291).

Xenaspis Waagen, 1895 [*Ceratites carbonarius* Waagen, 1873]. Like *Xenodiscus* but no lateral ribs on phragmocone; weak folds or ribs may be present on living chamber (547). U.Perm., SaltR.-Himalaya-Madag.-Timor-Tex.—Fig. 162.2. *X. carbonarius* (Waagen), SaltR.; 2a,b, ×0.7; 2c, ×1.5 (291*, 547).

Paraceltites Gemmellaro [*P. hoeferi*] [=Paralecanites Diener, 1897]. Whorls compressed, venter

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Fig. 162. Xenodiscidae, Otoceratidae (p. L130-L132).
Cephalopoda—Ammonoidea—Ceratitina

Late; umbilical shoulder subrectangular. Suture goniatitic with 3 low lateral lobes. Genus based on single badly weathered specimen, form of suture and whorl section doubtful. U. Perm., SalzR.

Family OTOCERATIDAE Hyatt, 1900

Involute forms with subtrigonal whorl section; venter tricarinate, umbilical shoulders generally prominent, umbilicus deep. Suture ceratitic (472). U. Perm.—L. Trias.

Otoceras GRIESBACH, 1880 [*O. woodwardi*] (472). L. Trias. (L. Scyth.), Himalaya—E. Greenland—Alaska. O. (Otoceras). Umbilical rim acutely flared (472). L. Scyth., Himalaya—E. Greenland—Alaska. —Fig. 162, 10. *O. (O.) woodwardi*, Himalaya; 10a,b, X 0.5; 10c, X 1 (102*).

O. (Metocteras) SPATH, 1930 [*O. (M.) dieneri* (=Hungarites sp. DIENER, 1897)]. With no umbilical rim (472). Scyth., Himalaya.

Anotocteras HYATT, 1900 [*Proshingites nala DIENER, 1897* (holotype, DIENER’S pl. 1, fig. 4; SD SPATH, 1930)]. Evolute, reduced otoceratids with rounded or bluntly fastigate venter (472). L. Trias. (Scyth.), Himalaya.—Fig. 162, 7. *A. nala* (DIENER); 7a,b, X 1 (102*).

Protoceras SPATH, 1930 [*Ceratites trochoides ABICH, 1878*]. Like Otoceras but small, with fastigate venter and flared umbilical rim. Suture ceratitic and simpler (468). U. Perm., Armenia.—Fig. 162, 5. *P. trochoides* (ABICH); 5a-c, X 1 (622*).

Discotoceras SPATH, 1930 [*Hungarites raddei ARTHABER, 1900*]. Evolute smooth; platycones, venter fastigate; umbilical shoulder sharply rounded. Suture ceratitic with broad low saddles and narrow lobes (468). U. Perm., Armenia.—Fig. 162, 6. *D. raddei* (ARTH.); 6a-c, X 1 (622*).

Anderssonoceras GRABAU, 1924 [*Glyphioceras (Anderssonoceras) anjuense*]. Small smooth like Protoceras, with flared umbilical shoulders; venter low, arched, with low median keel, ventral shoulders angular. Suture goniatitic with narrow lobes. U. Perm., China.—Fig. 162, 8. *A. anjuense* (629*).

Family OPHICERATIDAE Arthaber, 1911

Serpenticones with compressed elliptical whorl sections; venter generally rounded; ornamentation usually weakly developed. Suture simple, ceratitic. Descendants of U. Perm. Xenodiscidaceae (488). L. Trias.


Fig. 163. Sutures of Paracelites (A), Cibolites (B, C), Xenodiscites (D), and Kingoceras (E) (110).

Fig. 164. Paralecanites sextensis DIENER, U. Perm., Eu.; X 1 (110).

Arched; lateral area with prorsiradiate ribs, venter smooth. Suture goniatitic (291). M. Perm.—U. Perm., Sicily—Alps—Crimea—Tex.—Mex.—Figs. 162, 9; 163A. *P. elegans* Girty, M. Perm., Tex.; 162, 9a, b, conch, X 0.7 (291*); 163A. suture, enlarged.—Fig. 164. *P. sextensis* (DIENER), U. Perm., Eu.; X 1 (291).

Cibolites PLUMMER & SCOTT, 1937 [*C. uddeni*]. Like Xenodiscites but suture goniatitic, conch smooth (291). U. Perm., Tex.—Mex.—Figs. 162, 3; 163B, C. *C. uddeni*, Tex.; 162, 3a, b, conch, X 0.7 (291*); 163B, C, suture (291).

Palaeolecanites REED, 1944 [*P. chapriensis*]. Whorls higher than in Paracelites, venter narrow, tabular; lateral area with prorsiradiate ribs, venter smooth. Suture goniatitic (291). M. Perm.—U. Perm., Sicily—Alps—Crimea—Tex.—Mex.—Figs. 162, 9; 163A. *P. elegans* Girty, M. Perm., Tex.; 162, 9a, b, conch, X 0.7 (291*); 163A. suture, enlarged.—Fig. 164. *P. sextensis* (DIENER), U. Perm., Eu.; X 1 (291).
Mesozoic Forms—Otocerataceae

L. Scyth., N. Am.-Asia.—Fig. 165, 5. *O. (O.) tibeticum, Himalaya; 5a, b, ×0.7; 5c, ×1 (102*).

O. (Lytophiceras) Spath, 1930 [*O. chamunda Diener, 1897]. Like *O. (Ophiceras) but more discoidal and involute; without high umbilical rim (472). L. Scyth., N. Am.-Greenl.-Asia.—Fig. 165, 5. a, b, ×0.7; 5c, ×1 (102*).

O. (Ophiceras) Spath, 1930 [*O. (O.) ehamunda Diener, 1897]. Like *O. (Ophiceras) but more discoidal and involute; without high umbilical rim (472). L. Scyth., N. Am.-Greenl.-Asia.—Fig. 165, 6. *O. (L.) ehamunda, Himalaya; ×0.7 (102*).

O. (Acanthophiceras) Diener, 1916 [*Trachyceras (?) gibbonum Griesbach, 1880]. Like *O. (Ophiceras) but with tendency toward blunt, lateral tuberculation (472). L. Scyth., Greenl.-Asia.—Fig. 165, 3. *O. (A.) gibbonum (Gries.), Himalaya; 3a, b, ×0.66 (102*).


Glyptophiceras Spath, 1930 [*Xenodiscus aequicoostatus Diener, 1913]. Like Ophiceras but with coarse, sigmoidal ribs which tend to degenerate adorally (472). L. Scyth., N. Am.-Asia.—Fig. 165, 1. *G. aequicoostatum (Diener), Himalaya; 1a, b, ×0.7 (110*).

Vishnuites Diener, 1897 [*V. pralambha]. Evolute

Fig. 165. Ophiceratidae (p. L133-L134).
compressed Ophiceratidae with acute venter (472).
L.Seyth., E.Greenl.-Himalaya.
V. (Vishnuites). Conch generally smooth (472).
L.Seyth., E.Greenl.-Himalaya.—Fig. 165.2. *V. (V.) pralamba, Himalaya; 2a,b, ×0.7 (102*).
V. (Paravishnuites) Spath, 1935 [*V. (P.) oxynotus]. Like V. (Vishnuites) but more involute and with faint, almost radial lineations (473).
L.Seyth., E.Greenl.


—Fig. 165.7. *S. kashmiricus (Diener); 7a,b, ×0.7; 7c, ×1 (110*).

?Protophiceras Hyatt, 1900 [*Danubites nicolai Diener, 1895]. Evolute, whorl section compressed, sides flattened, venter arched; faint ribbing on inner whorls and distant blunt costae on inner lateral area of outer whorls, projecting adorally and weakening peripherally (472). L.Seyth., E.Sib.—Fig. 165.4. *P. nicolai (Diener); 4a,b, ×0.7; 4c, ×1 (101*).

Family DIENEROCERATIDAE Kummel, 1952

Evolute, slightly compressed, whorl section rounded, venter arched. Suture ceratitic or goniatitic, generally with only ophiceratids and probably root of some later ornamented stocks (472). L.Trias.

Dienecoceras Spath, 1934 [*Ophiceras dieneri Hyatt & Smith, 1905]. Scyth., Calif.-Nev.-Ida.—Fig. 166.1. *D. dieneri (Hyatt & Smith); 1a,b, ×1; 1c, ×2 (203*).

Superfamily NORITACEAE

Karpinsky, 1889

[=Meeoceiceratidae Waagen, 1895 (nom. transl. Kummel, 1952, ex Meeoceiceratidae Waagen, 1895)].

Typically smooth, more or less discoidal shells with rounded or truncate peripheries and ceratitic sutures, but producing globose, carinate, or ribbed offshoots that may have complicated or simplified sutures. These families are direct or indirect derivatives of the lower Scythian ophiceratids (472). L.Trias.-M.Trias.

Family GYRONITIDAE Waagen, 1895

Evolute to involute, discoidal ammonites with flattened sides and rounded or truncate periphery. Suture ceratitic to subgoniatitic (472). L.Trias.

Subfamily GYRONITINAE Waagen, 1895

Evolute, with ceratitic suture. L.Trias.

Gyronites Waagen, 1895 [*G. frequens; SD Smith, 1904]. Venter tabulate, sides flattened, umbilical shoulder rounded, some with striation near periphery and on it. Suture generally with distinct auxiliary series. L.Seyth.(Gyronitina), SaltR.—Fig. 167.6. *G. frequens; 6a,b, ×1 (548*).

Gyrocecanites Spath, 1934 [*Lecanites impressus Waagen, 1895]. Venter tabulate, sides convex, umbilical walls rounded but abrupt. Suture goniatitic with 2nd lateral saddle close to umbilical wall. L.Seyth.(Gyronitina), SaltR.—Fig. 167.1. *G. impressus (Waagen); 1a,b, ×0.7 (548*).

Prionolobus Waagen, 1895 [*P. atatus; SD Hyatt & Smith, 1905]. Discoidal, with rounded or tabulate venter and tendency toward involution. Suture as in Gyronites. Scyth.(U.Gyronitan-L.Flemingitan), SaltR.-Timor-Madag.-Mont.-Nev.—Fig. 167.3. *P. impressus (Waagen), Gyroniti, SaltR.; 3a,b, ×0.7 (548*).

Ambites Waagen, 1895 [*A. discus; SD Spath, 1934]. More involute, compressed discoidal, with moderately small umbilicus; venter tabulate. Suture subgoniatitic. Scyth.(Flemingitan), SaltR.—Fig. 167.2. *A. discus; 2a,b, ×0.5 (548*).

?Phyropiceras Spath, 1934 [*Lecanites gangeticus (DeKoningk) Waagen, 1895]. Venter rounded, sides convex, umbilical wall rounded. Suture subgoniatitic. L.Seyth.(Gyronitan-Flemingitan), SaltR.—Fig. 167.5. *G. gangeticum (Konz.), SaltR.; 5a,b, ×1; 5c, ×2 (548*).

Catalecanites Spath, 1934 [*C. planus (=Lecanites sp. Diener, 1897)]. Like Gyronites but more compressed, with distinct umbilical shoulder; conch smooth. Suture goniatitic. Scyth.(Flemingitan), Himalaya.—Fig. 167.7. *C. planus; 7a,b, ×1; 7c, ×1 (102*).

Subfamily KYMATITINAE Waagen, 1895

With increasing involution and subgoniatitic suture, being discoidal developments of Gyrocnitinae (472). L.Trias.

Kymatites Waagen, 1895 [*K. typus]. Conch compressed, discoidal, smooth; venter tabulate, umbilicus small. Suture as in Gyrocnitinae but simpler. Scyth.(Gyronitan), SaltR.—Fig. 167.4. *K. typus; 4a,b, ×0.7; 4c, ×1 (548*).
Parakymatites Waagen, 1895 [*P. discoidea*]. Like *Kymatites* but more involute and discoidal. Suture with wide ventral lobe and 3 auxiliary saddles (548). *Scyth.(Flemingitan)*, SaltR.—Fig. 167,6. *P. discoidea*; X0.75 (548*).

Family FLEMINGITIDAE Hyatt, 1900

Evolute, discoidal, generally with robust ornamentation. Suture tending to greater elaboration than in ancestral Ophiceratidae (472). *L.Trias.*

Flemingites Waagen, 1892 [*Ceratites flemingianus* DeKoninck, 1863]. Ribbing prominent and generally also striation; venter rounded to subrun-
cate. Suture ceratitic but more advanced than in *Gyronitid*ae. *Scyth.(Flemingitan-Owenitan)*, Salt R.—Madag.—Timor.—Ida.—Mont.—Fig. 168,4. *F. radiatus* Waagen, Flemingitan, SaltR.; 4a,b, X0.5 (548*).

Euflemingites Spath, 1934 [*Flemingites guyerdi-formis* Welter, 1922]. More or less involute serpenticones with slightly compressed whorls, arched venter, and rounded umbilical wall, with distinct striation but no radial ornamentation. *Scyth., Timor-Himalaya-Spitz.-Ida.—Fig. 168,3. *E. guyerdi-formis* (Welter), Timor; 3a,b, X0.7; 3c, X1 (560*).

Pseudoflemingites Spath, 1930 [*P. timorensis*]. Serpenticones with ribbing as in *Xenodiscoides* or
strigation as in *Flemingites*, but with very evolute smooth inner whorls and simpler suture. *Scyth. (Owenitan)*, Timor.—Fig. 168.6. *P. timorenensis*; 6a,b, ×0.5 (560*).

Subvishnuites *SPATH, 1930* ["S. weltersi"). Evolute, smooth, with inner whorls as in *Pseudoflemingites* and similar suture; with tendency for periphery to become fastigate. *Scyth. (Owenitan)*, Timor.—Fig. 168.2. *S. weltersi*; 2a, ×0.7; 2b, ×1 (560*).

Subflemingites *SPATH, 1934* ["S. involutus (=Aspidites meridianus involutus WELTER, 1922)]. Involute, subdiscoidal, with smooth serpenticone inner whorls; umbilical wall rounded, venter arched. Suture with irregular auxiliaries as in *Clypeoceras*. *Scyth., Timor.*—Fig. 168.1. *S. involutus* (WELTER); 1a,b, ×1 (560*).

Xenodiscoides *SPATH, 1930* ["Xenodiscus perplicatus FRECH, 1905"). Strongly ribbed shells resembling the inner whorls of *Flemingites*, but without strigation; venter rounded or subtabulate. Suture slightly simpler than in *Flemingites* (468). *Scyth. (Flemingitan)*, Salt.R.—Fig. 168.5. *X. perplicatus* (FRECH); 5a, ×0.8; 5b, ×2 (156*).

Family XENOCELTITIDAE *SPATH, 1930*

Conch evolute, discoidal, generally ribbed, especially on inner whorls, or constricted, with ribs often projected forwards across a smooth, arched or keeled venter. Suture ceratic or goniatitic. Derived from primitive “ophiceratid” stock that modified its primitive (*Glyptophiceras*) characters only in ventral area (472). *Up.L.Trias.*

Subfamily XENOCELTITINAE *SPATH, 1930*

Smooth, venter arched or slightly sharpened; may be crenulate when traversed by faint prolongations of lateral ribs. *L.Trias.*

Xenoceltites *SPATH, 1930* ["X. subvolutus (=Xenodiscus cf. comptonii FREBOLD, 1930; non DIENER)]. Compressed serpenticone with faint distant bulges on inner whorls and irregular costation, on outer whorl generally causing constrictions. Suture with 2 weakly toothed lateral lobes (468). *U.Scylh., Spitz.-Sib.-SaltR.-Utah.*—Fig. 169.1. *X. ruskiensis* *SPATH*, Sib.; 1a,b, ×1; 1c, ×2 (101*).

Preflorianites *SPATH, 1930* ["Dannhites strongi HYATT & SMITH, 1905"). Venter tending to become acute, with radial ribbing most prominent on inner whorls, not reaching periphery (468). *U.Scyth., Calif.-Ida.-Timor-Albania.*—Fig. 169.2. *P. strongi* (HYATT-S.), Owenitan, Calif.; 2a,b, ×0.7; 2c, ×2 (203*).

Hemilecanites *SPATH, 1934* ["Lecanites discus ARTHABER, 1908"). Smooth, evolute, with tendency to oxynite venter, mouth border constricted with ventral lappet. Suture reduced. *U.Scyth., Calif.-
Subfamily INYOITINAE Spath, 1934

Compressed, keeled offshoots of same stock that produced Preflorianites, with similar costation degenerating into striation and comparable ceratitic suture (472). *L.Trias.

*Inyoites* Hyatt & Smith, 1905 [*I. oweni*]. Platycones with high hollow keel and distinct umbilical shoulder; radial ribs that diminish toward compressed venter (203). Scyth. (Owenitan), Calif. - ?Indochina. — Fig. 169, 5. *I. oweni*, Calif.; 5a, b, ×0.7; 5c, ×2 (203*).

*Metinyoites* Spath, 1930 [*Vishnuites discoidalis* Welter, 1922]. More compressed and highly keeled than *Inyoites* and suture more specialized (468). Scyth. (Owenitan), Timor. — Fig. 169, 4. *M. discoidalis* (Welter); ×0.7 (560*).

**Family PARANORITIDAE Spath, 1930**

Discoidal, more or less involute, with flattened sides and rounded or truncate venter which tends to sharpen. Suture ceratitic, with auxiliaries becoming fairly well individualized (472). *L.Trias.*

*Paranorites* Waagen, 1895 [*P. ambiensis*]. Conch more or less involute, periphery narrowly rounded, sides slightly convex, umbilical wall high but rounded. Suture ceratitic, with ventral saddles and lobes more differentiated than in *Ophiceras* or *Prionolobus*. Scyth. (U. Gyronitan-Flemingitan),

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**Fig. 169. Xenoceltitidae (p. L136-L137).**

Albania. — Fig. 169, 3. *H. discus* (Arth.), Albania; 3a, b, ×2 (472*).

**Fig. 170. Paranoritidæ (p. L137-L138).**
SaltR.—Fig. 170,2. *P. ambiensis; 2a, ×0.3; 2c, ×0.7 (548*).

Koninckites Waagen, 1895 [*K. vetustus; SD Smith, 1904]. Involute, compressed, with flattened sides and narrowly rounded to subtabulate venter; umbilical wall gently rounded. Suture with greater individualization of elements in auxiliary series. Scyth.(Gyronitina-Flemingitan), SaltR.-Himalaya-Mont.—Fig. 170,1. *K. vetustus, SaltR.; 1a,b, ×0.7; 1c, ×1 (548*).

Kingites Waagen, 1895 [*K. lens; SD Smith, 1934]. Like Koninckites but with rounded venter, deep funnel-shaped umbilicus and indentations of suture more individualized. Scyth., SaltR.—Fig. 170,6. *K. lens; ×1 (548*).

Clypeoceras Smith, 1913 [pro Aspidites Waagen, 1895 (non Peters, 1877)] [*Aspidites superbus Waagen, 1895 (=Aspiditella Strand, 1929)]. Involute, discoidal; venter narrowly rounded, almost acute. Suture advanced, especially auxiliary series. Scyth.(Gyronitina-Flemingitan), SaltR.-Himalaya-Timor.—Fig. 170,5. *C. superbum (Waagen), SaltR., 5a, ×0.1; 5b, ×0.3 (548*).

Paraspidites Spath, 1934 [*P. praecursus (Frezch) (=Aspidites superbus Waagen, mut. praecursus Frech, 1905)]. Involute oxycones with deep umbilicus. Auxiliaries less developed than in Clypeoceras. Scyth.(Flemingitan), SaltR.—Fig. 170,4. *P. praecursus; ×0.7 (156*).

Pseudoaspidites Spath, 1934 [*Aspidites muthianus Krafft in Krafft & Diener, 1909]. Involute, with rounded or sub truncate venter. Suture subammonitic with submonophylic saddles. Scyth. (Owenitan), Himalaya-Ilda.—Fig. 170,3. *P. muthianus (Krafft), Himalaya; ×1 (240*).

Family PROPTYCHITIDAE Waagen, 1895

Discoidal, more or less involute, inflated derivatives of the Ophiceratidae, with arched or sharpened venter; whorl section generally subtriagonal, producing a deep umbilicus; conch smooth or feebly ornamented. Suture cero tic to subammonitic (472). L.Trias.

Subfamily PROPTYCHITINAE Waagen, 1895

Periphery broadly or narrowly arched but not sharpened. L.Trias.

Propytochites Waagen, 1892 [*Ceratites lawrencianus DeKonincx, 1863]. More or less involute, discoidal, with tendency to inflation; venter arched. Suture more advanced than in ancestral Ophiceratidae. Scyth.(U.Gyronitan-Flemingitan), Asia-N.Am.—Fig. 171,3. *P. lawrencianus (Kon.), SaltR. 3a,b, ×0.3 (548*).

Pachypropytochites Diener, 1916 [*Propytochites otoceroides Diener, 1895]. With narrowly rounded venter, flattened or slightly concave sides, high umbilical rim and funnel-shaped umbilicus. Scyth., Sib.—Fig. 171,7. *P. otoceroides (Diener); 7a,b, ×0.5 (101*).

Proptychitoides Spath, 1930 [*P. decipiens (=Proptychites latifimbriatus Arthaber, 1911 (non DeKoninck)). Like Propytochites, with narrowly rounded venter and deep umbilicus but suture subammonitic, with monophylic saddles. U.Scyth., Albania-Chios.—Fig. 171,6. *P. decipiens, Albania; ×0.66 (472*).

Eoptychites Spath, 1930 [*Propytochites obliqueplicatus Waagen, 1895]. With rursiradiate, bifurcating, blunt ribs and arched venter. Scyth.(Flemingitan), SaltR.—Fig. 171,2. *E. obliqueplicatus (Waagen); 2a,b, ×0.7 (548*).

Ussuriceras Spath, 1930 [*Propytochites acutissilatus Diener, 1895]. With weak radial ribs, arched venter, and high umbilical wall. Suture subammonitic, with high linguiform saddles. Scyth., Sib.—Fig. 171,5. *U. acutissilatus (Diener); ×1 (101*).

P?rocarnites Arthaber, 1911 [*Parapopanoceras kokeni Arth., 1908]. Discoidal, involute, with increased number of sutural elements. U.Scyth., Albania-Chios.—Fig. 171,4. *P. kokeni (Arth.); ×2 (22*).

Subfamily OWENITINAE Spath, 1934

Lenticular to oxycone developments of Proptychitidae, parallel with paranannitids and with similar globose, constricted young, but distinguished by suture (472). L.Trias.

Owenites Hyatt & Smith, 1905 [*O. koeneni]. Involute, smooth, lenticular tendency to become oxycones. Suture cero tic with numerous lobes and saddles (203). Scyth.(Owenitan), Calif.-Nev.-Ida.-Mont.-Timor.—Fig. 171,8. *O. koeneni, Calif.; 8a,b, ×1; 8c, ×2 (203*).

Parowenites Spath, 1934 [*Owenites simplex Wel ter, 1922]. Like Owenites but with sigmoidal ribs and goniatitic suture. Scyth.(Owenitan), Timor.—Fig. 171,1. *P. simplex (Wel ter); 1a, ×0.7; 1b, ×2 (560*).

Family PARANANNITIDAE Spahn, 1930

More or less globular ammonites with depressed whorl sections, at least in young; commonly constricted. Suture cero tic or goniatitic, simple (472). L.Trias.

Subfamily PARANANNITINAE Spahn, 1930

Venters broadly arched with no tendency towards carination. Suture generally with more than one lateral lobe. L.Trias.

Paranninites Hyatt & Smith, 1905 [*P. aspenensis]. Conch involute, subgloboso, compressed; early-formed part smooth, later with radial folds or constrictions. Suture cero tic (203). Scyth.(Owenitan),
Mesozoic Forms—Noritaceae

Parowenites

Fig. 171. Proptychitidae (p. L138).

Ida.—Fig. 172,7. *P. aspennensis; 7ab, ×1; 7c, ×3 (203*).

Arnautoceltites DIENER, 1916 [*Celtites arnauticus ARTHABER, 1911] [=Juvenites, Thermalites SMITH, 1927]. Like Paranannites but with oblique constrictions. Suture goniatitic or ceratitic. U.Scyth., Albania-Chios-Calif.-Nev.-Ida.—Fig. 172,9. *A. arnauticus (ARTH.), Albania, 9ab, ×1; 9c, ×2 (22*).

Prosphingites MOJSISOVICS, 1886 [*P. czekanowski]. With globose inner whorls and almost keeled, galeate or compressed outer whorls in some; surface smooth or with faint striae, ridges, constrictions. Suture ceratitic. U.Scyth., Calif.-Nev.-Albania-Spitz.-Sib.—Fig. 172,6. *P. czekanowski, Sib.; 6ab, ×0.7; 6c, ×1 (294*).

Zenoites RENZ & RENZ, 1948 [*Prosphingites (Zenoites) helena*]. Like Prosphingites, with arched venter, but with prominent irregular, nearly radial constrictions that encircle whorl section (372). U.Scyth., Chios.—Fig. 172,4. *Z. helena (RENZ-R.); 4ab, ×1; 4c, ×2 (372*).

Iscutuloides SPATH, 1930 [*Iscutulites originis ARTHABER, 1911]. Involute, subglobose, smooth, with contracting body chamber and eccentric umbilicus. Suture ceratitic with two lateral lobes. U.Scyth., Albania-Chios-Timor.—Fig. 172,13. *I. originis (ARTH.), Albania; 13ab, ×1; 13c, ×3 (22*, 372).

Chiotites RENZ & RENZ, 1948 [*Prosphingites (Chiotites) globularis*]. Like Iscutuloides but with longitudinal striae on body chamber. Suture as in Prosphingites but with 2 ceratitic auxiliary lobes (372). U.Scyth., Chios.—Fig. 172,11. *C. globularis (RENZ-R.); 11ab, ×1; 11c, ×3 (372*).

?Paragoceras ARTHABER, 1911 [*P. dukaginii]. Like Arnautoceltites but with distinctive suture. U.Scyth., Albania-Chios.—Fig. 172,3. *P. dukaginii; 3ab, ×1; 3c, ×3 (22*).

Subfamily COLUMBITINAE Spatham, 1930

Venters arched to keeled, conch generally evolute, with early coronate stage. Suture typically with one differentiating lateral lobe. L.Trias.
Cephalopoda—Ammonoidea—Ceratitina

Columbites Hyatt & Smith, 1905 [*C. parisi anus]. Evolute, feebly ornamented with ribs, constrictions, and spiral striae; venter arched tending to become acute. Suture ceratitic with large lateral lobe and small 2nd lateral (203). U.Scyth., Ida.-Wyo.-Utah.—Fig. 172,2. *C. parisi anus; 2a, ×0.7; 2b, ×2 (203)*.

Subcolumbites Spath, 1930 [*Columbites perrimismithi Arthaber, 1908]. Like Columbites but with more pronounced tendency to carination (472). U.Scyth., Albania-Chios-Timor.—Fig. 172,15. *S. perrimismithi (ARTH.), Albania-Chios; 15a,b, ×0.7 (22)*.

Prenkites Arthaber, 1911 [*P. malsorensis]. Cadi­cones with constricted body chamber and aperture, bearing indications of umbilical tubercles on inner whorls, umbilicus eccentric (472). U.Scyth., Albania-Chios-Timor.—Fig. 172,8. *P. malsorensis, Albania-Chios; 8a,b, ×1; 8c, ×1.5 (22)*.

Protropites Arthaber, 1911 [*P. hilmi]. More or less involute, inflated, with cadicone inner whorls and keeled outer whorl, body chamber constricted. Suture subceratitic with wide lateral lobe (472). U.Scyth., Albania.—Fig. 172,5. *P. hilmi; 5a,b, ×1; 5c, ×2 (22)*.

Chioceras Renz & Renz, 1948 [*C. mitzopouloi]. Smooth, evolute, whorl section rounded, with keel, as in Protropites, developed late; some forms with lateral nodes. Suture with 3 serrated lobes (372). U.Scyth., Chios.—Fig. 172,10. *C. mitzopouloi; 10a,b, ×1; 10c, ×2 (372)*.

Arianites Arthaber, 1911 [*A. musacchi]. Smooth, evolute, whorl section depressed, with pronounced umbilical rim. Suture with deep ventral lobe and a bifid lateral lobe (472). U.Scyth., Albania.—Fig. 172,14. *A. musacchi; 14a, ×1; 14b, ×2 (22)*.

Metopella Renz & Renz, 1948 [*Arianites (Meropella) plejanae]. Like Arianites but whorl section not depressed, inner whorls with faint ribs, and suture with 2 bifid lateral lobes (372). U.Scyth., Chios.—Fig. 172,12. *M. plejanae (RENZ-R.); ×4 (372)*.

Epipelites Arthaber, 1911 [*E. genti]. Evolute, compressed, with fine lineation and periodic flares or constrictions. Suture with single, ceratitic lateral lobe (472). U.Scyth., Albania-Chios.—Fig. 172,1. *E. genti; 1a,b, ×0.7; 1c, ×2 (22)*.

Family USURRIIDAE Spath, 1930
[nom. correct. Kummel, herein (pro Ussuridae Spath, 1930)]

Involute, smooth, discoidal ammonites with arched to narrowly rounded venters and flat whorl sides. Suture ammonitic (472). L.Trias.

Ussuria Diener, 1895 [*U. schamarae; SD Diener, 1895]. Suture submonophyllic with lateral saddles notched on dorsal side. Scyth., Sib.—Fig. 173,13. *U. schamarae; 13a,b, ×0.7 (101)*.

Parussuria Spath, 1934 [*Ussuria compressa Hyatt & Smith, 1905]. All saddles of suture deeply divided. Scyth., Calif.—Fig. 173,7. *P. compressa Hyatt-S.; ×0.7 (203)*.

Metussuria Spath, 1934 [*Ussuria waageni Hyatt & Smith, 1905]. Suture with adventitious lobe and saddle. Scyth., Ida.—Fig. 173,11. *M. waageni (Hyatt-S.); ×0.5 (203)*.

Family HEDENSTROEMIIDAE Waagen, 1895

Discoidal, compressed, generally smooth, involute, with tabulate to oxynote venters. Suture ceratitic, with more elements than in parallel development shown by Paranoritid, and with adventitious saddles and lobes (472). L.Trias., ?M.Trias.

Subfamily HEDENSTROEMINAE Waagen, 1895

Suture with regular ceratitic lobes, smooth saddles and no tendency to simplification (472). L.Trias.

Hedenstroemia Waagen, 1895 [*Ceratites hedenstroemi Keyserling, 1845] (=Anahedenstroemia Hyatt, 1900). Venter acute in adult, tabulate in earlier stages. Suture with prominent adventitious lobe. U.Scyth., Spitz.-Sib.—Fig. 173,5. *H. hedenstroemia (KEYS.), Sib.; 5a,b, ×0.5 (472)*.

Pseudoahedenstroemia Kummel, nom. nov. [pro Anahedenstroemia Spath, 1934 (non Hyatt, 1900)] [*Anahedenstroemia himalayica Spath, 1934]. Venter tabulate, suture with outer saddles linguiform and numerous generally well-individualized auxiliaries. Scyth., Himalaya-Salt-R.-Timor-Calif.—Fig. 173,6. *P. himalayica, Himalaya; 6a,b, ×0.7 (102)*.

Clyptites Waagen, 1895 [*C. typicus]. Like Pseudo­hedenstroemia but with closed umbilicus and adventitious elements of suture less individualized. Scyth., Salt-R.-Himalaya.—Fig. 173,15. *C. typicus, Salt-R.; 15a,b, ×1 (548)*.

Parahedenstroemia Spath, 1934 [*Hedenstroemia acuta Krafft in Krafft & Diener, 1909]. Like Pseudohedenstroemia but with oxynote periphery. Scyth., Himalaya.—Fig. 173,3. *P. acuta (KRAFFT); 3a,b, ×1 (240)*.

Ephihedenstroemia Spath, 1934 [*Hedenstroemia skipetarensis Arthaber, 1911]. Venter tabulate, comparatively broad. Suture with primitive lobes and saddles, and high curvature. U.Scyth., Albania.—Fig. 173,12. *E. skipetarensis (ARTH.); ×2 (22)*.

Metahedenstroemia Spath, 1934 [*Hedenstroemia kastriotae Arthaber, 1911]. Highly compressed conch, with narrowly tabulate venter. Suture with bluntly serrated lobes and well individualized auxiliaries. U.Scyth., Albania.—Fig. 173,10. *M. kastriotae (ARTH.); ×1.5 (22)*.
Mesozoic Forms—Noritaceae

Fig. 172. Paranannitidae (p. L138-L140).

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Cephalopoda—Ammonoidea—Ceratitina

Tellerites Mojsisovics, 1902 [*Ceratites furcatus ÖBERG, 1877]. Discoidal, involute, with sulcate venter bordered by 2 keels and faint sigmoidal ribs on sides. Suture with small adventitious saddles. U.Scyth., Spitz.—Fig. 173,2. *T. furcatus (ÖBERG); 2a,b, ×1; 2c, ×2 (294*).

Subfamily LANCEOLITINAE Spath, 1934
Venter tabulate, whorl sides flat. Suture ammonitic with wide, high ventral lobe, indistinct adventitious elements (472). L.Trias.

Lanceolites Hyatt & Smith, 1905 [*L. compactus (203). Scyth.(Owenitan), Ida.-Calif.—Fig. 173, 8. *L. compactus; 8a, ×0.5; 8b, ×1 (203)*.

Subfamily ASPENITINAE Spath, 1934
Venter acute or oxycone, suture almost goniatitic with numerous elements and adventitious lobes (472). L.Trias.

Aspenites Hyatt & Smith, 1905 [*A. acutus]. Venter oxycone, conch smooth or with fine, strong radial folds. Suture ceratitic, with small adventitious lobes and goniatitic auxiliaries (203). Scyth.(Owenitan), Ida.-Ida.—Fig. 173,1. *A. acutus, Ida.; 1a,b, ×0.66; 1c, ×3 (203*).

Pseudaspenites Spath, 1934 [*Aspenites layeriformis Welter, 1922]. Like Aspenites but more evolute and with curvature of suture and more numerous auxiliary. Scyth. (Owenitan), Timor.—Fig. 173, 9. *P. layeriformis (Welter); ×1 (560*).

?Beatites Arthaber, 1911 [*B. berthae]. Somewhat strongly evolute, with oxycone venter, greatly compressed. Suture goniatitic. U.Scyth., Albania.—Fig. 173,4. *B. berthae; ×1 (22*).

?Subfamily BENECKEINAE Waagen, 1895
[nom. correct. KUmmel, herein (pro Beneckinae Waagen, 1895)]

Compressed, smooth oxycones with entire multilobate suture, with small adventitious lobes (472). L.Trias.-M.Trias.

Beneckeia Mojs., 1882 [non Beneckeia Uhlig, 1882 (=Silites Uhlig, 1882)] [*Am. buchi Alberti, 1834 (472). L.Trias.(U.Scyth.).M.Trias.(Anis.), Ger.-Transjordan.—Fig. 173,14. B. wogaumana (MEyER), Anis., Ger.; 14a,b, ×1 (702)*.

Family KASHMIRITIDAE Spath, 1930
Costate developments of a stock similar to primitive Flemingitids or xenoceltitids tending to peripheral ribbing, as in Anasibirites, or to carination (472). L.Trias.

Kashmirites Diener, 1913 [*Celites armatus Waagen; SD Diener, 1915]. More or less evolute, whorls quadrate, with strong, commonly tuberculate ribbing on inner whorls, degenerating into striation on outer whorls; venter wide; subtabulate, costae commonly continuous across venter. Suture ceratic, generally with only 2 lateral lobes. Scyth., SaltR.-Himalaya-Timor.—Fig. 174,4. *K. armatus (Waagen), Himalaya; 4a,b, ×1 (110*).

Anakashmirites Spath, 1930 [*Damubites nivalis Diener, 1897]. Evolute, serpenticones with ribs tending to thicken toward ventrolateral borders and widely arched peripheries. Suture ceratic. Scyth., Himalaya-Timor.—Fig. 174,1. *A. nivalis (Diener), Himalaya; 1a,b, ×1 (102*).

Pseudoceltites Hyatt, 1900 [*Celites multiplicatus Waagen, 1895]. Like Kashmirites but venter more arched and smoother; ribs tending to be prominent at ventral shoulders. Suture ceratic. U.Scyth., SaltR.-Ida.—Fig. 174,3. *P. multiplicatus (Waagen), SaltR.; 3a-c, ×1 (548*).

?Hanielites Welter, 1922 [*H. elegans]. More or less strongly ornamented and keeled offshoots of kashmiritids, with coronate inner whorls and ceratic suture. Scyth.(Owenitan), Timor.—Fig. 174,2. *H. elegans; 2a,b, ×1; 2c, ×2 (560*).

Family MEEKOCERATIDAE Waagen, 1895

More or less involute, compressed, discoidal forms, smooth or weakly ornamented; venter arched or tabulate. Suture ceratic with broad saddles (472). L.Trias.-M.Trias.

Subfamily MEEKOCERATINAE Waagen, 1895
Venter tabulate but may be rounded on living chamber of some adults. L.Trias.

Meekoceras Hyatt, in C. A. White, 1879 [*M. gracilitatis White, 1879]. Involute to evolve, discoidal, generally smooth. Suture with few dentations in lobes. Scyth.(Owenitan), Calif.-Neve.-Ida.-Utah-Timor.—Fig. 175,8. *M. gracilitatis, Ida.; 8a,b, ×0.7; 8c, ×1 (203*).

Wyomingites Hyatt, 1900 [*Meekoceras aplanatum White, 1879]. Evolute, compressed, with tabulate venter that tends to widen and become subsulcate; sides smooth or with radial folds. Suture ceratic, may be goniatitic, with only 2 lateral lobes. Scyth. (Owenitan), Ida.—Fig. 175,7. *W. aplanatum (White); 7a,b, ×1; 7c, ×3 (451*).


Subfamily ARCTOCERATINAE Arthaber, 1911
With arched venters, slightly sigmoidal striae and folds on outer whorl (472). L.Trias.

Submeekoceras Spath, 1934 [*Meekoceras mush­bachanianum White, 1880]. Robust, more or less evolute, with striae and blunt folds on whorl sides in some. Suture ceratic with saddles more slender.
than in *Arctoceras*. Scyth. (*Owenitan*), N.Am.-Timor.—Fig. 175,3. *S. mushbachanum* (White), Ida.; 3a, X 0.25; 3b, X 0.7 (203*).

*Arctoceras* Hyatt, 1900 [*Ceratites polaris* Mojsi-sock, 1886] [= *Arctoceroides* Strand, 1929]. Generally involute, discoidal, venter narrowly arched; smooth or striate; flattened sides. Suture ceratitic with wide, low saddles. U.Scylh., Spitz.—Fig. 175,4. *A. polaris* (Mojs.); 4a,b, X 0.7 (294*).

*Czekanowskites* Diener, 1915 [*Ceratites decipiens* Mojsi-sock, 1886]. Like *Arctoceras* but inflated, with globose inner whorls. Suture with higher saddles and more digitations of lobes. U.Scylh., Yugo.—Fig. 175,6. *P. sivilajanus* (Kittl), 1903. Like *Submeekoceras* but smooth and suture with 2 goniatitic lateral lobes. U.Scylh., Yugo.—Fig. 175,6. *P. sivilajanus* (Kittl); X 1 (232*).
Subfamily DAGONOCERATINAE Spath, 1934

Venters arched or tabulate, conch more or less involute, smooth or feebly ornamented. Suture ceratitic with only one lateral lobe (472). L.Trias.-M.Trias.

Dagonoceras Arthaber, 1911 [*D. nopceanum; SD Diener, 1915]. Venter arched, conch inflated, discoidal, greatest width at umbilical shoulder; smooth or with indistinct folds. U.Scyth., Yugo.-Chios.—Fig. 175,1. *D. nopceanum, Albania-Chios; 1a,b, ×1; 1c, ×1.5 (22*).

Prosavites Arthaber, 1896 [*P. hiefelli]. Involute, discoidal, inflated, smooth, venter tabulate with angular ventrolateral edges. Suture goniatitic. L.Trias.(U.Scyth.)-M.Trias.(Anis.), Yugo.—Fig. 175,9. *P. avitus Arth., Anis., 9a-c, ×1 (584*).

Family NORITIDAE Karpinsky, 1889

Smooth, flat, discoidal; venter tabulate, bordered by pronounced ventral shoulders. Suture ceratitic with club-shaped saddles, 1st lateral lobe divided by median indentation (472). L.Trias.-M.Trias.

Norites Mojsisovics, 1878 [*Am. gondola Mojs., 1869]. Venter with marginal keels, umbilical shoulder sharp, conch involute. M.Trias.(Anis.-Ladin.), Alps-Balkan-Timor.—Fig. 176,1. *N. gondola (Mojs.), Anis., Alps-Balkan-Greece; 1a,b, ×0.7; 1c, ×1 (293*).

Arthaberites Diener, 1900 [*A. alexandrae]. Involute, discoidal, compressed. Suture resembling that of Pseudosagecera or Cordelieres. M.Trias.(Anis.), Alps-Balkan.—Fig. 176,3. *A. alexandrae; 3a, ×0.66; 3b, ×1 (22*).

Ananorites Diener, 1907 [*A. monicola]. Evolute, smooth, discoidal, with sharp ventral shoulders developed at late stage (104). M.Trias.(Anis.), Himalaya.—Fig. 176,5. *A. monicola; 5a,b, ×0.7 (104*).

Albanites Arthaber, 1909 [*Pronorites triadicus Arth., 1908]. More or less involute, smooth or faintly ribbed, sides flattened; venter tabulate and with transverse ribs in some. L.Trias.(U.Scyth.), Albania-Chios—Fig. 176,2. *A. triadicus (Arth.), Albania-Chios; 2a,b, ×1; 2c, ×1.5 (22*).

Bosnites Hauer, 1896 [*B. clathratus; SD Diener, 1915]. Compressed, involute planoconic with flat venter, convex sides; whorl sides with low, weak radial ribs and a spiral row of nodes at midpoint (488). M.Trias.(Anis.), Yugo.—Fig. 176,4. *B. clathratus; 4a,b, ×0.5; 4c, ×0.7 (633*).

Family PRIONITIDAE Hyatt, 1900

Ribbed and tuberculate forms developed from Meekoceratidae with tendency to acquire a broadly tabulate venter, without transverse costae or notches of Sibiritidae. Suture ceratitic as in Meekoceras, with 2 lateral lobes and serrated auxiliary series (472).

L.Trias.

Prionites Waagen, 1895 [*P. tuberculatus; SD Diener, 1915]. More or less evolute, discoidal, with rounded to subtabulate venter; whorl sides with blunt nodes or tuberculated ribs. Second lateral lobe may be goniatitic, auxiliaries serrated (548). U.Scyth., SaltR.-Himalaya-Timor.—Fig. 177,2. *P. tuberculatus, SaltR.; 2a,b, ×0.5 (548*).

Hemiprionites Spath, 1929 [*Goniodiscus Waagen, 1895 (non Müller & Troeschel, 1842)] [*Goniodiscus typus Waagen, 1895]. Involute, with flat, nearly smooth sides and tabulate venter; indistinct serration of ventrolateral edge and transverse ribs on periphery, as in Anasibirites. U.Scyth.(Owenitan), SaltR.-Timor-Utah-Ida.-Spitz.—Fig. 177,3. *H. typus (Waagen), SaltR.; 3a,b, ×1; 3c, ×0.7 (548*).

Gurleyites Mathews, 1929 [*G. smithi]. Like Hemiprionites but with excentric umbilicus, rounded body chamber, tending to inflation; with radial ribs and umbilical nodes. Suture ceratitic as in Hemiprionites. U.Scyth.(Owenitan), Utah-Ida.-Spitz.—Fig. 177,4. *G. smithi, Utah; ×0.5 (658*).
Mesozoic Forms—Noritaceae

FIG. 175. Meekoceratidae (p. L142-L144).

Arctoprionites Spath, 1930 [*Goniodiscus nodosus Frebold, 1930]. More or less involute, discoidal ammonites with tabulate venters, tending to develop crenulation of the ventral shoulder and ribbing or tuberculation on the whorl sides. Suture as in Hemiprionites but with large 1st lateral saddle and simple ventral lobe. U.Scyth., Spitz.—Fig. 177,1. *A. nodosus (Frebold); 1a,b, ×0.7 (472*).

Family SIBIRITIDAE Mojsisovics, 1896

Ribbed or tuberculate derivatives of Meekoceratidae with modification of venter ranging from mere widening and transverse ribbing to sulcation (472). L.Trias-M.Trias.

Sibirites Mojsisovics, 1886 [*S. pretiosus]. Evolute, with subtabulate venter; whorl sides with sigmoidal ribs that thicken at ventral shoulders; ribs form adorally projected chevrons on venter, incompletely fused along mid-line. Suture ceratitic, with 2 lateral lobes. L.Trias.(U.Scyth.), Sib.—Fig. 178,3. *S. pretiosus; 3a,b, ×1 (294*).

Anasibirites Mojsisovics, 1896 [Sibirites kingianus Waagen, 1895; SD Diener, 1915] [=Pseudosibirites Arthaber, 1911]. More or less involute discoidal, with arched or subtabulate venters; with sigmoidal ribs continuous across and commonly thickened on venter and generally absent on body.

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Wasatchites Mathews, 1929 [*W. perrini*]. With trapezoidal whorl section, tabulate venter, and umbilical tubercles which give rise to lateral ribs that also cross venter. *L.Trias.(U.Scyth.)*, Utah-Ida.-B.C.-Timor.-Spitz.—Fig. 178, 4. *°A. kingianus* (WAAGEN), SaltR.; 4a,b, ×0.7 (548°).

Anawasatchites McLearn, 1945 [*A. tardus*]. Like *Wasatchites* but with slightly excentric umbilicus, nearly smooth inner whorls. *L.Trias.(U.Scyth.)*, B.C.

Keyserlingites Hyatt, 1900 [*Ceratites subrobustus* Mojsisovics, 1886] [=Robustites PHILIPPI, 1901]. Inflated, with subtabulate to arched venter, with umbilical nodes; with lateral ribs that may cross venter or a row of nodes along ventral shoulder. Suture ceratitic with large 1st lateral saddle. *L.Trias.(U.Scyth.)*, Spitz.-Sib.-Ida.—Fig. 178, 7. *K. subrobustus* (MOJS.), Sib.; 7a,b, ×0.7 (294°).

Durgaites Diener, 1905 [*Keyserlingites dieneri* Mojsisovics, 1902 (=Ceratites subrobustus Diener; non MOJS., 1895)] [=Anastephanites Spath, 1930]. Like *Keyserlingites* but with coronate inner whorls and tendency to develop ventrolateral nodes after lateral nodes have shifted to below middle of whorl side; venter arched to subtabulate, with transverse ribs. *L.Trias.(U.Scyth.)-M.Trias.(Anis., Beyrichitan)*, Himalaya-Timor-Calif.—Fig. 178, 6. *°D. dieneri* (MOJS.), U.Scyth., Himalaya; 6a,b, ×0.2 (102°).

Pearylandites Kummel, 1953 [*P. troelseni*]. Evolute, with wide deep umbilicus; outer whorls subtrigonal, with prominent umbilical tubercles from which ribs extend ventrally; venter fastigate; inner whorls more depressed, at first rounded, then trapezoidal, with prominent ventrolateral tubercles from which ribs extend dorsally. Suture ceratitic with large 1st lateral lobe. *M.Trias.(Anis.)*, Pearyland.—Fig. 178, 1. *°P. troelseni*; la,b, ×0.7; 1c, ×3 (650°).

?Olenikites Hyatt, 1900 [*Dinarites spiniplicatus* Mojsisovics, 1886]. Involute micromorphs with umbilical nodes on phragmocone that tend to disappear on body chamber or earlier. Suture generally goniatitic with 2 lateral lobes. *L.Trias.(U.Scyth.)*, Spitz.—Fig. 178, 5. *O. spiniplicatus* (MOJS.), 5a,b, ×1; 5c, ×2 (294°).
Superfamily CERATITACEAE
Mojsisovics, 1879
[non. transl. Mojs., 1896 (ex Ceratitaceae Mojs., 1879)]
Typically highly ornamented or tuberculate descendants of Meekocerataceae, with ceratitic suture that may become goniatitic or ammonitic in some offshoots (472). L.Trias-U.Trias.

Family STEPHANITIDAE Arthaber, 1896

More or less evolute, coronate shells with broadly arched venters, lateral tubercles, and simple ceratitic suture, generally with large 1st lateral saddle (472). L.Trias.

Stephanites WAAGEN, 1895 [S. superbus; SD DIENER, 1915]. Inflated conch with depressed coronate inner whorls and more rounded body chamber. Suture with 2 lateral lobes (548). U.Scyth., SaltR.—Fig. 179.2. *S. superbus; 2a,b, X0.25; 2c, X0.5 (548).

Parastephanites HYATT, 1900 [Acrochordiceras atavum WAAGEN, 1895] [=Acrochordiceroides Strand, 1929 (obj.)]. More compressed than Stephanites, venter narrowly arched; nodes and secondary ribs tending to disappear on body chamber. Suture incompletely known. U.Scyth., SaltR.

Paratretites STOYANOW, 1910 [*P. kitlii; SD SpATh, 1934]. With coarse distant ribs, prominent ventrolateral nodes, and broadly arched venter. Suture with large ventral saddle, small lateral saddle, and large auxiliary saddles. U.Scyth., Armenia-Iran.—Fig. 179.1. *P. kitlii, Armenia; 1a, X0.7; 1b, X1 (719*).

Family TIROLITIDAE Mojsisovics, 1882

Evolute shells, generally with prominent lateral tubercles; suture feebly ceratitic or goniatitic (472). L.Trias.

Tirolites Mojsisovics, 1879 [*Ceraitites idrianus HAUER, 1865; SD HYATT & SMITH, 1905]. Whorl rectangular, venter broadly rounded or tabulate; with tubercles on ventral shoulders, ribs commonly on whorl sides. Suture with large 1st lateral lobe, goniatitic or ceratitic, and small goniatitic 2nd lateral on umbilical wall. U.Scyth., Alps-Balkan-S.Russ.-Himalaya-Ilda.—Fig. 180.4. *T. idrianus (HAUER), Yugo.; 4a,b, X0.7 (293*).

Tirolitoides SPATH, 1934 [pro Paraceratites KITTL, 1903 (non HYATT, 1900) [*Ceraitites (Paraceratites) prior KITTL, 1903]. Like Tirolites but also with umbilical nodes and 2 denticulated lateral lobes. U.Scyth., Yugo.—Fig. 180.5. *T. prior (KITTL); X1 (232*).

Diaplococeras HYATT, 1900 [*Dinarites liccanum HAUER, 1865] [=Liccaites KITTL, 1903 (obj.)]. Compressed, with umbilical nodes and clavi on ventral shoulders. Suture ceratitic. U.Scyth., Alps-Yugo.—Fig. 180.6. *D. liccanum (HAUER), Yugo.; 6a,b, X0.3 (293*).

Svilajites KITTL, 1903 [*Tirolites (Svilajius) cingulatus]. With transverse ribs across arched venter. U.Scyth., Yugo.—Fig. 180.1. *S. cingulatus; 1a,b, X1 (232*).

Bittnerites KITTL, 1903 [*Tirolites (Bittnerites) bittneri]. With spinose stage reduced or absent; outer whorl with indistinct, projected ribs that cross venter. U.Scyth., Yugo.—Fig. 180.3. B. malici KITTL; 3a,b, X0.5 (232*).

Dorikranites HYATT, 1889 [*Am. bogdoanus von BUCH, 1881] [=Bogdoites KITTL, 1903 (obj.)]. Rib or tuberculation as in tirolitids but with acute venters. Suture simple, lobes entire or slightly toothed at siphonal or umbilical ends. U.Scyth., S.Russ.—Fig. 180.2. *D. bogdoanus (Buch); 2a,b, X0.3; 2c, X0.7 (293*).

Family DINARITIDAE Mojsisovics, 1882

Discoidal, smooth, feebly or strongly ornamented, with simple goniatitic or feebly ceratitic suture and typically only one lateral lobe (472). L.Trias.

Dinarites MOJSISOVICS, 1882 [*Ceratites dalmatinus HAUER, 1865; SD HYATT & SMITH, 1905] [=Placoceras HYATT, 1900 (obj.)]. More or less involute, with rounded or (rarely) flattened venters; conch smooth or with radial folds. Suture goniatitic. U.Scyth., Alps-Balkan.—Fig. 181, J. D. muchianus (HAUER), Yugo.; X0.7 (232*).

Pseudodinarites HYATT, 1900 [*Dinarites mohamedanus MOJSISOVICS, 1882] [=Hercegovites KITTL, 1903 (obj.)]. Evolute, smooth, with ceratitic lobes. U.Scyth., Balkan.

Hololobus KITTL, 1903 [*Tirolites (Hololobus) monopychus]. Intermediate between Dinarites and Carniolites, with entire, undivided ventral lobe. U.Scyth., Yugo.—Fig. 181, S. *H. monopychus; X1 (232*).

Carniolites ARTHABER, 1911 [*Tirolites carniolicus MOJSISOVICS, 1882]. Phragmocone as in Dinarites but with a few spines on body chamber. U.Scyth., Yugo.—Fig. 181, C. *C. carniolicus (MOJS.); 3ab, X0.5 (232*).

FIG. 179. Stephanitidae (p. L147).
Family HELLENITIDAE Kummel, 1952

Serpenticones, whorls subquadrate, shoulders well rounded, conspicuous ribs and well-developed keel on arched venter, bordered by narrow furrows. Suture ceratitic, with large 1st lateral lobe, small smooth 2nd lateral lobe. L.Trias.

Hellenites Renz & Renz, 1948 [*Tropicites pra-
**Fig. 182.** Beyrichitidae (p. L150-L151).

*C. praematurus* Arthaber, 1911 [*H. praematurus* (Arth.), Albania-Chios; 6a, 6, X 1; 6c, X 1.5 (372*)].

**Family ACROCHORDICERATIDAE**

*Arthaber, 1911*

More or less involute, commonly inflated with strong ribs which are continuous and generally most prominent on arched venter; with or without umbilical nodes. Suture ceratitic or ammonitic (472). *M. Trias.*

**Acrochordiceras** Hyatt, 1877 [*A. hyatti* Meek, 1877]. Suture simpler than in *Silesiacrochordiceras.*

- **A. (Paracrochordiceras)** Spath, 1934 [*A. anodosum* Welter, 1915]. With no tuberculation, suture simple (472). *Anis., Timor-B.C.—Fig. 181, 2, *A. (P.) anodosum* (Welter), Timor; 2a, b, X 0.7; 2c, X 1 (559*).
- **A. (Epacrochordiceras)** Spath, 1934 [*A. portii Martelli, 1906]. Nontuberculate as in *A. (Paracrochordiceras)* but more compressed and involute, ribs lost or weakened at some stage, generally on body chamber. *Anis., Alps-Balkan-AsiaM.*

**Silesiacrochordiceras** Diener, 1916 [*A. Acrochordiceras damesi* Noetling, 1880]. Like *A. (Acrochordiceras)* but with different, more subdivided suture. *Anis., Silesia.*

**Family BEYRICHITIDAE** Spath, 1934

Involute, discoidal, with falcoid, single or bifurcating ribs. Suture ceratitic with tendency to become subammonitic and complex (472). *L. Trias.-M. Trias.*


- **B. (Beyrichites)**. Nontuberculate. *L. Trias.* *U. Scyth.* *M. Trias.* (Anis.); Alps-Balkan-Chios-Himalaya-Japan-B.C.-Nev.—Fig. 182, 4. B. *kesava* (Diener), Anis., Himalaya; 4a, b, X 0.7; 4c, X 1 (100*).
- **B. (Gangadharites)** Diener, 1916 [*Meekoceras gangadhara* Diener, 1895]. Tubercles at middle
Mesozoic Forms—Ceratitaceae

Family CERATITIDAE Mojsisovics, 1879

Involute to evolute, generally highly ornamented with ribs and tubercles; venter tabulate to subcarinate. Suture ceratitic (472). *M. Trias.*

Ceratites de Haan, 1825 [*Am. nodosa Bruguierère, 1792; SD Smith, 1904*] [=Hauniceras Bayle, 1878 (obj.); Acanthoceratites, Cycloceratites, Doloceratites, Echinoceratites, Gymnoceratites, Hadooceratites, Hoploceratites, Nannoceratites, Opheoceratites, Patagioceratites, Phalacroceratites, Symboloceratites (obj.) Schrammen, 1928; Archioceratites, Baliceras, Pachyceratites Schram., 1933]. More or less evolute, robust, with coarse ornamentation usually persisting on body chamber. *Ladin., Ger.-Fr.-Sp.-Sard.-Rumania.*—FIG. 183, 2. *C. nodosus* (BRUG.), Ger.; 2a, b, X 0.7 (743').

Alloceratites Spath, 1934 [*Ceratites schmidti Zimmermann, 1883*]. Like Discoceratites in young; later with prominent lateral tubercles and ventrolateral clavi bordering subsulcate venter; indistinct ribbing between tubercles on whorl sides and ribs with strong forward sinus connecting ventrolateral clavi. *Ladin., Ger.*—FIG. 184, 4. *A. schmidti* (ZIM.); 4a, b, X 0.7; 4c, X 1 (681').

Frechites Smith, 1932 [*Ceratites humboldtensis Hyatt & Smith, 1905*]. Like Gymnotoceras but with tuberculation on ventral shoulders and at point of bifurcation of ribs; keel faint or absent (451). *Anis., Nev.-B.C.*—FIG. 185, 2. *F. hum-
boldensis (HYATT-S.), Nev.; 2a-b, ×0.66; 2c, ×1.5 (449*).

Semiornites ARTHABER, 1912 [*Ceratites cordevolico-
Mus MOJSISOVICS, 1882; SD DIENER, 1915]. Involute, com-
pressed ptycone, with either no distinct rib-
ing or single row of tubercles, or with ribs bifur-
cating at umbilical edge. Anis., Alps-Balkan-Hima-
laya.—Fig. 184,5. *S. cordevolicus (Mojs.), Alps; 5a-b, ×0.7 (293*).

Kellnerites ARTHABER, 1912 [*Ceratites bosnensis
HAUER, 1888] (=Bosnites FRECH, 1908 (non
HAUER, 1896); Popinites SALOPEK, 1915 (obj.)).
Highly sculptured, with radial ribs and several
rows of tubercles, outer ones most prominent;
venter subcarinate. Anis., Alps-Balkan-Greece.—
Fig. 183,1. *K. bosnensis (Hauer), Alps-Balkan;
1a-b, ×0.5; 1c, ×1 (633*).

Bulogites ARTHABER, 1912 [*Ceratites multinodosus
HAUER, 1892]. Whorl section rectangular; venter
broad and flattened; ribbing on whorl sides closely
spaced, with 3 or 4 rows of more or less equal-
sized tubercles. Anis., Alps-Balkan.—Fig. 185,5.
*B. multinodosus (HAUER), Alps-Yugo.; 5a-b,
×0.5; 5c, ×1 (633*).

Halilucites DIENER, 1905 [*Ceratites ruticus
HAUER, 1896]. Like Kellnerites but with distinct
keel, tubercles not nearly so prominent; tendency
toward decrease of ornamentation (488). Anis.,
Alps-Balkan-Greece.—Fig. 185,1. *H. ruticus
(Hauer), Yugo.; 1a-b, ×0.7; 1c, ×1 (633*).

Eudiscoceras HYATT, 1877 [*E. gabbi MEEK, 1877].
Like Halilucites but more compressed, discoidal,
involute; ribbing closer spaced and finer; venter
with keel bordered by clavi (203). Anis., Nev.—
Fig. 184,3. *E. gabbi; 3a-b, ×0.7 (203*).

Eutomoceras HYATT, 1877 [non MOJSISOVICS, 1879
(see MOJS., 1883)] [*E. laubei MEEK, 1877].
Compressed, discoidal, involute, keeled ptycone with
ribbed early volutions but tending to degeneration
of typically multipapillate ribs to final smoothness
(203). Anis., Nev.—Fig. 184,1. *E. laubei; la-b,
×0.7; 1c, ×1 (203*).

Koptoceras SPATH, 1951 [*K. falconi]. Like Euto-
moeceras but with falcate ribs, most marked near
umbilicus, declining toward venter; rapid degenera-
tion of ornamentation, adult whorls nearly smooth
(488). Anis., Spitz.

Salterites DIENER, 1907 [*Ceratites (Salterites) ober-
hummeri]. Like Hollandites but with strong um-
bilical tubercles which in later stage move out-
ward, still serving as point of bifurcation of ribs
which terminate at ventrolateral edge in small
tubercles. Suture ceratitic, as in Hollandites. Anis.,
Himalaya.

Haydenites DIENER, 1907 [*Ceratites (Haydenites)
hatchekii]. Evolute, whorl section subrectangular,
with broad slightly arched venter; inner whorls
with simple radial ribs, outer whorls with nodes
at junction of bifurcating ribs, also ribs crossing
venter, with small nodes on ventral shoulder. Su-

Fig. 184. Ceratitidae (P. L151-L152).
Fig. 185. Ceratitidae (p. L151-L152).

Family DANUBITIDAE Spath, 1951

Very evolute, with ribbed whorl sides which may be tuberculate or not; venter rounded to subcarinate. Suture ceratitic (488). *M. Trias.*

Danubites Mojsisovics, 1893 [*Celtites floriani Mojs., 1882*] [*=Florianites Hyatt, 1900 (obj.*)].
Whorl section subquadrate, with smooth to feebly carinate venter; whorl sides flattened, with prominent radial ribs that may bend adorally near the ventral shoulder (292). Anis., Alps-Balkan-Himalaya-Timor-Japan.—Fig. 186.6. D. kansa Diener, Himalaya; 6a-c, X0.7 (100*).

Pseudodanubites Hyatt, 1900 [*Danubites dritarashtra Diener, 1895]. Like Danubites but venter obtuse and suture more advanced (100). Anis., Himalaya.—Fig. 186.3. *P. dritarashtra (Diener); X1 (100*).

Reiflingites Arthaber, 1896 [*R. eugeniae]. Like Danubites but whorl section trapezoidal, venter tabulate or subcarinate; whorl sides with lateral projected ribs with 1 to 3 generally faint inner ventrolateral nodes (472). Anis., Alps.—Fig. 186.1. *R. eugeniae; 1a,b, X0.7; 1c, X1 (584*).

?Rikuzenites Yabe, 1949 [*R. nobilis]. Evolute, whorls slowly expanding; whorl sides with radial ribs; last half volution separated from phragmocone as in Scaphites. Suture ceratitic. Type and only specimen may be deformed, genus doubtful. Anis., Japan.

Family BALATONITIDAE Spath, 1951

Widely umbilicate, more or less serpenticone in form, with strong ornamentation; smooth, rounded, fastigate, or keeled venter; constrictions or more rarely tubercles. Simple ceratitic suture (488). M.Trias.

Balatonites Mojsisovics, 1879 [*Trachyceras balaticum Mojs., 1873]. Compressed, highly ornamented, with more or less fastigate venter; radial ribs with variable tuberculation, generally in umbilical, median, and ventrolateral rows, and in
some on center of venter (292). Anis., Alps-Bal-
kan-Ger.-Japan-Nev.—Fig. 186,5. *B. balatoni-
cus (Mojs.), Alps; 5a, b, X0.7 (293*).
Judicarites Mojssovics, 1896 [*Balatonites arietifor-
mis Mojs., 1882]. Venter with prominent keel,
whorl sides with radial ribs that are inflated and
projected adorally on ventral shoulder (295). Anis.,
Alps-Ger.-Balkan.—Fig. 186,4. J. prezzanus
(Mojs.), Alps-Yugo.; 4a, b, X0.7 (293*).
Cucoceras Diener, 1905 [*Trachyceras eucense
Mojssovics, 1873]. Compressed, whorl sides flat-
tened, venter narrowly rounded; with ribs and
constrictions that are continuous over venter, some
forms also with tubercles on whorl sides (488).
**Family HUNGARITIDAE** Waagen, 1895

Involute, compressed, discoidal, with keeled or sharpened venter; smooth or weakly costate. Suture ceratitic, usually with numerous elements, may have adventitious lobes (488). *L. Trias.-U. Trias.*

**Hungarites** Mojsisovics, 1879 [*Ceratites mojsiso­vici Roth, 1871 (=Ceratites zalaensis Boeckh, 1873)] (=*Iberites Hyatt, 1900*). Involute platycone, with high median keel on subtabulate venter; ventral shoulders usually well marked; smooth or with sigmoidal ribs. Suture ceratitic to subammonic (203). *M. Trias. (Anis.-Ladin.), Alps-Sp.-Balkan-Asia M.-Himalaya-N. Sib.-B.C.-Calif.-Nev.* — Fig. 187, 5. *H. spatiae Hyatt & Smith, Calif.; 5a,b, X1; 5c, X2 (203°).

**Noetlingites** Hyatt, 1900 [*Ceratites strombecki Grießenkerl, 1860*]. Like *Hungarites* but venter fastigate throughout. Suture without median saddle in ventral lobe, 3 lateral lobes, broadly rounded saddles (488). *M. Trias. (Anis.), Ger.—Fig. 187, 9. *N. strombecki (Grießenkerl); 9a,b, X0.7 (630°).*

**Longobardites** Mojsisovics, 1882 [*L. breguzzanus; SD Hyatt & Smith, 1905*]. Involute oxycones without distinct ventral shoulders; with sigmoidal striations. Suture ceratitic, with adventitious lobes (203). *M. Trias. (Anis.-Ladin.), Alps-B.C.-Nev.—Fig. 187, 4. *L. breguzzanus, Alps; 4a,b, X0.7; 4c, X1 (293°).*

**Neodalmatites** Spath, 1951 [*Dalmatites parvus Smith, 1914*]. Like *Longobardites* but slightly inflated and with weak lateral folds. Suture simpler (449). *M. Trias. (Anis.), Nev.—Fig. 187, 3. *N. parvus (Smith); 3a,b, X1.5 (449°).*

**Groenlandites** Kummel, 1953 [*G. nielseni*. Like *Neodalmatites* but whorl section subtrigonal, umbilical wall nearly vertical. Suture less advanced. *M. Trias. (Anis.), Pearyland.—Fig. 187, 1. *G. nielseni; 1a,b, X0.7; 1c, X4 (650°).*

**Perrinoceras** Johnston, 1941 [*P. novaditus*. Conch as in *Longobardites*, with sharp venter. Suture ceratitic but simpler, ventral lobe very simple (488). *U. Trias. (Carn.), Nev.—Fig. 187, 8. *P. novaditus; X1 (643°).*

**Archohungarites** Diener, 1916 [*Hungarites triformis Mojsisovics, 1886*]. Involute platycones with weak sigmoidal folds on body chamber; distinct keel only on adoral part of phragmcone, tending to again disappear. Suture ceratitic (294). *M. Trias. (Anis.), N.Sib.—Fig. 187, 2. *A. triformis (Mojsisovics); 2a,b, X1 (294°).*

**Dalmatites** Kittle, 1903 [*D. morlaccus*. Discoidal, involute, nearly smooth oxycones. Suture ceratitic, simple, with 3 feebly toothed lobes (232). *L. Trias. (U. Scyth.), Yugo.—Fig. 187, 7. *D. morlaccus; 7a,b, X1 (232°).*

**Prohungarites** Spath, 1934 [*P. similis*. More or less evolve, discoidal; irregular ribbing continuous across tricarinate or feebly keeled venter. Suture ceratitic, with only 2 lobes (560). *L. Trias. (U. Scyth.), Timor-Sib.-Ida.—Fig. 187, 6. *P. similis, Timor; 6a,b, X0.7; 6c, X1 (560°).*

**Family CARNITIDAE** Arthaber, 1911

Discoidal, compressed, very involute, ventral narrow and bicarinate, tricarinate, sharpened or truncated; weak ribs and tubercles

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Mesozoic Forms—Ceratitaceae

may be present. Suture generally ammonitic, with adventitious and auxiliary elements (488). M.Trias.-U.Trias.

Carnites Mojsisovics, 1879 [*Nautilus floridus Wulfen, 1793; SD Mojs., 1882]. Venter tricarinate in young, bicarinate to sharpened in later volutions; sides with low flexuous ribs and in places tubercles along mid-line of sides and near venter. Suture ammonitic (293). U.Trias.(Carn.), Alps-Himalaya.—Fig. 188,5. *C. floridus (Wulfen); 5a,b, ×0.5; 5c, ×0.7 (293*).

Rimkinites Mojsisovics, 1902 [*Hungarites miitensis Mojs., 1896]. Tricarinate venter persisting; sides with weak sigmoidal ribs, some forms with clavi at ventrolateral edge. Suture subammonitic with no adventitious elements but with auxiliary elements (295). M.Trias.(Ladin.)-U.Trias.(Carn.), Himalaya.—Fig. 188,1. *R. miiensis (Mojs.), Ladin., Himalaya; lab, ×1.5 (295*).

Pseudocarnites Simionescu, 1913 [*Carnites (Pseudocarnites) arthaberi]. Venter truncate, conch smooth. Suture with monophylllic saddle endings (488). U.Trias.(Carn.), Rumania.—Fig. 188,6. *P. arthaberi; ×1 (709*).

Klamathites Smith, 1927 [*K. schucherti]. Venter grooved or slightly rounded; conch nearly smooth or with weak lateral folds. Suture subammonitic (450). U.Trias.(Carn.), Calif.—Fig. 188,2. *K. schucherti; ×1 (450*).

Parahauerites Diener, 1916 [*Hauerites ashleyi Hyatt & Smith, 1905] [=Fremonites Smith, 1927 (obj.)]. Like Klamathites but with simpler suture (450). U.Trias.(Carn.), Calif.—Fig. 188,3. *P. ashleyi (Hyatt-S.); ×1 (450*).

Dieneria Hyatt & Smith, 1905 [*D. arthaberi]. Compressed platycone, venter truncate, conch smooth. Suture simple, with only 1st lateral lobe slightly serrated, others entire (203). U.Trias. (Carn.), Calif.—Fig. 188,4. *D. arthaberi; ×2 (450*).

Neoclypites Spath, 1951 [*Metahedenstroemia? desertorum Johnston, 1941]. Venter truncate or grooved; sides with falciform radial growth lines that may be bundled at intervals. Suture ceratitic, multilobate, with adventitious and auxiliary lobes (488). U.Trias.(Carn.), Nev.—Fig. 188,7. *N. desertorum (Johnston); ×0.7 (643*).

Family PROTEUSITIDAE Spath, 1951

Generally involute, with arched venter; tendency for outer volution to be excentric; conch extremely variable in degree of involution and relative dimensions; broad fold like ribs, strigation, and umbilical tubercles may all be present or only some of these. Suture ceratitic to slightly ammonitic (488). M.Trias.

Protesutes Hauer, 1887 [*P. kellneri] (488). Anis., Balkan-Himalaya-Alaska.—Fig. 188,5. *P. kellneri, Balkan; 5a,b, ×0.7; 5c, ×1 (633*).

Family APLOCOCERATIDAE Spath, 1951

Ceratitids with very simplified suture and tendency to lose their ornamentation; generally evolute, more or less compressed, with
rounded venter; ornamentation, if present, of umbilical ribs that disappear toward venter. Suture goniatitic or ceratitic (488). M. Trias.

Aplococeras Hyatt, 1900 [*Dinarites asisanus Mojsisovics, 1882]. Evolute discoidal forms with convex, converging whorls, rounded sides, and slightly flexuous umbilical ribs that disappear toward venter. Suture with 2 lateral lobes (?)goniatitic). Ladin., Alp.-Fig. 189,1. *A. asisanus (Mojs.); 1a,b, ×0.7 (293*).

Velebites Salopek, 1918 [*Dinarites (Velebites) dinaricus]. Like Aplococeras but ribs more recurved and suture ceratitic. Ladin., Yugo.

Apleuroceras Hyatt, 1900 [*Ceratites sturi Mojsisovics, 1882]. Evolute, essentially smooth conch, with subquadrate whorl section, broadly rounded venter. Suture ceratitic with 2 lateral lobes (293). Ladin., Alp.-Fig. 189,2. *A. sturi (Mojs.); 3a,b, ×0.5 (293*).

Pseudaplococeras Spath, 1951 [*Lecaneites vogdei (Hyatt & Smith, 1905). Compressed, evolute, discoidal conch with flexuous umbilical ribs; venter narrowing adorally. Suture goniatitic. Anis., N.-Alaska.-Fig. 189,4. *P. vogdei (Hyatt-S.), Nev.; 4a,b, ×0.7 (449*).

Metadinarites Spath, 1951 [*Dinarites desertorum Smith, 1914]. Like Pseudaplococeras but whorls more robust. Suture with 2 ceratitic lobes. Anis., Nev.-Fig. 189,2. *M. desertorum (Smith); 2a,b, ×0.7; 2c, ×3 (449*).

Dobrogites Kitti, 1908 [*D. tiroliformis]. Evolute, compressed platycone, with rounded venter, whorl sides divergent; inner whorls with Tirolites-like ornamentation, outer whorls smooth, Suture multilobate and smooth. Anis., Rumania.

Superfamily CLYDONITACEAE Mojsisovics, 1879

Generally costate, tuberculate ammonoids with smooth, grooved, or keeled venters. Suture ceratitic or ammonitic, goniatitic in a few offshoots. Includes some genera with heteromorph coiling of shell. Whole group descended from Ceratitaceae. L.Trias.-U. Trias.

Family TRACHYCERATIDAE Haug, 1894

More or less involute, highly ornamented derivatives of Ceratitaceae; venter generally with median furrow bordered by rows of tubercles or continuous keel; whorl sides with flexuous ribs usually tuberculate, arranged in spiral pattern. Suture ceratitic to ammonitic (488). M.Trias.-U.Trias.

Trachyceras Lajbe, 1869 [*Ceratites aon Münster, 1834]. Moderately involute, compressed; venter rounded, with median furrow bordered by rows of tubercles; whorl sides with single and bifurcating ribs and spiral rows of tubercles. Suture ammonitic, not deeply serrated, with 2 lateral lobes (292). M.Trias.(Anis.).-U.Trias.(Carn.), cosmop.

T. (Trachyceras). With 2 rows of tubercles bordering each side of ventral furrow (292). M.Trias. (Ladin.).-U.Trias.(Carn.), Alps-Balkan-AsiaM.-Himalaya-Timor-Neve.-Fig. 190,5. *T. (T.) aon (Münster), Carn., Alp.; 5a-c, ×1 (293*).


T. (Paratrachyceras) Arthaber, 1914 [*T. hofmanni Boeckh, 1873] [=Mecinoceras McLearn, 1930]. With little or no tuberculation, ribbing dense (23). M.Trias.(Ladin.).-U.Trias.(Carn.), Alps-Sp.-Balkan-Japan-Indochina-B. C. - Neve.-Fig. 190,8. *T. (P.) hofmanni (Boeckh), Carn., Balkan; 8a,b, ×1 (293*).

Nevadites Smith, 1914 [*N. merriami]. Evolute, with subrectangular whorl section increasing slowly in height; whorl sides and venter flattened; no ventral furrow; with strong lateral ribs and tubercles, prominent tubercle at end of rib on ventrolateral shoulder. Suture ceratitic (449). M. Trias.(Anis.). Neva.-Balkan-?Japan.-Fig. 190,10. *N. merriami, Nev.; 10a,b, ×0.7 (449*).

Anolcites Mojsisovics, 1893 [*Trachyceras dolericum Mojs., 1869]. Trachyceratids with no distinct ventral furrow and ribs that cross venter (292). M.Trias.(Anis.-Ladin.), Alps-Ladin-Indochina-B. C.-Neve.-Fig. 190,9. *A. dolericum (Mojs.), Ladin., Alp.; 9a,b, ×1 (293*).

Sirenites Mojsisovics, 1893 [*Am. senicus Dittmar, 1866; SD Hyatt & Smith, 1905]. Compressed, with distinct furrow on venter; whorl sides flattened-convex with sigmoidal ribs that bifurcate near ventrolateral edge on a tubercle and project sharply adorally, 2 rows of tubercles on whorl side, one on umbilical shoulder. Tubercles arranged in spiral lines. Suture ammonitic (292). U.Trias.(Carn.-Nor.), Alps-Sicily-Balkan-Himalaya-Indonesia-B.Calif.-?Mex.

S. (Sirenites). With a single row of tubercles bordering ventral furrow (292). U.Trias.(Carn.-Nor.), Alps-Sp.-Himalaya-Timor-AsiaM.-Alaska-Calif.-?Mex.-Fig. 190,9. *S. (S.) senicus (Dittmar) Carn., Alp.; 9a,b, ×1 (292*).


S. (Anasirenites) Mojsisovics, 1893 [*S. (A.) ekkehardi Mojs.; SD Diener, 1915]. Ventral fur-
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Fig. 190. Trachyceratidae (p. L158-L160).
row bordered by continuous keel (292). U.Trias. (Carn.-Nor.), Alps-Sicily-Himalaya.—Fig. 190, 6. *S. (A.) ekkhardi*, Carn., Alps; ×1 (292*).

**Pseudosirenites** ARTHABER, 1911 [*Sirenites stachei* MOJSISOVICS, 1893; SD SPATH, 1951]. Like *Sire­nites*, with narrow venter bordered by nodose keel. Suture with 2 adventitious elements (292). V.Trias. (Nor.), Alps.—Fig. 190, 4. ·P. stachei (Mojs.); a,b, ×0.5; c, ×1 (292*).

**Welterites** DIENER, 1923 [*W. egregius*]. Involute, compressed, discoidal; median furrow bordered by nodose keels; whorl sides with flexuous ribs that project sharply forward on ventrolateral area. Suture ammonitic (115). V.Trias. (Nor.), Timor.—Fig. 190, 1. ·W. egregius; a,b, ×0.5; c, ×0.7 (115*).

**Vredenburgites** DIENER, 1916 [*Sirenites vredenburgi* DIENER, 1906]. Surface with thin flexuous ribs and numerous spiral rows of bullae. Suture with adventitious elements in 1st lateral saddle (115). U.Trias. (?Carn.-Nor.), Himalaya-Timor.—Fig. 190,3. V. vredenburgiformis DIENER, Nor., Timor; a,b, ×0.5; c, ×0.7 (115*).

**Dawsonites** BOHM, 1903 [*Trachyceras canadense* WHITEAVES, 1889]. Moderately evolute, venter broadly rounded, with deep furrow; whorl sides with radial ribs that bifurcate on whorl side and then project sharply adorally; ribs with spiral rows of tubercles. Suture ceratitic, with rounded saddles (450). U.Trias. (Carn.), B.C.-Alaska-BearI.—Fig. 190,2. ·D. canadense (Whiteaves); a,b, ×0.7; c, ×1 (732*).

**Family CLYDONITIDAE** MOJSISOVICS, 1879

Generally evolute, compressed, with fine, dense, irregularly granular ribs; median groove on venter. Suture goniatitic or weakly ceratitic (488). U.Trias.

**Clydonites** HAUER, 1860 [*Gon. decoratus* HAUER, 1846]. Venter arched, granular ribs not crossing median groove. Suture goniatitic, may be weakly ceratitic (292). Carn.-Nor., Alps-Sicily.—Fig. 191.3. ·C. decoratus (Hauer), Nor., Alps; a,b, ×0.7; c, ×1 (292*).

**Sandlingites** MOJSISOVICS, 1893 [*Am. oribasus* DÜTTMAR, 1866; SD HYATT & SMITH, 1905]. Venter broad, flattened, granular ribs crossing median groove; with umbilical tubercles. Suture goniatitic or ceratitic (292). Carn.-Nor., Alps-Balkan-Himalaya-Timor-Calif.—Fig. 191.1. ·S. archibaldi Mojs., Nor., Himalaya-Timor; a,b, ×0.7 (295*).

**Family CLIONITIDAE** ARABU, 1932

Generally evolute, with median ventral furrow usually bordered by rows of tubercles; whorl sides with sigmoideal ribs which may bear spiral rows of tubercles. Suture ceratitic (488). U.Trias.

**Clionites** MOJSISOVICS, 1893 [*C. angulosus*; SD HYATT & SMITH, 1905]. Evolute, whorl section subquadrat; with sigmoideal ribs, generally bifurcating, projected on ventrolateral area; little or no tuberculation on ribs. Suture ceratitic with 2 lateral lobes (292). Carn.-Nor., Alps-Balkan-Asia M.-Himalaya - Timor-Indochina-Bearl.-Nev.—Fig. 191.2. ·C. angulosus, Carn., Alps; a,b, ×0.7; c, ×1 (292*).

**Alloclionites** SPATH, 1951 [*A. timorensis (=Clionites ares timorensis WELTER, 1914)]. With many tubercles which tend to diminish on body chamber (558). Carn.-Nor., Alps-Balkan-Himalaya-Timor-B.C.—Fig. 192.9. ·A. timorensis (Welter), Timor; a,b, ×0.5 (558*).

**Californites** HYATT & SMITH, 1905 [*C. merriami*]. Evolute, whorl section trapezoidal, sides flattened, with radial tuberculate ribs which end in strong ventrolateral spines; venter low-arched, nearly smooth (203). Carn., Calif.—Fig. 192.3. ·C. merriami; a,b, ×1; c, ×2 (203*).

**Traskites** HYATT & SMITH, 1905 [*Clionites (Tras­kites) robustus*]. Evolute, whorl section quadrat, with tuberculate radial ribs which extend on venter to median groove (203). Carn., Calif. T. (Traskites). Ribs coarse, tuberculate. Suture ceratic with 2 lateral lobes (203).—Fig. 192.1. T. (T.) robustus; a,b, ×0.7; c, ×1 (203*).

**T. (Shastites)** HYATT & SMITH, 1905 [*Clionites (Shastites) compressus*]. More compressed, involute, ribs and tubercles finer, more dense (203).
Mesozoic Forms—Clydonitaceae

Fig. 192.6. *T. (S.) compressus* (Hyatt-S.); 6a,b, ×0.7 (450*).

T. (Stantonites) Hyatt & Smith, 1905 [*Clionites (Stantonites) rugosus*]. More evolute, compressed, with coarse sigmoidal tuberculate ribs and most prominent rows of tubercles on ventrolateral edge, ventral groove aligned by tubercles (203).— Fig. 192.8. *T. (S.) rugosus* (Hyatt-S.); 8a,b, ×0.7 (450*).

T. (Neanites) Hyatt & Smith, 1905 [*Clionites...
(Neanites) californicus]. Evolute, whorl sections subquadrate, sigmoidal tuberculate ribs continuous to shallow median groove, ventrolateral tubercles most prominent (203).—Fig. 192,10. *T. (N.) californicus (Hyatt-S.); 10a,b, × 1 (450)*.

Indoclonites Diener, 1916 [*Clonites gracilis* Diener, 1906]. Involute, compressed conch, whorl sides with fine sigmoidal ribs, bundled at umbilical margin, secondary ribs intercalated at middle of whorl side; tubercles on umbilical margin and ventrolateral area (103). *U.Trias., Himalaya.—Fig. 192,7. *I. gracilis (Diener); × 1 (103)*.

Steinmannites Mojsisovics, 1893 [*Am. hoernesi* Hauer, 1849; SD Diener, 1915]. Evolute, whorl section subrectangular, nodes on flexuous ribs at umbilical margin and distinct swelling of ribs at ventrolateral margin; median groove on venter with raised crenulate edge (292). *Carn.-Nor., Alps-Himalaya-Timor.—Fig. 192,2. *S. hoernesi (Hauer), Nor., Alps; 2a,b, × 0.3; 2c, × 0.7 (292)*.

Brouwerites Diener, 1923 [*Clonites involutus Wel'ter, 1914]. Involute, inflated, venter rounded; whorl sides with flexuous ribs ending at prominent node next to median groove; prominent fine stria­tion (115). *Carn., Timor.—Fig. 192,4. *B. involutus (Wel'ter); 4a,b, × 0.5; 4c, × 1 (558)*.

Glamocites Diener, 1917 [*G. katzeri*]. Evolute, whorl section subrectangular, venter arched; radial ribs that pass over venter projecting strongly; tubercles on umbilical and ventrolateral edge. Suture with high 2nd lateral saddle (488). *Carn., Yugo.—Fig. 192,5. *G. katzeri; × 1 (606)*.

**Family ARPADITIDAE Hyatt, 1900**

Generally evolute, compressed, with median furrow bordered by continuous, smooth or crenulated keels, or edges of siphonal groove simulating keel, or by clavi; sigmoidal ribs and tubercles present. Suture ceratitic to ammonitic (488). *M.Trias. U.Trias.*

Arpadites Mojsisovics, 1879 [*Am. arpadis Mojs., 1870; SD Hyatt & Smith, 1905]. Compressed, discoidal, evolute; with radial or faintly sigmoidal ribs; ventral keels continuous, smooth; generally umbilical tubercles but lateral and ventrolateral tubercles may occur also. Suture ceratitic with 2 lateral lobes (293). *M.Trias.(Ladin.-)U.Trias. (Carn.), Alps-Italy-Balkan-Himalaya-Japan.—Fig. 193,12. *A. arpadis (Mojs.), Ladin., Alps; 12a,b, × 0.7 (293)*.

Hyparpadites Spath, 1951 [*Arpadites liepoldtii Mojsisovics, 1882]. Median groove narrow, adjacent area on venter arched to form simulated keels; prominent umbilical and ventrolateral tubercles; weak radial ribs. Suture ceratitic, with 3 lateral lobes (293). *M.Trias.(Ladin.), Alps.—Fig. 193,6. *H. liepoldtii (Mojs.); 6a,b, × 0.5 (293)*.

Edmundites Diener, 1916 [*Arpadius rimkinensis Mojsisovics, 1896]. With sigmoidal, distant primary ribs, weaker secondaries; keels prominent, smooth. Suture ammonitic (295). *M.Trias.(Ladin.-)U.Trias.(Carn.), Himalaya.—Fig. 193,10. *E. rimkinensis (Mojs.); 10a,b, × 1 (295)*.

Klipsteinia Mojsisovics, 1882 [*Am. aehelous Münster, 1834; SD Diener, 1915]. With crenulated keels delayed in appearance; lateral tuberculation present or absent (293). *U.Trias.(Carn.), Alp,—Fig. 193,13. *K. aehelous (Münster); 13a,b, × 0.7 (293)*.

Trachystenoceras Johnston, 1941 [*Arpadius gabi Hyatt & Smith, 1905]. Involute, discoidal; median groove bordered by slightly beaded marginal ridges; sides with low folds made up of sigmoidal striae. Suture ceratitic (203). *U.Trias.(Carn.), Calif.-Nev.—Fig. 193,7. *T. gabi (Hyatt-S.); × 1 (203)*.

Silenticeras McLearn, 1930 [*Daphnites (Silenticeras) hatae]. Involute, discoidal, compressed, venter with prominent median groove but no distinct keels; strong growth lines projected (488). *U.Trias. (Carn.); B.C.*

Dittmarites Mojsisovics, 1893 [*Am. rimosus Münster, 1841; SD Diener, 1915]. Median groove bordered by prominent continuous keels; sides with falcate ribs projected on ventrolateral area. Suture ammonitic (292). *U.Trias.(Carn.-Nor.), Alps-Greece-Himalaya.—Fig. 193,2. D. rimosus (Münster), Carn., Alps; 2a,b, × 1 (293)*.

Trachypleuraspidites Diener, 1906 [*Arpadius (Trachypleuraspidites) griffithi]. Like Dittmarites but falcate bifurcating ribs multituberculate (103). *U.Trias.(Carn.-Nor.), Himalaya-Timor.—Fig. 193,9. T. griffithi (Diener), Himalaya; 9a,b, × 0.5 (103)*.

Asklepioceras Renz, 1910 [*Arpadius (Dictimaries) segmentatus Mojsisovics, 1893]. Evolute to involute, discoidal to subglosebo; median furrow not bordered by keels; prominent, distant projected constrictions that pass over venter. Suture ceratitic, simple (365). *M.Trias.(Ladin.-)U.Trias.(Carn.), Alps-Balkan-AsiaM.-B.C.—Fig. 193,8. *A. segmentatus (Mojs.), Carn., Alps; 8a,b, × 0.7 (292)*.

Muensterites Mojsisovics, 1893 [*Arpadius (Münsterites) ectodus]. Involute, slightly inflated, venter rounded; median furrow bordered by row of nodes, no continuous keel; also row of nodes on ventrolateral area; nodes decline adorally; ribs broad, low closely spaced, projected (292). *U.Trias.(Carn.), Alp,—Fig. 193,11. *M. ectodus; 11a,b, × 1 (292)*.

Drepanites Mojsisovics, 1893 [*Arpadius (Drepanites) hyatti; SD Diener, 1915]. Very involute, compressed, discoidal, venter truncate, with median furrow; sides with sigmoidal ribs that are strongest near periphery, ventrolateral angle serrated. Suture

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ammonitic (292). *U.Trias. (Nor.), Alps-Sicily-Timor.—Fig. 193,1. *D. hyatti; 1a,b, ×0.7; 1c, ×1 (292*).

**Daphnites Mojsisovics, 1893** [*Arpadites (Daphnites) berchiae; SD Diener, 1915*]. Compressed, involute, venter rounded, median furrow with keel-like edge; whorl sides with fine, sinuous, bifurcating, prorsiradiate, projected ribs, usually bundled at umbilical edge. Suture ceratitic (292). *U.Trias. (Nor.), Alps-Sicily-Himalaya.—Fig. 193, 2. *D. hyatti, Alps; 2a,b, ×0.7; 2c, ×1 (292*).

**Dionites Mojsisovics, 1893** [*Arpadites (Dionites) caesar; SD Diener, 1915*]. Compressed, involute, venter arched, distinct median furrow bordered by clavi; sides with dense, sigmoidal, broad ribs, spiral lines, spiral rows of tubercles; sculpture decreases adorally. Suture ammonitic (292). *U.Trias. (Nor.), Alps-Himalaya-Timor.—Fig. 193,3. *D. caesar, Alps; 3a,b, ×0.25; 3c, ×0.3 (292*)

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**Fig. 193. Arpaditidae (p. L162-L164).**
Heraclites Mojsisovics, 1879 [*Am. robustus Hauer, 1855; SD Diener, 1915] (292). Nor., Alps-Timor.—Fig. 194,1. *H. robustus (Hauer); 1a,b, X0.25 (292*).

Family LECANITIDAE Hyatt, 1900


Lecanites Mojsisovics, 1882 [*Am. glaucus Münster, 1834]. Essentially smooth, some forms with weak sigmoidal ribs (293). M.Trias.-(Ladin.)-U.Trias.-(Carn.), Alps-Nev.—Fig. 195,2. *L. glaucus (Münster); 2a,b, Alps; X1 (293*).

Badiotites Mojsisovics, 1882 [*Am. eryx Münster, 1834]. With sigmoidal ribs and smooth siphonal band; venter acutely rounded (293). M.Trias.-(Ladin.)-U.Trias.-(Carn.), Alps-Greece-Hung.—Fig. 195,4. *B. eryx (Münster); X1 (293*).
Mesozoic Forms—Clydonitaceae

**Mesozoic Forms**

**Clydonitaceae**

- **Tibetites**
- **Pterotoceras**
- **Metocornites**
- **Ib**
- **MOJSISOVICS**
- **10**
- **Policites**
- **40 Anotibetites**

**Fig. 196. Tibetitidae (p. L165-L166).**

Crenulated tubercles or keels or smooth keels; lateral area usually with flexuous ribs and spiral rows of tubercles. Suture ammonitic (488). *U.Trias.*

**Cyrtopleurites** **MOJSISOVICS,** 1893 [*Am. bicrenatus HAUER, 1846; SD DIENER, 1915.*] Compressed, involute, umbilicus small, venter narrow; whorl sides with sigmoidal ribs that end in crenulated tubercles at edge of and align ventral furrow; inner whorls with few spiral rows of tubercles which decrease adorally (292). *Carn.-Nor., Alps-Sicily-Himalaya-Timor-B.C.—Fig. 195,3. *C. bicrenatus (HAUER), Nor., Alps; 3a,b, X0.5 (292).*

**Acanthinites** **MOJSISOVICS,** 1893 [*Cyrtopleurites (Acanthinites) excelsus; SD DIENER, 1915.*] Like *Cyrtopleurites* but with numerous lateral, spiral rows of tubercles and continuous serrated keels aligning ventral furrow (292). *U.Trias. (Nor.), Alps-Himalaya-Timor.—Fig. 195,5. *A. excelsus (MOJS.), Alps; 5a,b, X0.5 (292).*

**Himavatites** **DIENER,** 1906 [*Acanthinites (Himavatites) watsoni.*] Whorl sides with flexuous primary and secondary bifurcating ribs, large nodes on primary ribs in spiral pattern, numerous spiral rows of spines on all ribs; ventral furrow shallow, bordered by spirally elongated tubercles (103). *Nor., Himalaya-Timor-B.C.—Fig. 195,6. *H. watsoni, Himalaya-Timor; 6a,b, X0.5 (115).*

**Hauerites** **MOJSISOVICS,** 1893 [*Am. rarestriatus HAUER, 1849; SD HYATT & SMITH, 1905.*] With continuous keels bordering ventral furrow; lateral ribs weak, no tubercles (292). *Carn.-Nor., Alps-Timor.—Fig. 195,1. *H. rarestriatus (HAUER), Nor., Alps; 1a,b, X0.5; 1c, X1 (292).*

**Family TIBETITIDAE** **HYATT,** 1900

More or less involute, compressed, venter generally narrow, bordered by clavi or tubercles at some stage; whorl sides with ribs and tubercles. Suture ceratitic to ammonitic with incipient or actual adventitious elements (488). *M.Trias.-U.Trias.*

**Tibetites** **MOJSISOVICS,** 1896 [*T. raylli; SD DIENER, 1915.*] Involute, compressed, with narrow venter bordered by 2 rows of clavi; with flexuous lateral ribs and spiral row of nodes at mid-section. Suture ceratitic with incipient adventitious lobule in 1st lateral saddle (295). *U.Trias. (Carn.-Nor.), Himalaya-Timor.—Fig. 196,8. T. perrinsmithi MOJS., Nor., Himalaya; 8a,b, X1 (295).*

**Anatibetites** **MOJSISOVICS,** 1896 [*Tibetites (Anatibetites) kelvini.*] Like *Tibetites* but venter of body chamber flattened and without clavi (295). *U.Trias. (Carn.-Nor.), Himalaya-Timor.—Fig. 196, 4. *A. kelvini, Nor., Himalaya; 4a, X0.7; 4b, X1 (295).*

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Paratibetites Mojsisovics, 1896 [*Tibetites (Paratibetites) bertrandii]. Like Tibetites in young; then ventral furrow appears bordered by distinct continuous keels, this followed by stage where ventral groove disappears and venter becomes obtusely rounded; ribbing and tuberculation decrease adorally. Suture ceratitic to ammonitic, more complex than in Tibetites (295). U.Trias.(Carn.-Nor.), Himalaya-Timor.—Fig. 196,3. P. adolphi Mojs., Nor., Himalaya; 2a,b, ×0.5; 3c, ×1 (295*).

Neotibetites Krumbeek, 1913 [*N. weteringi]. Like Tibetites in young with bicarinate venter, changing to carinate venter and then smooth continuous keel-like venter; ribbing and tuberculation decreases adorally. Suture ceratitic, simple (488). U.Trias. (Carn.-Nor.), E.Indies.

Metacarnites Diener, 1908 [*Carnites (Metacarnites) footei; SD Diener, 1915]. Like Paratibetites but with a more complex ammonitic suture (105). U.Trias.(Nor.), Himalaya-Timor-B.C.—Fig. 196,7. *M. footei, Himalaya; ×0.5 (606*).

Pterotoceras Welzer, 1915 [*P. arthaberi]. More or less evolute, compressed, discoidal, with ventral furrow bordered by clavi; with umbilical, lateral, and ventrolateral tubercles which decrease adorally. Suture ceratitic (559). M.Trias.(Ladin.)-U.Trias. (Carn.), Timor-B.C.-Alps.—Fig. 196,2. *P. arthaberi, Ladin., Timor; 2a,b, ×0.7; 2c, ×1 (559*).

Dimorphotoceras Späth, 1951 [*Pterotoceras abnorme Diener, 1923]. Like Pterotoceras but tuberculation remaining strong to end. Suture ammonitic, with adventitious saddle in ventral lobe (488). U.Trias.(Carn.-Nor.), Alps-Timor.—Fig. 196,3. *D. abnorme (Diener), Nor., Timor; ×0.5 (115*)

Palcites Gemmellaro, 1904 [*P. mojsisovici]. Like Anatibetites, ventral tubercles disappearing but lateral tubercles persisting to end. Suture ceratitic, simple, with incipient adventitious lobe in 1st lateral saddle (168). U.Trias.(Carn.), Sicily.—Fig. 196,6. *P. mojsisovici; ×0.7 (168*).

Mojsisovicsites Gemmellaro, 1904 [*M. crussectatus; SD Diener, 1915]. Inner whorls with 2 ventral and 2 ventrolateral rows of nodes, disappearing adorally, outer whorl smooth; venter arched, sides with low folds. Suture ceratitic, simple (168). U.Trias.(Carn.), Sicily.—Fig. 196,1. M. orenensis Gemm.; 1a-c, ×0.7 (168*).

Stikinoceras McLearn, 1930 [*S. kerri]. Compressed, evolute, sides flattened and with flexuous ribs; primary ribs slightly enlarged at umbilical edge; node on ventrolateral area, and on ventral shoulder adjoining a smooth venter bearing a thin, low keel. Suture ceratitic (488). U.Trias., B.C.

Family BUCHITIDAE Hyatt, 1900

Generally evolute, with subquadrate to suboval whors; flattened to rounded venter; sides with radial ribs that may cross venter. Suture ceratitic (488). U.Trias.

Buchites Mojsisovics, 1893 [*B. aldrovandii]. Whors increasing slowly, venter rounded; sides with flexuous projected ribs that end at smooth siphonal band or cross venter. Suture ceratitic (292). Carn.-Nor., Alps-Sicily-Greece-Himalaya.

Fig. 197. Buchitidae (p. L166-L167).
Mesozoic Forms—Clydonitaceae

---Fig. 197,5. *B. aldrovandii*, Carn., Alps-Greece; 5a,b, X0.7; 5c, X1 (292*).

Helicites Mojsisovics, 1879 [*Am. geniculatus* Hauer, 1855; SD Diener, 1915]. Like Buchites but flexuous, with bifurcating ribs that cross straight over venter (292). Carn.-Nor., Alps-Himalaya-Timor-Peru.—Fig. 197,2. *H. geniculatus* (Hauer), Nor., Alps; 2a,b, X1; 2c, X2 (292*).

Metatitrites Mojsisovics, 1893 [*Am. foliaceus* Dittmar, 1866]. Whorl section subquadrate, sides slightly divergent, venter broad, flattened; ventrolateral angle with prominent tubercles. Suture ceratitic (450). Carn., Alps-Calif.—Fig. 197,3. *M. foliaceus* (Ditt.), Carn., Alps; 3a,b, X1; 3c, X1.5 (292*).

Metatitrites Mojsisovics, 1893 [*Am. geniculatus* Hauer, 1855; SD Diener, 1915]. Like Blleichites but flexuous, with bifurcating ribs that cross straight over venter (292). Carn.-Nor., Alps-Himalaya-Timor-Peru.—Fig. 197,2. *H. geniculatus* (Hauer), Nor., Alps; 2a,b, X1; 2c, X2 (292*).

Epiceratites Diener, 1915 [*Am. elevatus* Dittmar, 1866]. Involute, venter rounded, smooth; sides with weak radial projected ribs. Suture ceratitic (292). Carn.-Nor., Alps-Greece.—Fig. 197,4. *E. elevatus* (Ditt.), Carn., Alps; 4a,b, X1.5 (292*).

Phormedites Mojsisovics, 1893 [*P. jullivaticus*; SD Diener, 1915]. Like Epiceratites but with dense prorsiradiate ribs, bundled at umbilical edge, strongly projected forming deep adoral curve across venter (292). Carn.-Nor., Alps-Sicily-Himalaya-Timor.—Fig. 197,6. *P. jullivaticus*, Nor., Alps-Timor; 6a,b, X1 (292*).

Martolites Diener, 1906 [*M. kraftii*]. Evolute, venter rounded, smooth siphonal band; sides with bifurcating ribs; a few oblique constrictions that cross venter; umbilical tubercles on outer volution. Suture ceratitic (488). Nor., Himalaya.—Fig. 197,8. *M. kraftii*; 8a,b, X0.7; 8c, X1 (606*).

Eremites Mojsisovics, 1893 [*T. crassitesta* Mojs.; 1a,b, X1; 1c, X1.5 (292*).

Family THISBITIDAE Spath, 1951

Evolute to involute, compressed, with median continuous keel; whorl sides with falcoid ribs, some constrictions on conch. Suture ceratitic, simple (488). *U.Trias.*

Thisbitites Mojsisovics, 1893 [*T. agricolae*; SD Diener, 1915]. Evolute to involute, whorl sides with single and bifurcating falcate ribs which terminate at ventrolateral nodes; venter with smooth keel. Suture simple, goniatitic to ceratitic (103). *T. agricolae*, Carn.-Nor., Alps-Sicily-Himalaya-Timor.—Fig. 197,1. *E. crassitesta* Mojs.; la,b, X1; 1c, X1.5 (292*).

Parathisbitites Mojsisovics, 1893 [*Am. scaphitiformis* Hauer, 1855; SD Diener, 1915]. Like Thisbitites but generally more involute, keel more prominent, ribs may cross venter. Suture ceratitic (488). Nor., Alps-Himalaya-Timor-B.C.—Fig. 198,4. *P. scaphitiformis* (Hauer), Alps; 4a,b, X0.7; 4c, X1 (292*).

Jellinekites Diener, 1906 [*J. barnardi*; SD Diener, 1915]. Venter tricarinate, marginal keels formed by junction of projected ends of lateral ribs; venter locally interrupted by constrictions; whorl sides with strong single or bifurcating ribs. Suture ceratitic (103). *J. barnardi*, Himalaya-Timor.—Fig. 198,1. *J. barnardi*, Himalaya; la,b, X0.7 (103*).

Siculites Gemmellaro, 1904 [*S. dolomiticus*; SD Diener, 1915]. More or less involute, compressed, venter arched with slight keel; with constrictions and in some species spiral striations. Suture ceratitic (488). *S. dolomiticus*; 5a,b, X1 (168*).

Family NORIDISCIITIDAE Spath, 1951

Evolute, compressed, discoidal, with truncated venter and sharp ventrolateral shoulders. Suture ceratitic (488). *U.Trias.*

Noridiscites Spatth, 1951 [*Ceratites viator* Mojsisovics, 1893]. Nor., Alps.—Fig. 199,1. *N. viator* (Mojs.), 1a,b, X0.7; 1c, X1.5 (292*).

Family DISTICHTITIDAE Diener, 1920

Evolute, compressed, generally robust;
venter with median furrow bordered by smooth, low, continuous keel; whorl sides with ribs that bend sharply forward on ventrolateral area, ribs may be tuberculate. Suture ceratitic to ammonitic (488). *U. Trias.*

**Distichites** *MOJSISOVICS, 1893* [*D. megacanthus; SD DIENER, 1915*]. Generally with row of nodes on umbilical and ventrolateral areas. Suture ammonitic (292). *Carn.-Nor., Alps-Himalaya-Timor-B.C.—Fig. 199,4. *D. megacanthus, Nor., Alps-Timor; 4a, 7b, X0.25; 4c, X0.7 (115°).*

**Paradistichites** *DIENER, 1916* [*Distichites ectolcitiformis DIENER, 1906*]. Like *Distichites* but more involute, sculpture more delicate; saddles of suture less serrated (103). *U.Trias., Himalaya-Timor.—Fig. 199,3. *P. ectolcitiformis (DIENER); X1 (103°).*

**Ectolites** *MOJSISOVICS, 1893* [*Am. pseudoaries HAUER, 1849; SD DIENER, 1915*]. Widely umbilicate, with subquadrate whorl section, rounded shoulders. Suture ceratitic to subammonitic (292). *Carn.-Nor., Alps-Himalaya-Timor.—Fig. 199,2. *E. pseudoaries (HAUER), Nor., Alps; 2a, 2b, X0.5; 2c, X1 (292°).*

**Family CHORISTOCERATIDAE** *Hyatt, 1900*

Evolute ammonites that may become uncoiled or straight in outer volutions; whorl sides with radial ribs that pass over venter; ventral furrow present in some forms. Suture simple, ceratitic or goniatitic (488). *U. Trias.*

**Choristoceras** *HAUER, 1865* [*C. marshi*.] Very evolute, outer whorl tending to uncoil, whorl section subquadrate, sides with strong radial ribs that may cross shallow ventral furrow; generally tubercles on ribs at ventrolateral area. Suture goniatitic to simple ceratitic (292). *Carn.-Rhaet., Alps-Timor-B.C.-Calif.-Nev.—Fig. 199,5. *C. marshi, Rhaet., Alps; 5a, 5b, X1 (292°).*

**Hannaoceras** *TOMLIN, 1931* [*pro Polycyclus MOJSISOVICS, 1893 (*non* LAMARCK, 1815; =Smithoceras HANNA, 1924, *non* DIENER, 1907)] [*Am. nasturtium, DITTMAR, 1866*] [*=Polysphinctoceras SPATH, 1934* (obj.)]. Widely umbilicate, compressed, with radial ribs passing over venter, intercostal area narrow. Suture goniatitic or ceratitic. *Carn.-Nor., Alps-Sicily-Balkan-Cyprus-Timor-Calif.-Nev.*

H. (Hannaoceras). Ribs become more widely spaced and thick on outer volution, no ventral furrow (292).
H. (Symplycoclymus) Spath, 1951 [*Polyculus nodifer Hyatt & Smith, 1905*. More compressed and with shallow ventral groove at some stage (203). Carn., Calif.—Fig. 199.9. *H. (S.) nodifer (Hyatt-S.); 9a, X1; 9b, X2 (203)*].

Peripleurites Mojissovics, 1893 [*Choristoceras (Peripleurites) roemeri; SD Diener, 1915*. Ventral groove only on inner whorls, ribs continuous across venter; conch not coiled in one universal plane, strongly uncoiled. Suture goniatitic (292). Nor., Alps-Hung.—Fig. 199.6. *P. roemeri, Alps; 6a, X1; 6b, X2 (292)*].

Rhabdoceras Hauer, 1860 [*R. suessi*. Straight or curved, only larval portion coiled; coarse ribs en-circle conch. Suture goniatitic (292). Nor., Alps-Sicy-Hung.—Fig. 199.7. *R. suessi, Alps-Sicy-Indon.-Peru.; X10 (641)*].

Family COCHLOCERATIDAE Hyatt, 1900


Cochloceras Hauer, 1860 [*C. fischeri* (292). Nor., Alps-Timor.—Fig. 199.8. *C. fischeri, Alps; X1 (743)*].

Paracochloceras Mojissovics, 1893 [*Cochloceras canaliculatum Hauer, 1860; SD Diener, 1915*. Suture of coiling with smooth band, umbilical area generally smooth (292). Nor., Alps.]

Superfamily TROPITACEAE Mojissovics, 1875

[nom. transl. Mojs., 1896 (ex Tropitidae Mojs., 1875)]

Involute to evolve generally ornamented ammonoids with ribs and/or nodes. Venter may bear keel, be smooth, or crossed by ribs. Suture generally ammonitic but ceratitic or goniatitic in some offshoots. Body chamber long. M.Trias.-U.Trias.

Family TROPITIDAE Mojsisovics, 1875

Conch involute to evolve, subspherical to discoidal, body chamber long; ventral keel and bordering furrows present, in some forms with keel appearing late; surface with ribs, nodes, spines or smooth. Suture generally ammonitic but may be ceratic or goniatitic (488). U.Trias.

Tropites Mojissovics, 1875 [*Am. subbullatus Hauer, 1849; SD Smith, 1904*. Whorl shape cadicone, venter broad, arched, with keel and bordering furrows; umbilical shoulder sharply rounded; umbilicus deep and wide; whorl sides with prorsiradiate ribs and umbilical nodes; final whorl contracting; spiral lines on shell. Suture ammonitic (450). Carn.-Nor., Alps-Himalaya-Timor-Alaska-B.C.-Calif.-Nev.—Fig. 200.6. *T. subbullatus* (Hauer), Carn., Alps-Himalaya-Timor-Calif., 6a,b, X0.7; 6c, X1 (292)*].

Discotropites Hyatt & Smith, 1905 [*Am. sandlingensis Hauer, 1850* [=Eutromoceras Mojsisovics, 1879 (non Hyatt, 1877)*. Involute compressed, discoidal, with acutely rounded venter and high hollow keel without bordering furrows; whorl sides with sigmoidal ribs, small umbilical tubercles and spiral lines. Suture ammonitic (203). Carn., Alps-Sicy-Himalaya-Hung.-Indochina- Alaska-Calif.—Fig. 200.3. *D. sandlingensis (Hauer), Alps-Sicy-Indo-Calif.; 3a-c, X0.5 (292)*].

Anatropites Mojissovics, 1893 [*Tropites (Anatropites) spinosus; SD Diener, 1915*. With spines instead of nodes on umbilical shoulder, at least on early whorls; conch more compressed and less extreme in cross section (292). Carn., Alps-Sicy-Himalaya-Timor-Calif.—Fig. 200.10. *A. spinosus, Alps; 10a,b, X1 (292)*].

Paratropites Mojissovics, 1893 [*Am. saturnus Dittmar, 1866; SD Diener, 1915*. Involute, laterally compressed; mature and early stages similar (203). Carn., Alps-Sicy-Italy-Yugo.-Hung.-Himalaya-Indochina-Timor-Calif.—Fig. 200.9. *P. saturnus (Dittmar), Alps; 9a,b, X1 (292)*].

Gymnotropites Hyatt & Smith, 1905 [*Paratropites (Gymnotropites) americanus*. Like Paratropites but with smooth shell (203). Carn., Calif.]

Paulotropites Mojissovics, 1893 [*Am. janus Dittmar, 1866; SD Diener, 1915*. No umbilical tubercles and with paulostome constriction on body chamber (292). Carn., Alps-Sicy-Calif.—Fig. 200.5. *P. janus (Dittmar), Alps; 5a,b, X1 (292)*].

Microtropites Mojissovics, 1893 [*Am. galeolus Hauer, 1860; SD Diener, 1915*. Dwarfed, involute forms; sculpture tending to become obsolete; body chamber leaving regular spiral, becoming contracted (292). Carn., Alps-Sicy-Calif.—Fig. 200.4. *M. galeolus (Hauer), Alps; 4a,b, X1 (292)*].

Hoplotropites Spath, 1929 [*pro Margarites Mojissovics, 1889 (non Gray, 1847)* [*Am. jokelyi Hauer, 1855; SD Diener, 1915*. Evolute, whorl section subrectangular, venter broad, rounded, with keel; whorl sides with spines on ribs at umbilical or ventral shoulder or both. Suture ammonitic (292). Carn., Alps-Sicy-Himalaya-Indochina-Timor-Alaska-Calif.—Fig. 200.8. *H. jokelyi (Hauer), Alps-Sicy-Indo-Calif.; 8a,b, X0.7; 8c, X0.3 (633)*].

Margaritopites Diener, 1916 [*Anatropites margariformis Diener, 1906*. Like Hoplotropites but with large true umbilical tubercles and furrows bordering keel very low (103). Carn., Himalaya.—Fig. 200.7. *M. margariformis (Diener) 7a,b, X0.7 (103)*].

Timorotropites Diener, 1916 [*Tropites dubiosus Welter, 1914*. Involute, globose, venter arched; keel appearing late in ontogeny; whorl sides with
radial single and bifurcating ribs and spiral lines. Suture ammonitic but more digitate than in typical tropitids (558). U. Trias., Timor.—Fig. 200,2. *T. dubiosus (WELTER); 2a, 2b, ×0.7; 2c, ×1 (558*).

Styrites MOJSISOVICS, 1893 [*S. tropitiformis; SD DIENER, 1915]. Smooth, small, evolute, compressed, discoidal; venter acute with prominent keel; body chamber contracting. Suture goniatitic (292). Carn., Alps-Hung-Sicily-Timor.—Fig. 200,1. *S. tropitiformis, Alps; 1a, 1b, ×1; 1c, ×2 (292*).


Mesozoic Forms—Tropitaceae

Sibyllites Mojsisovics, 1893 [*S. tenuispinatus; SD Hyatt & Smith, 1905]. Evolute, compressed, inner whorls with nodes and ribs on whorl sides, venter rounded; venter on outer whorl becoming acute with a blunt keel, commonly combined with decline in ornamentation. Suture ammonitic (292). Carn., Alps.—Fig. 200,11. *S. tenuispinatus (Mojs.); 11a,b, ×1 (292*).

Family TROPICELTITIDAE Spath, 1951

Widely umbilicate, allied to Tropitidae, with ventral keel generally on smooth venter; whorl sides with ribs and some nodes; body chamber long. Suture usually simple (488). U.Trias.

Tropiceltites Mojsisovics, 1893 [*T. rotundus; SD Hyatt & Smith, 1905]. Whorl section subquadrat, venter broadly rounded, smooth, with median keel but no aligning furrows; whorl sides with radial ribs that bend adorally on ventral shoulder. Suture goniatitic (292). Carn., Alps-Calif.—Fig. 201,2. *T. rotundus, Alps; 2a,b, ×1; 2c, ×1.5 (292*).

Arnioceltites Mojsisovics, 1893 [*Am. caducus Dittmar, 1866; SD Diener, 1915]. Like Tropiceltites but lateral ornamentation becoming obsolete on outer whorl (292). Carn.-Nor., Alps-Sicily-Calif.

Arietoceltites Diener, 1916 [*Tropiceltites arietitoides Diener, 1906]. Very evolute forms with lateral sculpture strong and deep furrows bordering ventral keel. Suture simple, ceratitic (103). Carn., Himalaya-Alps.—Fig. 201A. *A. arietitoides (Diener), Himalaya; 4a,b, ×0.5 (103*).

Tritropidoceras Schenk, 1935 [*T. packardi]. Whorl section subquadrat, with tuberculate prorsiradiate ribs that curve sharply adorally on ventral shoulder; venter with prominent keel bordered by furrows. Suture weakly ammonitic (488). Carn., Ore.—Fig. 201,5. *T. packardi; 5a, ×0.7; 5b, ×1; 5c, ×1.5 (699*).

Haidingerites Mojsisovics, 1893 [*Am. acutinodis Hauer, 1860]. Evolute, discoidal, with convergent whorl sides; venter acute and with spirally elongated nodes; whorl sides with radial ribs that terminate at ventral nodes (292). Carn., Alps.—Fig. 201,3. *H. acutinodis (Hauer); 3a,b, ×1 (292*).

Tornquistites Hyatt & Smith, 1905 [*T. evolutus]. Evolute, compressed, whorl sides flattened, venter narrowly rounded; with distinct keel on inner whorls but only faint thin elevation on outer whorl; ornamented with fine sigmoidal ribs that cross venter. Suture goniatitic to weakly ceratitic (203). Carn., Calif.—Fig. 201,1. *T. evolutus; 1a,b, ×1; 1c, ×3 (203*).

Family CELTITIDAE Mojsisovics, 1893

Widely umbilicate with radial or prorsiradiate ribs that may or may not pass over the venter; body chamber very long. Suture generally simple (488). M.Trias.—U.Trias.

Celtites Mojsisovics, 1882 [*Trachyceras epolensis Mojs., 1878; SD Hyatt & Smith, 1905]. Whorl section subquadrat, venter arched, smooth; sides with numerous fine prorsiradiate ribs. M.Trias. (Ladin.), Alps.—Fig. 202,4. *C. epolensis (Mojs.); ×1 (293*).
Orthoceltites Spath, 1951 [*Goniatites buchii Klipstein, 1843 (non de Verneuil; = Aganides klipsteinii d’Orbigny, 1850)]. Like Celtites but with radial ribs and more rapid coiling of conch (488). *U. Trias. (Carn.), Alps.

Cycloceltites Mojsisovics, 1893 [*Celtites (Cycloceltites) arduini; SD Diener, 1915]. With fine and close ribs continuous across venter except in young; also with regular flared ribs. *U. Trias. (Carn.-Nor.), Alps.—Fig. 202.3. *C. arduini, Nor., Alps; 2a, b, X 0.7 (292*).

Otoceltites Diener, 1916 [*Celtites perauritus Diener, 1908]. With ribs interrupted along venter by narrow, smooth zone and with distinct flared ribs that pass over venter uninterrupted. Suture goniatitic. *M. Trias. (Ladin.), Himalaya.—Fig. 202,2. °O. perauritus (Diener); 2a, b, X 1; 2b, X 1.5 (105*).

Coeloceltites Spath, 1951 [*Am. rectangularis Hauer, 1860]. Venter and sides flattened; venter with longitudinal striations, tending to become concave and bordered by distinct subtuberculate ventrolateral edges. *U. Trias. (Carn.), Balkan.—Fig. 202.1. °C. rectangularis (Hauer); 1a, b, X 1 (292*).

Tropigastrites Smith, 1914 [*T. trojanus]. Widely umbilicate, whorl section depressed to compressed, whorl sides convergent, venter tending to become acute; with umbilical prorsiradiate ribs. Suture ceratitic or weakly ammonitic (449). *M. Trias. (Anis.), Nev.-Alps-Balkan.—Fig. 202.5. °T. trojanus, Nev.; 5a, X 0.7; 5b, X 2 449*).

Tropigymnites Spath, 1951 [*Sibyllites planorbis Hauer, 1896]. More compressed than Tropigastrites, venter carinate, whorl sides with weak radial ribs. *M. Trias. (Anis.), Alps-Balkan-Himalaya-Nev.—Fig. 202.6. °T. planorbis (Hauer), Yugo.; 6a, b, X 0.7; 6c, X 1 (633*).

Family METASIBIRITIDAE Spath, 1951
Small, evolute ammonites derived from Celtitidae, with bifurcating ribs that cross venter, generally tuberculate. Suture simple, ceratitic to goniatitic (488). *U. Trias.

Metasibirites Mojsisovics, 1896 [*Am. spinescens Hauer, 1855]. Whorl section rounded, generally depressed, venter arched; with bifurcating ribs and usually umbilical nodes (292). *M. spinescens (Hauer), Alps; 2a, b, X 1; 2c, X 2 (292*).
lower on whorl side. Suture simple, ceratitic (295). Nor., Himalaya-Timor.—Fig. 203 J. *T. huxleyi, Himalaya; 1a, ×0.7; 1b, ×1 (295*).

**Family HALORITIDAE** Mojsisovics, 1893

Subglobose, involute, commonly with lateral ribs that may cross venter, some groups also with nodes on ribs; keels or ventral furrows not typical; ribs may be interrupted on venter; last volution commonly excentric. Suture ammonitic, ceratitic, or goniatitic (488). U.Trias.

Subfamily HALORITINAE Mojsisovics, 1893

Spiral ornamentation weak or absent. U. Trias.

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*Fig. 204. Haloritidae (p. L174-L176).*
Cephalopoda—Ammonoidea—Ceratitina

Halorites Mojsisovics, 1879 [*Am. ramsaueri Hauer, 1846; SD Hyatt & Smith, 1905]. Involute, compressed, subglobose, venter rounded, sides convex; with radial ribs or rows of tubercles diagonal across shell; body chamber long, contracted, excentric. Suture ammonitic (292). Nor., Alps-Sicily-Himalaya-Timor-Calif.—Fig. 204,10. *H. ramsaueri (Hauer), Alps; 10a,b, x 0.3; 10c, x 0.7 (292*).

Hom erotes Mojsisovics, 1893 [*Am. semiglobosus Hauer, 1855; SD Hyatt & Smith, 1905]. Small, involute, globose, with excentric outer volute; phragmocone like Halorites, body chamber with slight ventral keel and radial dichotomous ribs that usually terminate at spines on ventral shoulder. Suture subammonitic (292). Carn., Alps-Calif.—Fig. 205,2. *H. semiglobosus (Hauer); 2a,b, x 0.7 (633*).

Jovites Mojsisovics, 1893 [*Tropites dacus Mojs., 1875; SD Diener, 1915]. Like Halorites but with faint feel-like ridge on venter and fewer elements in suture (292). Carn.-Nor., Alps-Sicily-Balkan-Himalaya-Timor-Calif.—Fig. 204,11. *J. dacus (Mojs.), Carn., Alps; 11a,b, x 0.5; 11c, x 1.5 (292*).

Bacchites Smith, 1927 [*Juvavites bacchus Mojsisovics, 1893]. Subspherical, with closed umbilicus, surface almost smooth but with faint transverse ribs, vestigial constrictions, and faint threadlike keel ridge. Suture ammonitic (450). Carn., Alps-Timor-Calif.—Fig. 204,9. *B. bacchus (Mojs.); 9a,b, x 0.7; 9c, x 1 (292*).

Amarassites Welte r, 1914 [*A. egrediens; SD Diener, 1915]. Like Halorites but more compressed, umbilicus more open, excentric; venter fastigate, sigmoidal ribs that cross venter (558). Nor., Timor-Alps.—Fig. 204,6. *A. egrediens, Timor; 6a,b, x 0.7; 6c, x 1 (558*).

Indonesites Welte r, 1914 [*I. dieneri]. Very involute, inflated, with broad rounded venter and faint keel; with faint ribs, outer volute excentric. Suture degenerate (558). U.Trias., Timor.—Fig. 204,5. *I. dieneri; 5a,b, x 0.5; 5c, x 1 (558*).

Juvavites Mojsisovics, 1879 [*Am. ehrlichi Hauer, 1855; SD Hyatt & Smith, 1905]. Involute, subglobose, some flattened to subdiscoidal, venter rounded; whorl sides with dichotomous ribs that pass over venter but may be interrupted along venter. Suture ammonitic (292). Carn.-Nor., Alps-Sicily-Himalaya-Timor-Indochina-Alaska-B.C.-Calif.—Fig. 205,5. *A. ehrlichi (Hauer), Nor., Alps; 5a,b, x 0.7 (633*).

Anatomites Mojsisovics, 1893 [*Juvavites (Anatomites) rotundus; SD Diener, 1915]. Like Juvavites but with periodic constrictions that pass over venter; ribs interrupted on venter by slight furrow (292). Carn.-Nor., Alps-Sicily-Balkan-Himalaya-Timor-Kotelny-Alaska-Calif.-Mex.—Fig. 204,8. *A. rotundus, Carn., Alps; 8a-c, x 1 (292*).

Griesbachites Mojsisovics, 1896 [*Am. medleyanus Stoliceka, 1865]. Like Juvavites but with clavi or nodes on ventrolateral area of the phragmocone; no constrictions (295). Carn.-Nor., Alps-Himalaya-Timor-B.C.—Fig. 205,12. *G. medleyanus, Carn., Himalaya; 12a,b, x 0.5 (295*).

Molengraaffites Welte r, 1914 [*Juvavites (Griesb achites) hannii Mojs., 1886; SD Diener, 1915]. Like Juvavites but with constrictions (558). Carn.-Nor., Timor-Himalaya.

Gonionotites Gemmellaro, 1905 [*G. italicus; SD Diener, 1915]. Inner volutions like Juvavites, body chamber inflated, smooth, with only traces of ribs (168). Carn.-Nor., Sicily-Alps-Himalaya-Timor-B.C.-Calif.—Fig. 205,3. G. megathieni Diener, Nor., Timor; 3a,b, x 0.5 (115*).


Guembelites Mojsisovics, 1896 [*Heraclites (G ümbelites) jandianus]. With smooth flattened venter; whorl sides with sigmoidal ribs that end at clavi on ventral shoulder; body chamber short. Suture ammonitic (295). Nor., Himalaya-Timor.—Fig. 205,11. *G. jandianus, Himalaya; 11a,b, x 1 (295*).

Parajuvavites Mojsisovics, 1896 [*P. blanfordi; SD Diener, 1915]. Like Juvavites but umbilicus of last volution excentric (295). Nor., Himalaya.—Fig. 205,4. *P. blanfordi; x 0.5 (295*).

Malayites Welte r, 1914 [*M. informis; SD Diener, 1915]. Like Juvavites but with spiral lineation (558). Carn.-Nor., Timor-Alps-Sicily.

Dimorphites Mojsisovics, 1893 [*Juvavites (Dimorphites) selectus; SD Diener, 1915]. Compressed, involute, discoidal, with narrow flattened venter, distinct angular ventral shoulders; whorl sides with sigmoidal ribs that may or may not cross venter; constrictions only on inner whorls (292). Carn., Alps-Sicily-Greece-Timor.—Fig. 205,7. *D. selectus, Alps; 7a,b, x 0.7 (292*).

Indojuvavites Diener, 1916 [*Juvavites angulatus Diener, 1908]. Like Dimorphites but venter rounded; sigmoidal ribs on whorl sides that meet on venter in sharp V's pointing adorally (105). Nor., Himalaya-Timor.

Miltites Mojsisovics, 1893 [*M. rastli; SD Diener, 1915]. More or less involute, discoidal, venter rounded, whorl sides with weak flexuous ribs that are interrupted along mid-part of venter; tubercles on umbilical edge in early volutions (292). Carn., Alps-Timor.—Fig. 205,9. *M. rastli, Alps; 9a,b, x 0.7 (292*).

Barrandeites Mojsisovics, 1893 [*Am. tubina Dittmar, 1866]. Small forms, very involute, venter broadly rounded and with keel on outer whorl; whorl sides smooth except for prominent constrictions. Suture ceratic (292). Carn., Alps-Sicily.—Fig. 204,3. *B. tubina (Dittmar), Alps; 3a,b, x 1; 3c, x 1.5 (292*).
Mesozoic Forms—Tropitacea

Fig. 205. Haloritidae (p. L174-L176).
Paraganides Hyatt & Smith, 1905 [*P. californicus*]. Small involute, compressed, with flattened whorl sides, weak radial ribs that pass straight over rounded venter. Suture goniatitic (203). Carn., Calif.—Fig. 204,7. *P. californicus*; 7a,b, ×2; 7c, ×5 (203*).

Tardeceras Hyatt & Smith, 1905 [*T. parvum*]. Like Paraganides but venter flatter, whorl sides with umbilical nodes giving rise to ribs that weakly cross venter. Suture ceratitic, simple (203). Carn., Calif.—Fig. 204,1. *T. parvum*; 1a,b, ×2; 1c, ×4 (203*).

?Leconteceras Smith, 1914 [*pro Leconteia Hyatt & Smith, 1905 (non Champion, 1893)] [*Leconteia californica Hyatt-S., 1905*]. Small, involute, globose ammonites, venter arched; whorl sides with broad low radial ribs that pass over venter, intercostal area narrow; inner whorls with low median furrow aligned with small nodes. Suture ceratitic (203). Carn., Calif.—Fig. 205,1. *L. californicum* (Hyatt-S.); 1a,b, ×1; 1c, ×2 (203*).


?Waldhausenites Welter, 1914 [*W. malayicus*]. Involute discoïdal, whorl sides convergent, venter narrow and with keel formed by angular junction of lateral ribs; umbilical tubercles on early whorls; with spiral lines. Suture ammonitic but simple (558). Carn.-Nor., Timor-Alps.—Fig. 205,8. *W. malayicus*, Nor., Timor; 8a,b, ×1 (558*).

?Girthiceras Diener, 1909 [*G. pernomosum*]. Small, involute, with flattened convergent whorl sides, flattened venter; umbilical and ventral shoulders sharply rounded; with umbilical tubercles and radiating ribs. Suture ammonitic (488). Carn., Himalaya.—Fig. 204,4. *G. pernomosum*; 4a, ×1; 4b, ×1.5 (606*).

Subfamily SAGENITINAE Spath, 1951

With prominent spiral ornamentation and more subdivided suture. *U.Trias.*

Sagenites Mojsisovics, 1879 [*Am. reticulatus Hauer, 1849*; SD Smith, 1904]. Subglobose, somewhat compressed, involute, venter arched; whorl sides with radial folds or ribs that pass over venter; also spiral ornamentation. Suture ammonitic (203). Carn.-Nor., Alps-Sicily-Timor-Himalaya-Calif.-Peru.

S. (Sagenites). Spiral ornamentation consisting of lines or ridges only (203). Carn.-Nor., Alps-Sicily-Timor-Himalaya-Calif.-Peru.

S. (Trachysagenites) Mojsisovics, 1893 [*Am. erinaceus Dittmar, 1866*; SD Hyatt & Smith, 1905]. Spiral ornamentation consisting of short spines in regular rows on ribs (203). Carn., Alps-Sicily-Balkan-Himalaya-Timor-Calif.—Fig. 205,6. *S. (T.) erinaceus* (Dittmar), Alps; ×0.7 (292*).

Subfamily EPISCULITINAE Spath, 1951

With simplified suture and uncoiling of body chamber. *U.Trias.*

Episculites Spath, 1951 [*Am. decrescens Hauer, 1855*] [*Isculites Diener, 1916 (non Mojs., 1886)*]. Small, involute, compressed, with arched venter; whorl sides with projected ribs that pass over venter and constrictions. Suture goniatitic (488). Nor., Alps-Timor-B.C.—Fig. 204,2. *E. decrescens* (Hauer), Alps; 2a,b, ×1; 2c, ×1.5 (292*).


Hypisculites Spath, 1951 [*Isculites dieneri Pakuckas, 1928*]. Like Episculites but with umbilical nodes and lateral ribs that end at nodes on ventrolateral area aligning smooth median band on venter. Suture goniatitic (488). Carn., Timor-B.C.—Fig. 205,10. *H. dieneri* (Pak.), 10a,b, ×1 (674*).

Family DIDYMITIDAE Haug, 1894

Involute, globose conch, somewhat compressed, venter broadly arched, last volution excentric; whorl sides with growth lines and some faint ribs; low median keel may be present on outer whorl. Suture ammonitic with saddles divided by prominent lobule (488). *U.Trias.*

Didymites Mojsisovics, 1875 [*Am. globus Quenstedt, 1849*; SD Diener, 1915] [*=Paradidymites, Timorididymites Diener, 1916*]. Nor., Alps-Sicily-Himalaya-Afghan.-Timor.—Fig. 206,1. D. quenstedti Mojs., Alps; 1a,b, ×0.7; 1c, ×1 (292*).

Superfamily LOBITACEAE Mojsisovics, 1882

[ nom. transl. Hyatt, 1900 (ex Lobitinae Mojs., 1882)]

Involute, generally subglobose, with excentric last volution, contracted body chamber. Suture with 2 bifid lateral lobes in which median division becomes very large. An isolated group, probably descended from Arccestidae (488). *M.Trias.-U.Trias.*

Family LOBITIDAE Mojsisovics, 1882


Lobites Mojsisovics, 1875 [*Clydonites ellipticus Hauer, 1860*; SD Mojs., 1902]. Whorl sides with low radial ribs that cross venter. Suture goniatitic (292). *M.Trias.(Ladin.).-U.Trias.(Carn.), Alps-
Mesozoic Forms—Lobitaceae, Arcestaceae

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Fig. 206. Didymites quenstedii Mojsisovics, U.Trias. (Nor.), Alps; 1a,b, ×0.7; 1c, ×1 (p. L176).

Balkan-AsiaM.-Himalaya-B.C.-Nev.—Fig. 207, 2. *L. ellipticus (Hauer), Carn., Alps; 2a,b, ×1; 2c, ×1.5 (292*).


Psilobites Renz, 1911 [*Lobites (Psilolobites) argolicus]. Like Parabolites but with no constrictions and simple pointed lobes and rounded saddles (365). U.Trias.(Carn.), Balkan.—Fig. 207,4. *P. argolicus, Greece; 4a,b, ×1 (365*).

Coroceros Hyatt, 1877 [*Cladonites monili Laube, 1869]. Like Lobites but with double constriction on body chamber forming 2 hoods (292). U.Trias. (Carn.), Alps-Balkan-Himalaya-Timor-Nev.—Fig. 207,1. *C. monili (Laube), Alps; 1a,b, ×1 (292*).

Indolobites Renz, 1911 [*Clydonites oldhamianus Stoliczka, 1865]. With incipient subdivisions of lobes (365). ?M.Trias., Himalaya.—Fig. 207,3. *I. oldhamianus (Stol.), 3a,b, ×1 (101*).

Orestites Renz, 1911 [*O. frechi]. Smooth, with suture lobes trifid to irregular, weakly toothed at base and sides (365). U.Trias.(Carn.), Greece.—Fig. 207,5. O. pelopsi Renz; ×1.5 (687*).

Superfamily ARCESTACEAE
Mojsisovics, 1875
[nom. transl. Mojs., 1896 (ex Arcestidae Mojs., 1875)]

Typically involute, smooth, subglobular shells with complex ammonitic sutures; constrictions and flared ribs may be present. Suture ammonitic, lobes and saddles triangular, septa closely spaced (488). M.Trias.-U.Trias.

Arcestes Suess, 1865 [*Am. galeiformis Hauer; 1850 (pro Am. galeatus Hauer, 1846; non von Buch); SD Mojs., 1893]. Characters of family. M.Trias.(Anis.)-U.Trias. (Rhaet.). cosmop.

A. (Arcestes) [=Gonarcestes Diener, 1919; Rhaetites Hyatt, 1900]. Periodic constrictions confined to phragmocone (292). U.Trias.(Carn.-Rhaet.). cosmop.—Fig. 208,1d,e. A. (A.) intudlabiatus Mojs., Nor., Alps; 1d, ×0.7; 1e, ×1 (743*).—Fig. 208,1c. A. (A.) gigantogaleatus Mojs., Nor., Alps; ×0.25 (584*).—Fig. 208,1a. A. (A.) pinacostomus Diener, Carn., Alps; ×0.5 (584*).—Fig. 208,1b. A. (A.) colonus Mojs., Carn., Alps; ×0.5 (584*).


A. (Pararcestes) Mojsisovics, 1893 [*Arcestes sublabiatus Mojs., 1875; SD Diener, 1915] [=Galeites Rollier, 1909]. Constrictions and flared ribs on phragmocone and body chamber, the latter

Family ARCESTIDAE Mojsisovics, 1875

Smooth many-whorled ammonites with long body chambers and modified peri-
also modified; umbilicus closed by callus

**M.Trias.** (Anis.) - U.Trias. (Carn.), Alps - Balkan - Himalaya - Timor.

**Pararcestes**

**Fig. 208.**

**A. (P.)** *heinrichi* DIENER, X1 (709).

**A. (Stenarcestes)** MOJSISOVICS, 1895 [*Am. subumbilicatus* HAUER, 1846]. Discoidal, resembling *Joannites* in shape but with deepened umbilicus surrounded by spiral depression or mere dimples

**Family JOANNITIDAE** Mojsisovics, 1882

Suture ammonitic, generally curved anteriorly and with bifid saddles. Body chamber long, conch compressed, discoidal, with constrictions or striations common

**Joannites** Mojsisovics, 1879 [*Nautilus cymbiformis* WULFEN, 1793]. Very involute, surface smooth, conch with periodic constrictions.

**Istreites** SIMIONESCU, 1913 [*Joannites (Istreites)*]
**Mesozoic Forms—Arcestaceae**

**Psychoites**. Like Pycnites; differs from *Joanmites* in having no constrictions and suture with small but high ventral lobe and no conspicuous curvature (488). *U.Trias.* (Carn.,) Balkan-Timor.

**Joonnites** *coangustatus* Carn.-Nor., 210, Fig. 209, 1a, b, X0.7; *psychoites* [Simion.]. Like *Psychoites*; differs from *Joonnites* in having no constrictions and suture with small but high ventral lobe and no conspicuous curvature (488). *U.Trias.* (Carn.-Nor.), Balkan-Himalaya-Timor-Spit-z.-Nev.


**Family MEGAPHYLITIDAE** Mojsisovics, 1896

Generally small, very involute, compressed to subglobose; usually smooth. Suture ceratitic with phylloid saddles (488). *M.Trias.*—*U.Trias.*

**Megaphyllites** *Mojsisovics*, 1879 [*Am. jarbas* Münster, 1841]. Compressed, involute, low arched venter; smooth but with periodic constrictions, mainly on body chamber. Suture with large number of elements (292). *M.Trias.* (Anis.-U.Trias. (Rhaet.), Alps - Balkan - Sicily - AsiaM.-Himalaya-Indochina-Timor.—Fig. 210, 4. *M. jarbas* (Münster), Ladin.-Carn., Alps-Balkan-Himalaya-Timor; 4a-c, X1 (293).

**Parapopanoceras** Haeug, 1894 [*Popanoceras verneili* Mojsisovics, 1886] (=*Dienerites Mojs.*, 1902 (obj.); *Beaumontites Browne, 1952*). Like *Megaphyllites* but more discoidal, body chamber modified (294). *M.Trias.* (Anis.), Spitz.-N.Sib.-N. Greenl.-N.Z.-B.C.—Fig. 210, 3. *P. verneili* (Mots.), Spitz.; 3a,b, X0.7 (294).

**Ptychopopanoceras** Spath, 1951 [*Popanoceras*...
Superfamily PTYCHITACEAE
Mojsisovics, 1882

Typically involute, subglobular to discoidal descendants of L. Triassic parananitids, with globose inner whorls. Suture ammonitic but including some forms with ceratic or goniatitic sutures. Conch smooth with lateral folds or strigations (488). M. Trias.-U.Trias.

Family PTYCHITIDAE Mojsisovics, 1882

Involute, subglobular, discoidal to highly compressed; smooth or with lateral ribs or strigations; inner whorls globose. Suture ammonitic (488). M.Trias.-U.Trias.

Ptychites Mojsisovics, 1875 [*Am. rugifer Oppel, 1865; SD Spath, 1951]. Subovoid, compressed, discoidal, umbilicus small, umbilical walls steep; sides with distant radial folds (293). M.Trias. (Anis.-Ladin.), Alps-Ger.-Balkan-Himalaya-Timor-Japan-N.Sib.-Spitz.--Fig. 211.J. *P. rugifer (Oppel), Anis., Himalaya; 1a,b, X 0.3; 1c, X 0.7 (100*).
**Mesozoic Forms—Ptychitaceae**

Discoptychites Diener, 1916 [*Am. megalodiscus Beyrich, 1867*]. More discoidal than in Ptychites, with narrowly rounded to acute venter; raised umbilical edge developed already in early volutions (293). *M. Trias. (Anis.), Alps-Balkan-AsiaM.-Himalaya.*—Fig. 211,10. *D. megalodiscus* (Beyrich), Alps-Balkan-AsiaM.; 10a, ×0.5; 10b, ×1 (293*).

Flexoptychites Spath, 1951 [*Ptychites flexuosus Mojsisovich, 1882*]. Like Ptychites but more compressed and with flexuous folds or ribs (293). *M. Trias. (Anis.-Ladin.), Alps-Balkan-Himalaya.*—Fig. 211,6. *F. flexuosus* (Mojs.), Anis., Alps-Balkan; 6a,b, ×0.5; 6c, ×0.5 (293*).

Aristoptychites Diener, 1916 [*Am. gerardi Blanford, 1863*]. With triangular whorl section, venter acutely rounded, umbilical walls steep; radial folds weak. Suture curved (100). *M. Trias. (Anis.),

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**Fig. 211. Ptychitidae (p. L180-L182).**
Himalaya.—Fig. 211,9. *A. gerardi (Blane.); 9a, X0.5; 9b, X1 (100*).

**Malletpychites** DIENER, 1916 [*Am. malletianus STOLICZKA, 1865*]. Very evolute, whorls trigonal, suture distinctive (100). M.Trias.(Anis.), Himalaya.—Fig. 211,2. *M. malletianus (Stol.); 2a,b, X0.3; 2c, X0.7 (100*).

**Allopychites** SPATH, 1951 [*Psychites meeki HYATT & SMITH, 1905*]. With fine radial lines rather than folds and much simpler suture (203). M.Trias. (Anis.), Himalaya.—Fig. 211,3. **M. malletianus (Stol.); 3a,b,c, X1 (100*).

**Ischites** ARTHABER, 1914 [*I. marmarensis*]. Like *Ptychites*, with acute umbilical edge and flexuous ribs; short ammonitic suture, only 2 lateral lobes (23). M.Trias.(?Anis.), AsiaM.—Fig. 211,4. **I. marmarensis; X1 (23*).

**Sturia** MOTISOVICS, 1882 [*Amaltheus sansovinii Mol., 1869; SD DIENER, 1915*]. Compressed discoidal conch as in *Discoptychites*, with spiral striae. Suture ammonitic, saddles with phylloid terminations (293). M.Trias. (Anis.)—U.Trias.(Carn.), Alps-Balkan-AsiaM.-Himalaya—Timor-Japan.—Fig. 211,3. **S. sansovinii (Mots.); X1 (293*).

**Metasturia** SPATH, 1951 [*Sturia? gracilis HAUER, 1892*]. Like *Sturia* but with smooth outer volution; whorls depressed. Suture ceratitic to subammonitic (488). M.Trias. (Anis.-Ladin.), Alps.—Fig. 211,4. *P. emmrichi (Mojs.), Ladin., Alps; 4a,b, X0.7; 4c, X1 (293*).

**Family ISCULITIDAE** Spath, 1951

Involute, subglobular, smooth ammonites with excratic outer volution; whorls depressed. Suture ceratic to subammonitic (488). M.Trias.

**Ischites** MOTISOVICS, 1886 [*Clydonites hauerinus STOLICZKA, 1865*] [*=Spitsiculites DIENER, 1916 (obj.)*]. Conch slightly compressed, whorls depressed. Suture ceratic. Anis., Himalaya.—Fig. 212,1. *I. hauerinus (Stol.); 1a-c, X1 (100*).

**Smithoceras** DIENER, 1907 [*S. drummondi*]. Evolute, whorl sections subtriangular, umbilical shoulder sharply rounded. Suture subammonitic (104). Anis., Himalaya.—Fig. 212,5. *S. drummondi; 5a, X0.5; 5b, X1 (104*).

**Psychosphera** SPATH, 1951 [*=Sphaerites ARTHABER, 1896 (non DUFTSCHMID, 1805; nec QUENSTEDT, 1852)] [*=Sphaeritiglobulus ARTH., 1896*]. Small, involute, subglobular, smooth, resembling a young atcosellid. Suture simple, adventitious lobe between ventral and 1st lateral lobe (488). Anis., Balkan.—Fig. 212,1. *P. globulus (Arth.), Alps; 1a,b, X2; 1c, X6 (584*).

**?Thanamites** DIENER, 1908 [*T. bicuspidatus*]. Like *Isculites* but suture very simple, bifid 1st lateral lobe, rounded small 2nd (105). Ladin., Himalaya—Timor-B.C.—Fig. 212,2. *T. bicuspidatus, Himalaya; X1 (105*).

**?Family NANNITIDAE** DIENER, 1897


**Nannites** MOJSISOVICS, 1881 [*Gon. spurius MÜNNER, 1843; SD HYATT & SMITH, 1905*]. M.Trias. (Ladin.-U.Trias.(Carn.), Alps.—Fig. 212,4. **N. spurius (Münster), Carn., Alps; 4a,b, X3 (293*)

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Superfamily PINACOCERATAEAE Mojsisovics, 1879
[nom. transl. Mojs., 1896 (ex Pinacoceratidae Mojs., 1879)]

Evolute to involute, generally smooth, compressed ammonoids. Suture ammonitic, with adventitious and auxiliary elements, reaching acme of ammonite sutural specialization in some genera. Gymnitidae seem to stem from Dieneroceratidae and Pinacoceratidae to be derived from Gymnitidae. Group represents one of the common stocks of Middle and Upper Triassic (488). L.Trias.-U.Trias.

Family PINACOCERATIDAE Mojsisovics, 1879


Pinacoceras Mojsisovics, 1873 [*Am. metternichi Hauer, 1846; SD Diener, 1915]. Venter acute, conch smooth. Suture represents acme of ammonite specialization (292). U.Trias.(Carn.-Nor.), Alps-Sicily-Balkan-Himalaya-Timor-Kotelny. —— Fig. 213.1. *P. metternichi (Hauer), Nor., Alps-Himalaya-Timor: la, X0.25; lb, X0.5 (607*).

Eupinacoceras Spath, 1951 [pro Parapinacoceras Arthaber, 1928 (non Diener, 1916)] [*Pinacoceras subimperator Mojsisovics, 1873]. Like Pinacoceras but more evolute and with simpler suture (24). U.Trias.(Nor.), Alps-Timor. —— Fig. 213.3. *E. subimperator (Mojs.); X0.7 (292*).

Parapinacoceras Diener, 1916 [*Pinacoceras aspidoides Diener, 1900]. Like Pinacoceras but with a much simpler suture (488). M.Trias.(Anis.-Ladin.), Alps-Yugo. —— Fig. 213.5. *P. aspidoides (Diener); 5a, X0.5; 5b, X0.7 (606*).

Pompeckjites Mojsisovics, 1902 [*Am. layeri Hauer, 1847]. Umbilicus of outer volution excentric; ventral portion of whorl sides with radial or sinuous folds (292). U.Trias.(Carn.), Alps-Balkan-Timor-Calif. —— Fig. 213.6. *P. layeri (Hauer); 6a,b, X0.25; 6c, X0.7 (292*).

Bambanagites Mojsisovics, 1896 [*B. schlagintweitii; SD Diener, 1915]. With sculpture, at least on early volutions, as in Pompeckjites but body chamber slightly inflated, venter broadly rounded on last volution. Suture simpler and with subphyloid saddle endings (295). U.Trias.(Nor.),

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Fig. 213. Pinacoceratidae (p. L183-L184).
Himalaya.—Fig. 213,8. *B. schlagintweitii; 8a, X0.5; 8b, X1.5 (295*).

Protoblattites Cockerell, 1905 [pro Platites Mojsisovics, 1902 (non Guénée, 1845)] [*Pinacoceras neglectus Mojs., 1873]. More or less evolve, smooth pinacoceratid with a simple gymnitid suture (292). U.Trias.(Nor.), Alp.—Fig. 213,7. *P. neglectus (Mojs.); X1.5 (292*).

Placites Mojsisovics, 1896 [*Pinacoceras platyphyllum Mojsisovics, 1873] [=Paragymnites Hyatt, 1900; Paraplacites Kutasy, 1928 (nom. nud.)]. Involute, smooth, compressed, with closed umbilicus, flattened whorl sides, rounded venter. Suture not as complex as in Pinacoceras (295). U.Trias.(Carn.-Nor.), Alps-Sicily-Balkan-Himalaya-Timor-B.C.-Nev.—Fig. 213,2b. P. oxyphyllus (Mojs.), Nor., Alps-Sicily; X1 (292*).—Fig. 213,2a, P. postsymmetricum (Mojs.), Nor., Alps, X0.7 (292*).

Pinacoplacites Diener, 1916 [*Placites meridianus Welter, 1914]. Like Placites but with an opening umbilicus. Suture with development of adventitious elements similar to those in Pinacoceras (558). U.Trias., Timor.—Fig. 213,4. *P. meridianus (Welter); X1 (558*).

Family GYMNITIDAE Waagen, 1895
Evolute to involute, compressed; venters rounded to sharpened, conch generally smooth. Suture ammonitic. Group closely related to Pinacoceratidae (488). L.Trias.—U.Trias.

Gymnites Mojsisovics, 1882 [*Am. incultus Beyrich, 1867; SD Diener, 1915]. Evolute, whorl section oval, venter arched; shell smooth, outer volutions may have costation or rows of nodes or both. Suture ammonitic with 2 lateral lobes and retracted auxiliaries (293). M.Trias.(Anis.-Ladin.), Alps-Balkan-Himalaya-Timor-B.C.-Nev.—Fig. 214,2. *G. incultus (Beyrich), Anis., Alps-Balkan-Himalaya; 2a,b, X×0.25; 2c, x1 (293*).

Anagymnites Hyatt, 1900 [*Am. lamarecki Oppel, 1863]. Like Gymnites but periphery sharpened or bluntly keeled (100). M.Trias.(Anis.), Alps-Balkan-B.C.-Nev.

Mesozoic Forms—Phyllocerataceae


Buddhaites Diener, 1895 [*Gymnites (Buddhaites) rama]. Involute oxycone with flexuous ribs, strongest along mid-portion of whorl side. Suture with long series of auxiliaries (100). M.Trias.(Anis.), Himalaya.—Fig. 214,1. *B. rama; la,b, ×0.3; 1c, ×1 (100*).

Eogymnites Spath, 1951 [*Japonites arthaberi Diener, 1915 (=Japonites sugirisa Diener var. Arthaber, 1911; E. decipiens Spath, 1951)]. Like Gymnites but whorl section more robust, suture simpler (22). L.Trias.(U.Scyth.), Albania.—Fig. 214,4. *E. arthaberi (Diener); 4a,b, ×0.5; 4c, ×0.7 (22*).

Japonites Mojsisovics, 1893 [*Ceratites planiplicatus Mojs., 1888]. Evolute compressed; whorl sides convergent, venter acute or narrowly rounded; with lateral recurved ribs and umbilical bulges. Suture distinctive (488). M.Trias.(Anis.), Japan-Himalayas-Timor-Alps.—Fig. 214,5. *J. planiplicatus (Mojs.), Japan; ×0.3 (664*).

?Bukowskites Diener, 1907 [*B. colvini]. Widely umbilicate, with elliptical whorl section, venter rounded and with distinct, narrow siphonal groove. Suture ammonitic, similar to that of Japonites (104). M.Trias.(Anis.), Himalaya.—Fig. 214,3. *B. colvini; 3a, ×0.7; 3b, ×1 (104*).

Suborder PHYLLOCERATINA
Arkell, 1950

Smooth or feebly ornamented derivatives of Meekoceratidae, characteristically with phylloid saddle endings. An exceptionally persistent, conservative stock, which gave rise to all post-Triassic ammonoids as offshoots, but itself remained relatively very little changed (12). Trias.-Cret.

Superfamily PHYLLOCERATAEAE Zittel, 1884
[non. transl. Hyatt, 1900 (as Phylloceratida) (ex Phylloceratidae Zittel, 1884); non. correct. Arkell, 1952]

The typical, least divergent Phylloceratina. Test thin. Ornament typically confined to fine lineation or liration and some foldlike ribs, with or without constrictions. Suture typically has several auxiliary elements, with
lobes trifid and saddles normally diphyllic or tetraphyllic. Aptychi, if any, unknown. This is the only superfamily of ammonoids that survived from Triassic to Jurassic (201, 357, 536, 577). L.Trias.-Cret., world-wide but scarce in the Boreal realm.

Family USSURITIDAE Hyatt, 1900
[=Monophyllitidae J. P. Smith, 1913]

Discoidal, evolute; venters rounded; little or no ornamentation. Suture with primitive monophyllid saddles, dorsal lobe lituid (472). L.Trias.-U.Trias.

Monophyllites Mojsisovics, 1879 [*Am. sphaero­phyllus* Hauer, 1850; SD Mojs., 1902]. Whorl section rounded, venter arched, conch with sigmoidal growth lines. Suture with irregularly trifid 1st lateral lobe, 4 or more monophyllid saddles (472). M.Trias.(Anis.)-U.Trias.(Carn.), cosmop. —Fig. 215,5. *M. sphaero­phyllus* (Hauer), Eu.-Asia-Timor; 5a,b, ×0.4; 5c, ×0.7 (293*).

Eophyllites Spath, 1930 [*Monophyllites dieneri* Archi­aber, 1908] [=Monophyllites (Schizophyll­ites) Renz & Renz, 1948]. Evolute, compressed, discoidal, with subtrigonal whorl section, arched venter, flattened sides; with nearly radial growth lines and indistinct folds. Suture with shallow wide ventral lobe, which tends to be divided by short rounded saddle, long 1st lateral lobe, saddle monophyllid (472). L.Trias.(U.Scyth.), Albania-Chios-Timor. —Fig. 215,1. *E. dieneri* (Arth.), Albania; 1a-c, ×0.7 (22*).

Palaeophyllites Welter, 1922 [*P. steinmanni*]. Like Monophyllites but with smooth inner whorls with some flares, outer whorl with irregular ribs, slightly projected peripherally. Suture monophyllid, simple (472). L.Trias.(U.Scyth.), Chios-Timor. —Fig. 215,7. *P. steinmanni*, Timor; 7a, ×0.75; 7b, ×1 (560*).

Ussurites Hyatt, 1900 [*Monophyllites sicotius* Diener, 1895]. Like Monophyllites but with simpler suture. First lateral saddle typically indented only on ventral side, 2nd lateral on dorsal side (472). M.Trias.(Anis.), Sub-Spitz.-Himalaya-Timor-Japan-B.C.-Calif.-?Alabamia.—Fig. 215,3. *U. sicotius* (Diener), Sib.; ×0.5 (101*).

Leiophyllites Diener, 1915 [*Monophyllites suessi* Mojsisovics, 1882]. Serpenticone, generally smooth with simple monophyllid suture (472). L.Trias.(U.Scyth.)-M.Trias.(Anis.), Eu.-Asia.—Fig. 215,6. *L. suessi* (Mojs.), Anis., Eu.-Asia; 6a,b, ×0.7; 6c, ×1 (293*).

Mojsvarites Pompeckj, 1895 [*Am. (Ceratites) agenor Münster, 1834; SD Diener, 1915]. Evolute, smooth, with rounded slightly compressed whorl section and arched venter. Suture as in Monophyllites but saddles more indented (472). U.Trias.(Carn.-Nor.), Alps-Hung.-Himalaya.—Fig. 215,4. *M. agenor* (Münster), Carn., Alps-Hung.-Himalaya; ×1 (293*).

Eopiloceras Spath, 1930 [*Am. planorboides Güm­bel, 1861]. Evolute, smooth, discoidal, with compressed whorl section, narrowly rounded venter. Suture with terminal monophyllid saddle leaflet and with phylloid lateral leaflets (472). U.Trias.(Nor.-Rhaet.), Alps.—Fig. 215,2. *E. planorb­oides* (Güm­bel), Rhaet., Alps; 2a, ×0.7; 2b, ×1 (348*).

Family DISCOPHYLLITIDAE Spath, 1927

Like Monophyllitidae but principal saddles have di- or triphyllic terminations (488). U.Trias.

Discophyllites Hyatt, 1900 [*Lytoceras patens Mojsisovics, 1873]. First lateral saddle unsymmetrically monophyllid (472). Carn.-Nor., Alps-Sicily-Himalaya-Timor-Calif.-Alaska.—Fig. 217,2. *D. patens* (Mojs.), Nor., Alps-Alaska; ×1 (292*).

Rhacophyllites Zittel, 1884 [*Am. neojurensis Quenstedt, 1845; SD Smith, 1927] [=Diphyll­ites, Triphyllites Jullien, 1911]. First lateral saddle diphyllid, adjacent lateral saddles diphyllid or triphyllic (472). Carn.-Nor., Alps-Hung.-Sicily-Himalaya-Timor-Calif.-Alaska.—Fig. 216,1. *R. neojurensis* (Quenst.), Nor., Alps-Timor; 1a,b, ×0.5; 1c, ×1 (743*).

Tragorhacoceras Spath, 1927 [*Phylloceras occultum Mojsisovics, 1873]. With peripheral ribs on outer whorl, and suture with large leaflets in diphyllid saddle (472). Nor., Alps-Sicily.—Fig. 217,3. *T. occul­tum* (Mojs.), Alps; 3a,b, ×0.7 (621*).
Trachyphyllites ARTHABER, 1927 [*Monophyllites (Trachyphyllites) costatus*]. Evolute, with rounded whorl section; sides with sigmoidal growth lines and about 6 ribs or flares per whorl. Suture less phylloid than other genera of family (472). Nor., Timor.—Fig. 217.1. *T. costatus; 1ab, ×0.7; 1c, ×1 (24†).

Family PHYLLOCERATIDAE Zittel, 1884

Involute, smooth shells with very thin test, many covered with fine growth lines, usually without ribbing, with or without sigmoid contractions. Sutures complex, major and minor branches of saddles with phylloid or spatulate endings of double (diphyllic), triple (triphyllic), or quadruple (tetraphyllic) type. Probably derived from Triassic Discophyllitidae (239, 466, 577). U.fur.–U.Cret., world-wide (except Boreal unless stated), especially abundant in Tethyan and Pacific realms.

Subfamily PHYLLOCERATINAE Zittel, 1884

[Includes Hypophylloceratinae SPATH, 1927, and Phyllopachycoceratinae COLLIGNON, 1937]


Phylloceras SUESS, 1865 [*Am. heterophyllus J. SOWERBY, 1820*] [≡Rhacoceras HYATT, 1867 (obj.); Xeimplacloceras BUCKMAN, 1921; Heterophylloceras KOVACS, 1939 (obj.)]. Involute, compressed forms with gentle umbilical slope, dense, fine radial lirae on test but not on internal mold, and some more or less vague radial folds on whorl sides. Sutures with triphyllic saddles. LJur.(Sinem.)‐U.Cret.(Valang.), world-wide.—Fig. 218.5. *P. heterophylum (Sow.), LJur.(Toarc.), Eng.; 5ab, ×0.2 (583n).

Partschiceras FUCINI, 1923 [*Am. partschihypophylloceras ROMAN, 1938 (obj.); Macrophylloceras SPATH, 1927*]. In addition to lirae as in Phylloceras, blunt ribbing gradually sets in on venter and outer half of whorl sides. Sutures with very slender, diphyllic saddles. LJur.(Sinem.)‐L.Cret. (Valang.), U.Cret.(Barrem.), world-wide.—Fig. 218.3ab. *P. monestieri BREISTROFFER, LJur.(U.Pliensb.), Italy; ×0.75 (628*).—Fig. 218, 3cd. P. sp.; ×0.5 (743*).

Phyllopachyceras SPATH, 1925 [*Am. infundibulum d'ORBIGNY, 1841*]. Moderately to very involute, inflated, widest point usually at mid-side with flat slope to a minute umbilicus. Smooth to a varying diameter (throughout in some) with strong rounded ribs on outer part of whorl. Sutures with 1st and 2nd lateral saddles tetraphyllic. L.Cret. (Barrem.)‐U.Cret.(Maastr.), Eu.-N.Afr.-S.India.-W.Austral.-N.Z.-Japan-Greenl.—Fig. 218.2a,b. *P. infundibulum (Orb.), Barrem, Fr.; ×0.75 (329†).—Fig. 218.2c. P. rouyani (Orb.), L.Cret.(Apt.), Fr.; ×1 (329†).

Procliviceras FUCINI, 1920 [*Phylloceras proclitic ROSENBERG, 1909*] [≡Proclivoceras ROMAN, 1938 (obj.)]. Very involute; whorl section oval; adult ribbed on venter and outer part of whorl sides; inner whorls feebly constricted in some. Sutures moderately complex, saddles diphyllic. LJur.(Pliensb.), Eu.—Fig. 218.4. *P. proclitic (ROSENBERG), Aus.; 4ab, ×1 (694†).

Zetoceras KOVACS, 1939 [*Am. zetes d'ORBIGNY, 1850*]. Compressed, involute. Sutures with saddle endings commonly tetraphyllic. LJur.(Sinem.)‐M. Jur.(Baj.), probably also U.Jur., Eu.—Fig. 218.7. *Z. zetes (Orb.), LJur.(Sinem.), Ger.; 7ab, type, ×0.3 (358†).

Hantkeniceras KOVACS, 1939 [*Phylloceras hantkeni SCHLOENBACH, 1867 (fig'd. PRINZ, 1904)*]. Large, smooth, evolute, whorls somewhat quadratic, flattened. Sutures rather simple, with 1st lateral lobe shorter than 2nd lateral. LJur.(U.Pliensb.), Hung.-Ger.—Fig. 218.1. *H. hantkeni (Schloenb.), Hung.; 1a-c, ×0.25 (357†).

Geyerceras HYATT, 1900 [*Am. cylindricus J. DE C. SOWERBY, 1831*] [incl. Lavizzaroceras KOVACS]
Involute, smooth, compressed, sides and venter flattened. First lateral lobe long; lateral saddles diphylllic to tetraphyllic; internal suture with 3 monophyllic saddles. *L. jur. (Plienb.)*, Eu.

Fig. 218. *G. cylindricum* (Sow.), Italy; 6a,b, ×0.7 (307*).
Hypophyllloceras

Fig. 219. Hypophyllloceras ononense (Stanton). L. Cret. (Apt.), Calif.; X0.5 (2*). (p. L189).

Hypophyllloceras Salfeld, 1924 [*Phylloceras ononense Stanton, 1895] [incl. Neophyllloceras Shimizu, 1934; =Paraphyllloceras Shimizu, 1935 (nom. nud.) (non Salfeld, 1979); Hyporbuli/es Breitroffer, 1947; Gorephyllloceras Collignon, 1949; Aphrodiriceras Mahmoud in Breit., 1952 (n.n.)]. Compressed, finely ribbed, some with periodic stronger ribs or folds. Sutures complex, lobes large and finely divided, asymmetric, 1st lateral much larger than external and 2nd lateral, saddle endings commonly not phylloid. L. Cret. (Hauteriv.-U. Cret. (Maastr.). world-wide except Boreal.—Fig. 219.1. *H. ononense (Stanton). L. Cret. (Apt.), Calif.; X0.5 (2*).

Subfamily CALLIPHYLLOCERATINAE Spath, 1927

Regularly with constrictions or flares or both (466). L. Jur. (Hett.)-L. Cret. (Alb.).

Calliphyllloceras Spath, 1927 [*Phylloceras disputabile Zittel, 1869 (=Am. demidoffi Rousseau, 1841) [Neocaliphyllloceras Besairie, 1936; Counterdielles Kovacs, 1939; Euphylloceras Drouchet-Chitz, 1953]. Smooth, involute, compressed, with rounded venter and periodic sigmoid constrictions on internal mold, with or without corresponding flares on ventral half of test; surface also with lirae, as in Phylloceras. First and 2nd lateral saddles usually triphyllic, others diphyllic. L. Jur. (Hett.)-L. Cret. (M. Alb.). world-wide.—Fig. 220, 3. *C. disputabile (Zittel). L. Jur. (Bath. or Callov.). Hun.; a,b, holotype, X0.5 (649*).

Holophyllloceras Spath, 1927 [*Phylloceras mediterraneum Neumayr, 1871 (=Am. zignodanum Orb., 1848) [Salzfeldiella Spath, 1927; Teledigiceras Kovacs, 1939]. Resembles Calliphyllloceras but constrictions affect test as well as internal mold and are more acutely sigmoid, languate, or angular, and outer half of whorl is ribbed. Saddles of sutures diphyllic except 1st lateral saddle, which becomes triphyllic in later forms. M. Jur. (Baj.)-L. Cret. (Apt.). world-wide.—Fig. 220,5. *H. mediterraneum (Neu.); a-c, X0.5 (667*).—Fig. 220,4. H. guettardi (Raspail), L. Cret. (Apt.). Fr.; type species of Salzfeldiella, 4a,b, X1; 4c, enlarged (329*).

Ptychophyllloceras Spath, 1927 [*Phylloceras feddeni Waagen, 1875] [Tatroceras Kovacs, 1939; =Neumayriceras Sorrentino, 1942 (non Rollier, 1909)]. Smooth, involute shells with broadly rounded venter crossed by periodic labial ridges, or flares, which are present even on internal mold; umbilical slope gentle. Suture saddles diphyllic and triphyllic. M. Jur. (Baj.)-U. Jur. (Tithon.), probably world-wide.—Fig. 220,6. *P. feddeni (Waagen). M. Jur. (Callov.). Cutch; a-c, X0.3 (546*).

Haplophyllloceras Spath, 1925 [*Phylloceras striige Blanford in Uhlig, 1903]. Inner whorls smooth, venter rounded; outer whorl developing flattened venter and large foldlike ribs which strengthen and sharpen in approaching venter, projected as they cross it; umbilical slope gentle. Sutures with saddle endings tending to lose phylloid form and become multiful. Ju. or Cret., Spiti sh., India-Indon.-N. Guinea.—Fig. 220,7. *H. striige (Blanford). Spiti sh.; a,b, X1 (533*).

Sowerbyceras Parona & Bonarelli, 1895 [*Am. tortilisacum d'Orbigny, 1849] [=Martelliloceras Sorrentino, 1942 (obj.) (non Schindewolf, 1925)]. Evolute, compressed, with flattened sides and venter and abrupt or stepped umbilical edge; smooth except for distant, acutely sigmoid constrictions on test and internal mold (but in some unconstricted). Sutures with short lobes. U. Jur. (chiefly Oxz-Kimm.). Eu.-N.Afr.-Anatolia-Cauc.-Persia-India.—Fig. 220,1. *S. tortilisacum (Or.,) U. Jur. (U.Oxf.), Fr.; a-c, X0.5 (330*).

Calaiceras Kovacs, 1939 [*Am. calais Meneghini, 1881]. Evolute, with rounded whorls of medium height. sides somewhat divergent; internal mold with 4 or 5 forwardly curved constrictions per whorl, increasing with growth. Sutures complex, 1st lateral saddle high and diphyllic. L. Jur. (U. Pliensb.), S.Eu.—Fig. 220,2. *C. calais (Men.). Italy; a,b, X1 (660*).

Holocallisoceras Spath, 1928 [*Lissoceras pincudae Di Stefano, 1884]. Evolute, with deep gallowoid constrictions. Sutures unknown. U. Jur. (Kimm.). Eue.—Fig. 220,8. *H. pincudae (Stef.). Sicily; a,b, X0.75 (716*).

Family JURAPHYLLOCITIDAE Arkell, 1950

[*Rhaphophyllitidae Spath, 1927 (name based on Rhaphophyllum see Adcet., non Zittel, 1884)].

Compressed, evolute, with modified body chamber which usually carries coarse ventral ribbing. A few genera are more involute but all are compressed, and a few lack ribbing. First lateral saddles diphyllic, others
Fig. 220. Phylloceratidae (Calliphylloceratinae) (p. L189).

Juraphyllites Müller, 1939 [*Phylloceras diopsis Gemmellaro, 1884*] [=Rhacophyllites Auctt. (non Zittel, 1884)]. Evolute, with sharp umbilical edge; smooth except for prorsiradiate ribs or folds on body chamber. Sinem.-Pliensb.—Fig. 221.8. *J. diopsis (Gemm.), L.Jur.(Pliensb.), Italy; 8a-c, ×0.5 (627*).

Tragophylloceras Hyatt, 1900 [*Am. heterophyllus numismalis Quenstedt, 1845; SD Buckman, 1912*] [Phyllobolites Vadász, 1907]. Evolute, umbilical

Fig. 221. Juraphyllitidae (p. L191-L192).
angle blunt; ventral half of outer whorl with falconoid foldlike ribs which become plications as they cross venter. Pliensb.—Fig. 221,7. *T. numismalis* (Quenst.); 7a,b, x0.3 (65*).

**Dasyceras Hyatt, 1900** [*Phylloceras rakosense* Herrich, 1878] [=Paradadyceras Cossmann, 1901 (obj.)]. Evolute; inner whorls smooth, outer whorl gradually developing coarse falcoïd ribs which originate close to umbilical margin and do not pass on to venter. Sinem., Eu.—Fig. 221,5. *D. rakosense* (Herrich), SE.Eu.; 5a,b, x1 (635*).

**Schistophylloceras Hyatt, 1900** [*Phylloceras auratum* Herrich, 1878] [=Kochi/tes Prinz, 1905 (obj.)]. Evolute, smooth shells with keel, which may correspond to ventral sulcus on internal mold; umbilical slope blunt. Hett., Eu.-Tibet.—Fig. 221,2. *S. auratum* (Herrich), SE.Eu.; 2a,b, x0.7 (635*).

**Paradasyceras Spath, 1923** [*Phylloceras ürmösesense* Herrich, 1878]. Smooth, compressed, evolute, with sharp umbilical angle, no keel. Hett. Eu.-N. Caled.—Fig. 221,3. *P. ürmösesense* (Herrich), SE.Eu.; 3a-c, x0.25 (550*).

**Meneghiniceras Hyatt, 1900** [*Phylloceras lariense* Meneghini, 1867]. Evolute shells with simple, forward-curved or gently sigmoid constrictions (on type species 8 per whorl); and on body chamber ventral ribbing and median row of clavi which form a serrated keel. Sinem.-Pliensb., Eu.—Fig. 221,6. *M. lariense* (Men.), L.Jur.(U.Pliensb.), Italy; 6a,b, x0.75 (660*).

**Harpophylloceras Spath, 1927** [*Am. eximius* Hauer, 1854]. Similar to *Juraphyllites* but with continuous keel. Pliensb., Eu.—Fig. 221,1. *H. eximium* (Hauer), Aus.; 1a-d, x0.75 (633*).

**Galaticeras Spath, 1938** [*Amphiceras harpoceroides* Gemmellaro, 1884] [*Amphiceras Gemm., 1884 (non Gray, 1847)]]. Shell more evolute than in any other Jurassic Phylloceratina, compressed, disoidal, with rounded-quadrate, slowly enlarging whorls on which feeble juraphyllid ribbing remains, but sutures have lost their phylloid character as in some Cretaceous forms. Pliensb., Eu.-?Cauc.—Fig. 221,4. *G. harpoceroides* (Gemm.), Italy; 4a,b, x0.5 (627*).

**Suborder LYTOCERATINA Hyatt, 1889**

[nom. correct. Askell, 1950 (pro suborder Lytoceratinae Hyatt, 1889)] [=Lytoceratidae Buckman, 1894 (ranked as suborder)]. [Both Hyatt and Buckman included Triassic genera in this division of the ammonoids, although no pre-Jurassic forms now are placed here.]

Evolute, loosely coiled, usually round-whorled shells, ornamented with growth lines and commonly flares, rarely ribbed. Sutures with few but very complex elements, with mosslike endings, usually not phylloid; septal lobe present in some. Aptychi single-valved, with shiny surface, striated centrically (*Anaptychus*) (found in situ in *Lytoceras cornucopia* Young & Bird L. Toarc. and various Cret. forms). Descended from Triassic Ussuritidae or Discophyllitidae or both, but not known from the Rhaetian (62, 63, 200). Jur.-Cret., world-wide, but especially abundant in Tethyan and Pacific realms, though occurring at certain horizons as far north as Greenland.

**Superfamily LYTOCERATACEAE Neumayr, 1875**

[non. transl. Askell, 1950 (ex Lytoceratidae Neumayr, 1875)] [non suborder]

Coiled Lytoceratina which persisted throughout Jurassic and most of Cretaceous and periodically gave off more or less uncoiled families, especially in Cret. (12). *Jur.-Cret.*

**Family PLEUROACANTHITIDAE Hyatt, 1900**

[nom. correct. Askell, 1950 (pro Pleuroacanthitidae Hyatt, 1900; validation proposed Askell, 1955, ICZN pend.).]

Lytocerataeae which combine some characters of Lytoceratina, Phylloceratina, and earliest Ammonitina, and show as well special characters of their own. *L.Jur.(Hett.), S.Eu-Tibet-Indon.*
Subfamily PLEUROACANTHITINAE Hyatt, 1900
[nom. transl. et correct. Arkell, 1950 (ex Pleuroacanthitidae
Hyatt, 1900), validation proposed Arkell, 1955 (ICZN pend.)]

Very evolute, whorls numerous, subcircular in section, becoming incipiently keeled
in adult; early whorls bearing parabolic nodes, later whorls covered with oblique
parabolic lines which are rursiradiate on sides, prorsiradiate on shoulders, and form a
long ventral sinus. Sutures with general plan and lobes of Lytoceratina but saddle
endings more or less phylloid (12, 201, 550). L./ur.(Hett.).

Pleuroacanthites Canavari, 1883 [*Am. biformis
J.deC.Sowerby, 1831 (fig’d Canavari, 1882); SD Haug, 1889] [=Pleuracanthites Zittel, 1884
(obj.)]. Only genus. Hett., Italy.—Fig. 222,1.
*P. biformis (Sow.); 1a,b, X1 (597*).

Subfamily ANALYTOCERATINAE Spath, 1927
[nom. transl. Arkell, 1950 (ex Analytoceratidae Spath,
1927)]

Inner whorls constricted; middle whorls
with parabolic lines and conspicuous parabolic
nodes; outer whorls with sigmoid
flares; adult body chamber with ventrolat­
eral spines (466, 550). L./ur.(Hett.).

Analytoceras Hyatt, 1900 [*Am. articulatus J.deC.
Sowerby, 1831 (fig’d WaeleNer, 1894)]. Only
genus. Hett., Aus.—Fig. 222,3. *A. articulatum
(Sow.); 2a-d, X1 (550*).

Family ECTOCENTRITIDAE Spath, 1926

Straight-ribbed planulate Lytoceratacea with smooth or incipiently keeled venter;
sutures complex, of lytoceratacean type but having a longer ventral lobe, with lateral
lobes more symmetrical and produced and saddle endings tending to be phylloid (466,
550). L./ur.(Hett.-Sinem.)., one genus L.

Pleuroacanthites Canavari, 1888 [*Am. petersi Hauer,
1856; SD Bonarelli, 1900] [incl. Cosmolytoceras
Spath, 1924]. Ribs fine to medium; venter broad,
smooth, flattened; whorls quadrate or rounded; no
constrictions. Hett. Aus.—Fig. 223,5. *E. petersi
(Hauer); 5a,b, X0.3 (550*).

Lyctotropites Spath, 1924 [*Ectocentrites lucini
Bonarelli, 1900]. Very evolute, constricted;
whorl depressed, rounded, with straight, large but
weak radial ribs; venter with incipient keel. (?Sub-
Cephalopoda—Ammonoidea—Lytoceratina

Lytocerataceae developing capricorn ornament. L.Jur. (Sinem.-Pliensb.).

Derolytoceridae Spath, 1927

Derolytoceras Rosenberg, 1909 [*Am. lineatus tortus QUENSTEDT, 1885; SD ROMAN, 1938] [=Dolytoceras ROMAN, 1938 (obj.), ?misprint]. Small forms, evolve, whorls only just in contact but enlarging fairly rapidly, subquadrate in section; ribbing on inner whorls fine and dense, changing suddenly to coarse and prorsiradiate, becoming foldlike across venter. Sutures as in young Lytocerataceae (466). U.Pliensb., Eu.—Fig. 224, 2. *D. tortus (QUENST.), Ger.; X2 (662)*.

Tragolytoceras Spath, 1924 [*Am. alcecinetum HAUER, 1886]. Similar to Derolytoceras but larger and with coarse ribs starting more gradually. (?)Subgen. of Derolytoceras. Sinem., S.Eu.—Fig. 224, 3. *T. alcecinetum (HAUER), Italy; X1 (42)*.

Aegolytoceras Spath, 1924 [*Lytoceras serorugatum GEYER, 1886, cited by SPATH as Lytoceras (Geyeria) serorugatum (STUR) FUCINI, 1901] [=Geyeria FUCINI, 1901 (non BUCKMAN, 1899); Fucinia TOMLIN, 1930 (obj.)]. Inner whorls round, smooth but for constrictions which are gently convex forward; outer whorl becoming compressed and developing coarse, blunt, curved ventral ribs. Pliensb., Eu.—Fig. 224, 4. *A. rugatum (STUR), Italy; 1a,b, X1 (162)*.

Family LYTOCERATIDAE Neumayr, 1875

[sic; NEUMAYR used correct form of designation for this assemblage but inconsistently used vernacular names only for some other families] [=Thysanoidae HYATT, 1867; incl. Heterolytoceratinae Spath, 1897].

Shells very evolute, generally enlarging rapidly, having whorls in contact but normally overlapping only slightly or not at all; surface ornamented with various combinations of straight or crinkled growth lines, flares, constrictions and, more rarely, plications. Sutures highly complex, with mosslike detail but few major elements; lateral lobes widely splayed and blunt or obliquely deflected at ends; external lobe short. Aptychus single-valved (Anaptychus) (466).

Jur.-Cret., world-wide.

Subfamily LYTOCERATINAE Neumayr, 1875

Whorls bearing growth lines or lamellar flares or both, corresponding commonly to constrictions on internal mold. External suture with 2 lateral lobes, of which 1st is much the larger, internal suture with cruciform dorsal lobe (466). L.Jur.-Cret. (Cenom.).

Lytoceras SUES, 1865 [*Am. fimbriatus J.SOWERBY, 1817; ICZN Opinion 130] [=Opiloceras SUES, 1865 (obj.) (non GRIEBEL, 1880, ICZN-validated L.Trias. genus; Fimbriolytoceras BUCKMAN, 1918 (obj.); Thysanoceras HYATT, 1867; Thysanolytoceras BUCK., 1905; Kallilytoceras BUCK., 1921; Crenilytoceras BUCK., 1926]. Whorls round or quadrate, covered with crinkled growth lines or riblets; some species with lamellar flares, under...
Fig. 225. Lytoceratidae (p. L194-L196).
which slight constriction usually occurs on internal mold; some with fine striation. L.Jur.(Sinem.)-U.Cret., world-wide, as far N. as Greenl. and N. Alaska.—Fig. 225.3. *L. limbatum (Sow.), L. Jur.(Pliensb.), Eng.; 3a,b, ×0.5 (65%).

Trachylytoceras Buckman, 1913 [*Am. nitidus Young & Bird, 1828] [Orchlytoceras Buck., 1926]. Smooth but for rursiradiate growth lines which stand out as irregularly spaced rings of variable size. If Orchlytoceras is congeneric, the larger species have later growth lines minutely crinkled. L.Jur.(Toarc.), Eng.——Fig. 226.3. *T. nitidum (Young-B.); 3a,b, ×1 (65%).

Ptycholytoceras Spath, 1927 [*Lytoceras humile Prinz, 1904]. Inner whorls round, outer whors depressed; sides thrown into rursiradiate folds which do not pass on to venter. L.Jur.(Toarc.), SE. Eu.—Fig. 225.5. *P. humile (Prinz), Hung.; 5a,b, ×0.7 (357%).

Hemilytoceras Spath, 1927 [*Am. immanis Oppel, 1865] [Saturnoceras Anderson, 1938 (nom. nud.)]. Inner whorls round, smooth, outer whors becoming depressed and in some developing high lamellae which bend forward over venter. U.Jur. (Oxf.-Tithon.), L.Cret.(M.Alb.), Fr.—Fig. 226.2. *H. immane (Oppel), U.Jur.(Tithon.), Eu.; ×0.7 (389%).

Pterolytoceras Spath, 1927 [*Am. exoticus Oppel, 1863]. Whors subcircular in section, enlarging very slowly, barely in contact; surface with minutely crinkled growth lines and fine irregular ribs. ?Tithon., Valang., Himalaya(Spiti sh.-Punjab.—Fig. 226.1. *P. exoticus (Oppel), Spiti sh.; 1a-c, ×0.5 (533%).

Eulytoceras Spath, 1927 [*Am. inaequallatus d'Orbigny, 1840]. Whors compressed or rounded, with regular distant fine ribs and periodic flares, all of which cross venter. L.Cret.(Hauteriv.-Barrem.), Eu.—Fig. 225.2. *E. inaequallatus (Orb.), L.Cret.(Barrem.), Fr.; 2a,b, ×1 (329%).

?Metalytoceras Spath, 1927 [*Lytoceras tribolletii Hoeneogger in Uhlig, 1883]. Finely ribbed, feebly constricted, ribs bifurcating at very acute angle. L.Cret.(Valang.), Silesia.—Fig. 227.4. *M. tribolletii (Hoeneogger); ×1 (532%).

Ammonoceratites Rafinesque, 1815 [*A. lamarcki Bowditch, 1822] [Ammonoceras Lamarck, 1822]. Large, evolute; whors almost circular, only just in contact; with dense, strongly crinkled fine ribs or growth lines. L.Cret.(U.Apt.)-U.Cret.(Chromon.), Eu.-Sinai-India-India.—Fig. 225.1. A. (A.) mahadeva (Stolizchka), U.Alb., S.India; 1a,b, ×0.25; le, ×0.5 (718%).

Argonauticeras Anderson, 1938 [*Lytoceras argonautarum Anderson, 1902]. Whors section trapezoidal, whors increasing rapidly in height; ribs weakly crinkled. (Subgen. of Ammonoceratites.) L.Cret.(U.Apt.), Fr.-Cauc.-Calif., Madag.—Fig 226.7 *A. (A.) argonautarum (Anderson), L.Cret.(U.Apt.), Calif.; 7a,b, ×0.5 (580%).

Pictetiæ Uhlig, 1883 [*Crioceras asterianum d'Orbigny, 1842]. Loosely coiled with whors not touching, section circular to depressed; body chamber may straighten; surface with feeble, irregular, weakly crinkled ribs. L.Cret.(L.Alb.-M.Alb.), W. Eu.-Madag.-India.—Fig. 225.4. *P. asteriæa (Orb.), L.Cret.(M.Alb.), Fr.; 4a-c, ×0.75 (329%).

Subfamily MEGALYTOCERATINAE Spath, 1927

Planulates forms which tend to lose lytoceratid characters of whors and sutures and to resemble perisphinctids (466). L.Jur. (Toarc.)-M.Jur.(Baj.), mainly Baj.

Megalytoceras Buckman, 1905 [*Lytoceras confusum Buck., 1881]. Early whors elliptical in section, bearing periodic flares; later whors becoming smooth and planulate, with convergent sides, rather wide umbilical area and abrupt umbilical edge. M.Baj., Eng.—Fig. 226.5. *M. confusum (Buck.); 5a,b, ×0.3 (595%).

Metrolytoceras Buckman, 1923 [*M. metretum]. Early whors unknown; middle and outer whors smooth, planulate, with flat sides. Sutures much simplified. M.Baj., Eng.—Fig. 226.6. *M. metretum; ×0.2 (65%).

?Asapholytoceras Spath, 1927 [*Lytoceras forojulianum Taramelli, 1880, cited by Spath as Lytoceras forojulianum Meneghini in Prinz, 1904]. Whors high, compressed, with fine riblets or growth lines which do not show on internal mold; umbilical angle sharp. External suture with 4 lateral lobes; dorsal lobe not cruciform. Toarc., SE. Eu.

Subfamily VILLANIINAE Arkell, nov.

Planulates retaining typical lytoceratid external sutures but lacking cruciform character of dorsal lobe and with somewhat peltoceratid type of ribbing (505). M.Jur. (Callov.).

Villania Till, 1911 [*V. densilobata]. Inner whors compressed, ribbed on sides; outer whors smooth, rounded. [Loczy's (1915, p. 422, pl. 8, 10, 13) identification of several ordinary perisphinctids with V. densilobata cannot be accepted.] M.Jur. (Callov.), Hung.-Ger.—Fig. 227.3. *V. densilobata, Hung.; 3a,b, ×0.7 (505%).

Subfamily ALOCOLYTOCERATINAE Spath, 1927

Forms with many deep constrictions, which produce some resemblance to capricorns in middle whors but pass to a smooth and more involute stage. Saddle endings of sutures tend to be phylloid (466). L.Jur. (Toarc.)-M.Jur.(Baj.).
Mesozoic Forms—Lytocerataceae

Fig. 226. Lytoceratidae (p. L194-L198).
**Alocolytoceras** Hyatt, 1900 [*Am. germaini* d’Orbigny, 1845]. Whorls passing from round to oval, rounded-square, or compressed; with about 10 deep constrictions per whorl and 4 to 20 sharp ribs between constrictions. Toarc., Eu.-Himalaya. —Fig. 227,1. *A. germaini* (Orb.), Fr.; 1a,b, X1 (330*).

**Pleurolytoceras** Hyatt, 1900 [*Am. hircinus* Schlotheim, 1820 (fig’d Quenst., 1849)]. Whorl section triangular-elliptical, with narrower venter, constrictions more numerous (17 per whorl in type) and interspaces smooth. Toarc., Eu.—Fig. 227,5. *P. hircinus* (Schloth.), Ger.; 5a-c, X1 (358*).

**Pachylytoceras** Buckman, 1905 [*Am. torulosus* Zieten, 1831]. Early whorls round, generally with numerous constrictions, which break up surface into a series of swollen ribs; later whorls becoming elliptical. In the *jurensense* group constrictions fail on middle and outer whorls, or in some species entirely, leaving whole shell smooth. Toarc.-L.Baj., Eu.-Crimea-E.Asia-Indon.—Fig. 226,4. *P. torulosum* (Zieten), Toarc., Ger.; 4a,b, X0.5 (742*).

**Lobolytoceras** Buckman, 1923 [*Am. siemensi* Denckmann, 1887]. Innermost whorls only have large swollen ribs; later whorls become compressed-elliptical with crinkled growth lines or riblets, which coarsen somewhat near aperture and develop striae. Toarc., Eu.—Fig. 227,7. *L. siemensi* (Denck.), U.Toarc., Ger.; X0.25 (605*).

**Family NANNOLYTOCERATIDAE**

Spath, 1927

Dwarf, evolute, compressed, unribbed forms, with deep constrictions. Sutures relatively simple, with long ventral lobe and 2 main lateral lobes (466). *L.jur. (U.Pliensb.)*-M.jur. (Bath.).

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**Fig. 227.** Lytoceratidae (p. L196-L198).
Mesozoic Forms—Lytoceraceae

Nannolytoceras Buckman, 1905 [*Am. pygmaeus d’Orbigny, 1846] [Polystomiceras Spath, 1924; Polystomites Spath, 1931]. Smooth, many-whorled, with varying number of deep constrictions, which are oblique to acutely sigmoid, running forward on whorl sides, backward on venter; whorl section quadrate. Baj.-Batli., Eu.-N.Afr.—Fig. 228,2. *N. pygmaeus (Orb.), Baj., Fr.; 2a-c, X1 (330*).

Fig. 228. Nannolytoceratidae (p. L199).

?Audaxlytoceras Fucini, 1923 [*Lytoceras audax Meneghini, 1881; SD Arkell, herein]. Small, evolute, smooth, compressed, with a few narrow constrictions, which are gently convex forward on whorl sides and straight over venter. U.Pliensb., Italy.—Fig. 228,1. *A. audax (Men.); 1a-c, X1 (660*).

Family PROTETRAGONITIDAE Spath, 1927

Very evolute, with circular to oval whorl section and regular radial straight or slightly curved constrictions; test smooth or with fine growth lines only. Suture with a tendency to develop one or more auxiliaries. Probably derived from Lytoceras (s.s.), young whorls of which commonly have a few strong constrictions, as in Protetragonites (466). U.Jur.(U.Tithon.)-L.Cret. (M.Alb.).

Protetragonites Hyatt, 1900 [*Am. quadrisulcatus d’Orbigny, 1840]. Whorl section circular; constrictions few, straight to slightly curved. U.Jur. (U.Tithon.)-L.Cret. (Valang.), Eu.—Fig. 229,1. *P. quadrisulcatus (Orb.), Valang., Fr.; 1a,b, X1 (329*).

Leptotetragonites Spath, 1927 [*Am. honnoratianus d’Orbigny, 1840]. Section compressed oval; 10 or more constrictions to whorl, with strong, rounded rib in front. L.Cret.(Berrias.-Valang.), Fr.—Fig. 229,2. *L. honnoratianus (Orb.), Valang., Fr.; X0.75 (329*).

Fig. 229. Protetragonitidae (p. L199-L200).

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Hemitetragonites Spath, 1927 [*Am. crebrisulcatus Uhlig, 1883]. Whorl section more or less round but tending to be slightly flattened on sides and venter; constrictions straight or slightly curved. Suture more incised than in Protetragonites. L. Cret. (Haasteriv.-M. Alb.), Fr.-C.Eu.-Madag.—Fig. 229,3. *H. crebrisulcatus (Uhlig), Barrem., Aus.; 3a-c, X1 (530*).

Family TETRAGONITIDAE Hyatt, 1900

Distinguished from Lytoceratidae by having several auxiliary elements in the suture and from Protetragonitidae, its ancestor, in having usually more auxiliaries and being more involute, with less circular whorl section. Shell lirate, striate or smooth, rarely folded or strongly ribbed. Although developed Gaudryceratinae and Tetragonitinae are very distinct, the Lower Cretaceous members are all very closely related and subfamilial separation, as recommended by Breistroffer, seems adequate (53, 214, 230, 238, 571). L.Cret. (Barrem.)-U.Cret. (Maastr.).

Subfamily GAUDRYCERATINAE Spath, 1927

[Includes Hypogaudryceratinae Shimizu, 1934]

Typically with rounded and depressed or oval whorl section, becoming higher with age, very fine to coarse lirae. With more or less symmetrically bifid saddles and a single saddle in the internal suture, but there are several exceptions (53, 214, 230, 238, 571). L.Cret. (Barrem.)-U.Cret. (Maastr.).

Eogaudyceeras Spath, 1927 [*Am. numidus Coquand in Sayn, 1890]. Evolute, whorl section round to rounded-trapezoidal; fine, dense slightly sinusuous lirae; no constrictions except on inner whorls. Suture with 2 or more auxiliaries, descending in straight line. Barrem.-M. Alb., W.Eu.-C.Eu.-N.Afr.-Madag.—Fig. 230,1. *E. numidus (Coquand), U.Apt., Fr.; 1a,b, X1; 1c, X2 (214*).

Eotetragonites Breistroffer, 1947 [*E. raspalli]. Differs from Eogaudyceeras only in its slightly less regularly bifid saddles of suture, its emphatic oblique dense constrictions and (in some species only) its more angular whorl section. Internal suture still has only one saddle. ?Barrem., U.Apt.-L. Alb., S.Eu.-C.Eu.-?Madag.-N.Afr.—Fig. 230,3. *E. raspalli, U.Apt., Fr.; 3a,b, X1 (229*).

Anagaudyceeras Shimizu, 1934 [*Am. sacya Forbes, 1846] [=Paragaudyceeras Shimizu, 1934]. Inner whorls with circular to rather depressed but not angular whorl section, becoming higher than wide on outer whorls; shell with very fine more or less straight but prorsiradicate lirae, rarely smooth; some bearing periodic weak constrictions with strong collar; body chamber usually with more or less strong foldlike ribs. U-Alb.-Maastr., S.Eu.-C.Eu.-N.Afr.-Madag.-S.India-Japan.—Fig. 230,4. *A. sacya (Forbes), Cenom., S.India; X1 (620*).

Mesogaudryceeras Spath, 1927 [*Am. leptonema Sharpe, 1855]. Early whorls compressed, later whorls less so, sides convex, venter narrowly rounded. Sinuous lirae and absence of constrictions distinguish it from Anagaudyceeras and Zelandites and nature of early whorl section from Gaudryceras. Suture with shallow external lobe. Cenom., Eng.-Greenl.—Fig. 232,1. *M. leptonema (Sharpe), Eng.; 1a,b, X1 (440*).

Zelandites Marshall, 1926 [*Z. kaiparaensis] [=Paranaulites Shimizu, 1926; Hypogaudryceeras Shimizu, 1934; Anazaeldites Matsumoto, 1938]. Small; initially with round whorl section but rapidly becoming more high-whorled and involute; compressed, nearly smooth and with weak to strong, straight or sinusous, radial or prorsiradicate constrictions in some shells marked on outside by a threadlike rib. Suture with very asymmetrical 1st lateral lobe in adult. May include a series of compressed offshoots of other genera but no real distinction is seen between species groups of different dates. U.Alb.-Maastr., N.Afr.-SE.Afr.-S.India-Japan.-Fig. 230,5a,b. *Z. kaiparaensis Camp., N.Z.; 5a, X1.5; 5b, X7 (274*).—Fig. 230,5c. Z. varuna japonica Matsumoto, Camp., Japan; X1 (659*).

Paraizaubertella Matsumoto, 1943 [*P. kawakitana]. Like Anagaudyceeras at first but whorls rapidly become very depressed, with broad rounded ribs on last whorl. ?Cenom., Japan.—Fig. 231,5. *P. kawakitana; 5a,b, X4 (659*).

Gaudryceeras GROSSOUVRE, 1894 [*Am. miitius Hauer, 1866; SD Boule, Lemoine & Thevenin, 1906] [Epigaudryceeras, Pseudogaudyceeras Shimizu, 1934; Neogaudyceeras Shimizu, 1935]. Lirae coarser than in Anagaudyceeras, close or distant, simple or branching, moderately to very sinusous; last whorl may bear variable close or distant strong foldlike ribs. Suture with retracted auxiliaries. May be divisible into subgenera but nominal groups cited in synonymy are not well differentiated. Turon.-Maastr., world-wide except N.Eu.-N.Am.—Fig. 230,6. G. varugurense Kossmat, Santon., S.India; 6a-c, X1 (238*).

Vertebrites Marshall, 1926 [*V. murdochii]. With many more whorls, depressed to a later stage than in rest of family; shoulders tending to be nearly angular; lirae very fine, branching regularly at shoulder into still finer ones. Internal suture (at least in type species) with several saddles, decreasing in size to umbilical suture. Santon.-Maastr., N.Afr.-Madag.-S.India-N.Z.-Japan-Calif.-Mex.-Chile.—Fig. 230,2. *V. murdochii, Camp., N.Z.; 2a, X1; 2b, X2; 2c, X4.5; 2d, X3 (274*).

Subfamily KOSSMATELLINAE Breistroffer, 1953

Depressed or oval whorl section with
Fig. 230. Tetragonitidae (p. L200).
FIG. 231. Tetragonitidae (p. L200-L203).
large regular lateral bulges, derived from approximation of the constrictions of *Eoto-
tragonites*; lirate test and suture as in Gau-
dryceratinae (53, 214, 230). *L.Cret. (L.Alb.)-
U.Cret. (L.Cenom.).

**Kossmatella** Jacob, 1907 [*Am. agassizianus Pictet, 1847*. *L.Alb.-L.Cenom., Fr.-C.Eu.-Sinai-S.India-
Calif.-Tex.-Mex.*—Fig. 231,3. *K. agassiziana*
(Pictet), M.Alb., Fr.; 3a,b, X1; 3c, enlarged
(346*).

Subfamily **TETRAGONITINAE** Hyatt, 1900

[Incl. *Gabbioceratinae* Breistroffer, 1953]

Typically with square or trapezoidal whorl section, at least during some growth stage; shell usually smooth but some lirate or striate; constrictions usually present, strongly projected on sides and recurved on venter but forming no feature on outside of test. Suture with varying number of aux-
illary saddles, internal suture with 2 or more; typically major saddles are irregularly trifid. Derived from *Eotetragonites* (50, 214,
238, 571). *L.Cret. (Apt.)-U.Cret. (Maastr.).

**Gabbioceras** Hyatt, 1900 [*Am. batesi Gabb, 1869
(non Trask, 1855). =*Gabbioceras angulatum
Anderson, 1903, ICZN pend.] [*Jaubertia
ceras Jacob, 1907; Jaubertella Jacob, 1908*. Whorl sec-
tion round to depressed with a lateral angle dis-
tinct at some growth stage, usually very sharp;
with or without constrictions, test lirate (for
-Calif.—Fig. 231,4. *G. latecarinatum* (Anthula),
U.Apt., Cauc.; 4a-c, X1 (581*).

**Tetragonites** Kossmat, 1895 [*Am. timothea
nus Pictet, 1847*. Moderately evolute; whorl section
usually squarish but may be round; oblique con-
strictions usually present. Suture with auxiliaries
in straight line and 4 saddles in internal suture.
*U.Apt.-U.Cenom., Eu.-Sinai-Zululand-S.India-
Japan-Tex.-Mex.—Fig. 231,1. *T. timotheanus*
(Pictet), U.Alb., Fr.; 1a,b, X1; 1c, enlarged
(346*).

**Epiniceras** Spath, 1925 [*Tetragonites epigono
us Kossmat, 1895*. Differs from *Tetragonites* primar-
ily in suture having a retracted suspensive lobe
and, usually, more auxiliaries. L.Turon.-Maastr., N.
Afr.-W.Afr.-Madag.-S.India-Japan-W.Austral.-N.Z.-
Peru.

**E. (Epiniceras)** [=*Eoepigniceras, Neoepigni-
ceras Shimizu, 1935 (nom. nud.). Moderately
involute, whorl section square or trapezoidal. L.
Turon.-Camp., distr. as for genus.—Fig. 231,
2. *E. (E.) epigonum* (Kossmat), Camp., S.India;
2a-c, X1 (238*).

**E. (Saghalinites)** Wright & Matsumoto, 1954
(ex Shimizu, 1935, nom. nud.) [*Am. cala Forbes,
1845*. Very evolute, whorls increasing very
slowly in height; section round to octagonal;
regular weak or strong sinusoidal constrictions.
*U. Santon., Camp., Tunis.-Madag.-S.India-Sakhali.
—Fig. 232,2. *E. (S.) cala* (Forbes), Camp., S.
India; X1 (238*).

**Pseudophyllites** Kossmat, 1895 [*Am. indra
Forbes, 1845*. Early whorls as in *E. (Epiniceras)*
but later more involute, without constrictions and with
much higher and more rounded whorl section; test
finely striate. Suture very finely divided. Camp.,
Family MACROSCAPHITIDAE Hyatt, 1900

Distinctly ribbed or spinose derivatives of Lytoceratidae, with tendency to uncoil. Suture more or less as in Lytoceratidae and invariably ornate. Because initial coil of hooked *Macroscaphites* is indistinguishable from normally coiled *Costidiscus*, these genera must be placed in the same family;
Mesozoic Forms—Spirocerataceae

Fig. 234. Acantholytoceras longispinus (UHLIG), L. Cret.(Barrem.), Silesia; ×0.5 (530*) (p. L205).

Macroscaphites apparently gave rise to various heteromorph offshoots by reduction and disappearance of normally coiled part of shell (229, 530). L.Cret.(Barrem.-U. Apt.).

Costidiscus UHLIG, 1882 [*Am. recticostatus d'ORBIGNY, 1841]. Normally coiled, rather evolute, with dense strong straight radial ribs, which in some species are thickened on umbilical edge or even tuberculate; some forms also with distinct small ventrolateral tubercles; constrictions with enlarged ribs in front and behind usually present. Suture with sharp ends to all lobules; internal lobe with single point. Barrem.-L.Apt., S.Eu.-C.Eu.-Sinai-Mex.—Fig. 233,1. *C. recticostatus (Orb.), Barrem., Silesia; 1a,b, ×0.75; 1c,d, ×1 (530*).

Macroscaphites MEEK, 1876 [*Scaphites yvani Puzos, 1831]. Septate whorls exactly as in untuberculate or tuberculate species of Costidiscus (but usually smaller) followed by uncoiled body chamber with straight or even recurved shaft and final hook. Barrem.-Apt., S.Eu.-C.Eu.-N.Afr.—Fig. 233,3. *M. yvani (Puzos), Barrem., Silesia; ×0.75 (530*).

Acantholytoceras Spath, 1923 [*Hamites (Pictetia) longispinus UHLIG, 1883]. Whorls not in contact, whorl section oval; periodic enlarged ribs with long hollow umbilical, lower and upper lateral and ventrolateral spines. Barrem., C.Eu.-C.Eu.—Fig. 234,1. *A. longispinus (UHLIG), Barrem., Silesia; ×0.5 (530*).

Family CICATRITIDAE Spath, 1927

Known only in a few examples of a single species which seems to be derived from Costidiscus but differs primarily in its asymmetric suture (3). L.Cret.(Apt.).

Cicatrites ANTHULA, 1899 [*C. abichi]. Very evolute with depressed whorl section; regular flattened umbilical bullae each cover 3 of the dense straight ribs and presumably formed bases of long hollow spines. Suture with bifid elements but irregular and with asymmetric 1st lateral lobe. L.Apt.-U. Apt., Fr.-Cauc.—Fig. 233,2. *C. abichi, U.Apt., Cauc.; 2a-c, ×1 (581*).

Superfamily SPIROCERATAEAE

Hyatt, 1900

[nom. transl. ARKELL, 1950 (ex Spiroceratidae Hyatt, 1900)]

Uncoiled ammonoids of Jurassic. Possibly offshoots derived from Lytoceratina and hence classifiable with this suborder (12, 201, 355). L.Jur.(Pliensb.)-U./ur.(Oxf.).

Family ARCUCERATIDAE Arkell, 1950

Shell in form of open bow, enlarging very slowly; no ventral sulcus; ribs never oblique. Sutures unknown (12, 355). L.Jur. (Pliensb.).

Arcuceras POTONIE, 1929 [*A. marthae]. Only genus. Pliensb., Eu.—Fig. 235,4. *A. marthae POTONIE, Ger.; × (360*).

Family SPIROCERATIDAE Hyatt, 1900

[=Parapatoceratidae BUCKMAN, 1926]

Suture lines simple, consisting of 3 lobes

Fig. 235. Arcuceratidae, Spiroceratidae (p. L205-L207).