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PART I

BOTRYCERAS, A REMARKABLE NAUTILOID FROM THE SECOND VALUE OF NEW MEXICO

Abstract

Botryceras enigma is an apparent endoceroid cephalopod known from a remarkable endosiphuncle in which sheaths sparingly developed or preserved and the simple cones terminate in a group of centrate tubes, rather irregular, but divided anteriorly into two groups. No forms or close affinities are are known, but the structure indicates tentative assignment to the order Endoceratida.

Introduction

The form here described is a long, straight, very slender endosiphuncle, partly fibrous in texture and unusually rich in carbonaceous material peripherally, showing one good endosiphosheath, with a surface faintly angled in cross section, terminating centrally in a group of tubes that lack diaphragms. Only a single weathered endosiphuncle is known. The form is so remarkable that its description was delayed for several years in the hope of obtaining additional material, a hope that has so far remained unfulfilled. Indeed, the possibility that this could be some other organism than a cephalopod was considered, a possibility that has found no support and is, indeed, opposed by the presence of one well-preserved conical sheath. Though this form has the aspect of an endoceroid endosiphuncle, it must be noted that its abundant carbonaceous material is peculiar; it is not impossible that more material may show it to belong to some other group, perhaps the Michelinoceratida. Investigations still unpublished (Flower, in press) showed that *Narthecoceras,* which everyone including the writer had accepted as an endoceroid, belongs instead to the order Michelinoceratida. This was first indicated by Silurian material showing that the necks are short, the rings thin and homogenous, and cameral deposits are present, all features alien to the order Endoceratida. Further examination showed that though the siphuncle possesses a large, heavy endosiphuncle with seemingly simple endocones, it differs materially in habit from endosiphuncles of associated Endoceratida in Red River faunas: growth increments are much thinner, sheaths are poorly differentiated, microstructure reveals a peculiar fibrous texture alien to that of the Endoceratida, and the tube shows peculiarities of some complexity and variety, the most remarkable of which is the development of diaphragms from which "brackets" extend forward and are, in some species at least, short forward-projecting tubular structures of unknown function. The family Narthecoceratidae is regarded as stemming from the Troedssonellidae (*see* Flower, 1962), which are Michelinoceratida that develop a long, slender lining in the siphuncle instead of annuli. That family appears abruptly in the closing phase of Canadian deposition in the form of the genus *Buttsoceras,* which is now known from the Odenville limestone of Alabama, the Florida formation of the El Paso group of New Mexico and western Texas, the high Garden City limestone of northern Utah, and zone J and possibly also K in the Wahwah limestone of western Utah, and which has been recognized more recently in material from the high Arbuckle limestone of Oklahoma in association with *Ceratopea unguis (fide* Yochelson). *Troedssonella* itself is thus far known only from the upper *Orthoceras* limestone where it occurs (Jaanusson, 1960) in the Folkeslunda limestone of the late Lasnamagian.

There is seemingly a considerable stratigraphic gap between the Troedssonellidae and the Narthecoceratidae. The Narthecoceratidae are recognized as containing two subfamilies. The Narthecoceratinae, which has a central tube, is represented by *Narthecoceras,* which appears in the Red River faunas, apparently simultaneously from Greenland to western Texas but continues into the early Middle Silurian of the James Bay lowland, and *Calhounoceras,* a genus known as yet only from the Cape Calhoun beds of Greenland. The subfamily Donacoceratinae contains forms in which the tube is strongly eccentric, with cones short on the side to which the tube is closest but greatly extended forward on the opposite side. Here are placed the genera *Tasmanoceras* of the Ordovician of Tasmania, formerly assigned to the Endoceratida, and *Donacoceras,* known from the early Middle Silurian of east-central Canada.

With these matters in mind, the peculiar texture and fibrous composition of the endosiphuncle of *Botryceras* may indicate some other affinities in the Cephalopoda than the order Endoceratida, but the genus is tentatively assigned there inasmuch as there is no clear evidence of its connection with any other cephalopod lineage.

Oddly, one genus has been described as agreeing with *Botryceras* in having several subcentral tubes grouped closely together. This is the genus *Tallinoceras* Balashov (1960), based upon T. *lasnamense,* from beds in the Ordovician supposedly equivalent to the *Echinosphaerites* limestone of the Baltic. This is a straight, slender endoceroid with macrochoanitic necks, regarded as having three or four tubes, the central one the largest, but all traversed by diaphragms grouped at the center of the siphuncle. The illustrations suggest that the structure here may be misinterpreted and that there may be instead one large tube, but cross sections cutting considerably curved diaphragms may present the aspect of several tubes instead of one.*

The position of the genus is uncertain. Balashov assigned it

* It may be noted that elsewhere a similar appearance of several tubes grouped together in an endosiphuncle is demonstrably the result of a section cutting diaphragms. This has been observed in sections of *Dartonoceras* and one piloceroid genus as yet unpublished.

to the Emmonsoceratidae, apparently on the basis of the macrochoanitic necks. It shows no other resemblance to *Emmonsoceras,* which develops a ventral boss in the siphuncle around which endocones are draped, developing crescentic endocones, terminating in a tube free from diaphragms. The precise position of *Tallinoceras* in the endoceroids is not yet fully demonstrated. The simplicity of the endocones in section suggests possible relationship to the Endoceratidae, though elsewhere in that family diaphragms are not developed in the endosiphotube.

The new family Botryceratidae is proposed for *Botryceras;* this nomenclatorial step merely expresses the morphological isolation of the genus. In the absence of knowledge of the structure of the siphuncle wall, one cannot be sure that it is a true endoceroid or, if an endoceroid, whether it should be assigned to the Proterocameroceratina or to the Endoceratina (Flower 1955, 1958). The one known species occurs in the Second Value formation, which contains a fauna of Red River aspect; it is pre-Richmond and is believed by the writer to equate with the late Trenton and Eden of eastern North America. At the present time, we know no true members of the Proteracameroceratina, which suborder the genus suggests in the complexity of the tubes of the endosiphuncle, above beds of Chazyan (Marmor) age.

The family Botryceratidae may be defined as characterized by simple endocones terminating in a group of central tubes in one or two groups, without diaphragms.

Genus BOTRYCERAS FLOWER, n. gen.

Genotype: *Botryceras enigma* Flower, n. sp.

Thus far, only the genotype is known and is represented by a single, rather weathered, endosiphuncle. It is straight and very slender, shows a general texture of longitudinal fibers, and contains considerable carbonaceous material. Good sheaths are not preserved generally, though the type shows one prominent sheath near the anterior end. Tubes have thick carbonaceous walls and vary somewhat in pattern. Apically, they are close to the assumed dorsum and show one large tube on the dorsum with smaller ones irregularly grouped on its ventral side. Adorally, the tubes are separated into two groups, one above the other, each group containing several types. Several sections show that the tubes lack diaphragms.

Discussion.—The position of this genus is not yet clear. From the general nature of the endosiphuncle, one would assume this to be a highly aberrant and specialized endoceroid, and this may prove to be the true interpretation. It must be noted, however, that the texture of this form is very different from most endoceroids, and it is not impossible that this genus could prove to be a highly aberrant stock related to the Narthecoceratidae, which, from other material, we have found to be specialized Michelinoceratida rather than Endoceratida. All that can be said for certain is that this cephalopod is so peculiar that, as a straight, slender siphuncle containing groups of tubes centrally, it is the basis of a family Botryceratidae; proposing this name does no service to the problem of determining the affinities of this remarkable form. One endoceroid genus, *Tallinoceras* Balashov (196o), was described as containing three or four central tubes crossed by dia phragms. The problem of the affinities of this inadequately known genus has already been discussed. Also, there is no apparent relationship with *Dideroceras,* in which necks are similarly lengthened but endosiphuncles are generally regular and quite simple.

Botryceras enigma Flower, n. sp.
Plate I (entire)

The holotype and only known specimen consists of an endosiphuncle 235 mm long, very slender, increasing from 19 and 21 mm to an estimated 28 and 3o mm. The weathered side is illustrated, as showing the characteristic linear texture of this form; the opposite side is poor, showing also linear texture, and the real exterior is not seen except in a very few places. There is a suggestion of distant septal ridges, but they are so incompletely preserved that their slope and spacing cannot be determined; consequently, it is not possible to identify dorsum or venter with certainty. It is here assumed that the tubes lie dorsad of the center. What appears to be the margin of the endosiphocone anteriorly is an exceptionally prominent sheath, the calcite within darker than that at the outside, as is shown by the cross section, taken at *a* on figure 1 and shown in figure 7, which shows two groups of tubes near the center and a third smaller tube. A cross section at *b,* its two sides shown in figures 3 and 4, shows the sheath slightly eccentric, closer to the supposed dorsum than to the venter, with two groups of tubes within, each group cuneate in section, and with dark walls, largely vertical, dividing each region into several smaller tubes. Figure 5 shows a part of the exfoliated surface of the sheath, which is obscurely ridged longitudinally, at least at this point. A natural break at *c* shows again two groups of tubes, but division of each group into smaller tubes is not evident here. A cut at *d* has its anterior and apical surfaces shown in figures 8 and I 1. Here the two groups of tubes are joined and are no longer distinguishable; the walls of individual small tubes are thick and the tubes are irregular in cross section. A longitudinal section between *d* and *e* of figure i has its two surfaces shown in figures 9 and 1 o. The plane of the section is not quite parallel to the tubes, which appear intermittent on the surfaces, but there are no regular diaphragms. A cross section at *e* shows a somewhat similar pattern, but here there appears to be one large tube surrounded by several smaller ones. A natural break between *e* and *f* is shown in figure 14; here longitudinal sections are seen of several of the tubes, and no diaphragms are apparent. Farther apicad, at f, occur the two surfaces shown in figures 15 and 16; here there is one large tube with a few smaller ones, the structure being partly obscured by a break. At g occurs the section shown in figure 17, where the large tube is more dorsal in position, with several smaller ones below. The most apical cross section obtainable, at *h,* is shown in figure 18, where there is a large dorsal tube, somewhat askew in cross section, with several smaller tubes adjacent to it below, the whole pattern being most irregular.

The whole siphuncle shows much dark carbonaceous material and a pattern of longitudinal fibers. Except near the anterior end, where one prominent sheath is evident, sheaths are most obscure. There are traces of blades, shown particularly in figure 13, and less complete traces are in figures 8, 11,

and 12. Figures 15 and 16 show faint concentric structures which might represent sheaths, but they are close and poorly defined. Oddly, fibers appear transverse in the lower part of figures 17 and 18.

Discussion.—This siphuncle is unique in internal structure, showing central groups of tubes that are at first dorsal, with a large dorsal tube and smaller ones on its ventral side, later forming a more irregular grouping, and still later separated anteriorly into dorsal and ventral groups. The abundant carbonaceous material and the general structure of longitudinal fibers should serve as a ready means of identifying this form in the field. We have thus far had only the holotype and one fragment so poor that I am uncertain of its identity with this form. The present description has waited some years for publication in the hope of obtaining additional material, a hope so far unfulfilled.

Type and occurrence.—Holotype, no. 1136, from a 2-foot basal sandy limestone of the Upham limestone, transitional with the Cable Canyon sandstone below, Second Value formation, Montoya group, from the Cooks Range, New Mexico.

PART II

AN ENDOCEROID
FROM THE MOHAWKIAN OF QUEBEC

Abstract

A large endoceroid, *Cameroceras alternatum,* is described from strata of Black River age from the province of Quebec.

Introduction

The specimen here described was collected by Dr. T. H. Clark who submitted it to me for study, for which I am most grateful. It is from beds of Black River age at St. Raymond, Quebec. It is a further contribution to our knowledge of endoceroids in the Odovician, a matter on which available material is scant, owing to the large size of specimens and the difficulty of extracting them from the containing beds, commonly hard and massive limestones. It may be noted that Black River beds of northwestern New York contain largely true *Vaginoceras,* which is found also at Ottawa and at the Paquette Rapids of the Ottawa River. It is known north to Cape Calhoun and occurs (Troedsson, 1926) in beds then attributed to the base of the Cape Calhoun formation but may better be placed with the underlying Gonioceras Bay formation. Oddly, the dominant endoceroids of the Platteville limestones are forms with simple tubes, subcircular in section, terminating variously but without the compression of the cones apically or their termination in a vertical tube supported by two vertical blades.

Cameroceras alternatum Flower, n. sp.
Plate 2, figs. 1-7

This is a large endoceroid remarkable for (1) rhythmic alternation of zones of long and short camerae and (2) an exceptionally rapidly expanding early portion of the shell, which becomes more slender adorally. The type preserves 57 cm of phragmocone increasing in width from 75 to 165 mm; the basal height is 65 mm; adorally, the dorsum is incomplete, but height is obviously considerably less than the width. There are an additional 80 mm of a living chamber, incomplete adorally.

The shell surface bears fine transverse depressions or striae, 2-3 mm apart separated by flat elevated interareas. Sutures are transverse. Septa vary rhythmically in spacing, with intervals of camerae 4-5 mm in length, separated by longer intervals in which camerae average 19 mm in length. A basal 140 mm interval shows camerae 3-5 mm long, followed by a *17* cm interval with ten long camerae, a 60 mm interval with short camerae, a 160 mm interval with long camerae, and a 30 mm anterior interval with short camerae; the last three camerae are exceptionally short, suggesting that this part of the shell represents a mature phragmocone.

At the base of the type, the section is depressed, measuring *75* by 65 mm, containing a siphuncle touching the venter but not flattened ventrally, 40 mm wide and 36 mm high. In a length of 50 mm, the shell increases to 100 by go mm, containing a siphuncle 50 by 60 mm. In the anterior part of the phragmocone, free parts of septa and the siphuncle are destroyed. The siphuncle wall is holochoanitic, though the weathered ventral surface shows necks that are apparently less than the length of a camera. The anterior 40 mm of the phragmocone lacks any endosiphonal structure. Apicad of this region, the endosiphocone is slightly in excess of 150 mm long, terminating in a central tube from which extend faint horizontal blades. The type shows the siphuncle extending apicad of the preserved septa and shell wall but it does not attain the apex, though from the outline of the shell, the apex was probably not more than another 100 mm apicad of the known portion.

Discussion.—The horizontal blades and the centrally terminating tube place this species with Platteville and Red River *"Endoceras"* rather than with *Vaginoceras,* which dominates the Black River faunas of northwestern New York, Ottawa, and the Paquette Rapids. I have seen a form somewhat like this in the Lowville beds of Ottawa, which had very closely spaced septa, though rhythmic alternation of longer and shorter camerae was less apparent, but the specimen was weathered and fell apart along the septa when I tried to collect it. The resulting jigsaw puzzle was too much, and the specimen was not retained.

Type and occurrence.—The holotype, in the Redpath Museum of McGill University, is from the Black River beds of St. Raymond, Quebec, probably Leray or more properly Chaumont rather than Lowville, collected and submitted for study by Dr. T. H. Clark.

PART III

ENDOCEROIDS
FROM THE CANADIAN OF ALASKA

Abstract

Beds regarded as of Late Canadian age in Alaska have yielded endoceroids comprising four species, four new genera, three of which constitute the new family Yorkoceratidae, *Yorkoceras, Sewardoceras,* and *Telleroceras.* A fourth genus, *Kugeloceras,* is tentatively placed in the Proterocameroceratidae.

Introduction

The endoceroids here described were collected by Dr. C. L. Sainsbury in connection with an investigation of the Teller quadrangle, York district, Seward Peninsula, Alaska. The region shows evidence of (1) Lower Canadian Ellesmeroceratidae, not included in the present study, and (2) a group of very unusual endoceroids, which seem Middle Canadian, or more probably from their specializations, Upper Canadian, in aspect. These beds, on which finer stratigraphic divisions do not now seem possible, may represent a single general fauna. The endoceroids are remarkable, consisting of (1) *Kugeloceras,* a short endosiphuncle with a very blunt apex, represented by several specimens, all very short, and (2) a series of remarkable endoceroid siphuncles with somewhat expanded segments, segments nearly transverse and thus apparently well removed from the venter. These vary, but three species and three genera are recognized, while one unnamed specimen is distinct from all the others. They may be summarized as follows:

Yorkoceras discordium.—Segments short, siphuncle exterior with fine close transverse annuli as in the exterior of *"Cycloceras";* endocones short, broadly expanding, simple.

Sewardoceras tellerense.—Segments convex, longer, endocones long, sinuate in longitudinal section, steepening marginally and centrally.

Telleroceras undulatum.—Here segments present the aspect of the exterior of an annulated orthocone, but septa join the expanded parts of the segments. Sheaths show rhythmic variation in the distal part of the endocones, which are apparently turned strongly outward, then after a resting stage are first steeply inclined forward and, as growth progresses, gradually turn outward again.

KUGELOCERAS FLOWER, n. gen.

Genotype: ***Kugeloceras obtusum*** Flower, n. sp.

This is an endoceroid known only from endosiphuncles of distinctive form. The apex is bluntly and broadly rounded, giving way quite abruptly to an anterior tubular part which is three times the length of the blunt apex at the most. The rounded apex is longer ventrally than dorsally. Oblique septal ridges swing forward on the venter. Faint secondary ridges may represent the termination of septal necks; if so, the necks are probably short as in the Proterocameroceratidae, but proof is needed from specimens retaining sectionable siphuncle walls. Apical ends show a perforation, seemingly marking the tip of the tube; it is uncertain that this condition is original; slight weathering or solution prior to burial is a possible cause. The endosiphocone is simple and subcircular, as is its external cross section, and terminates in a simple tube just dorsad of the center of the siphuncle. Cross sections show considerable replacement, with simple radial markings; one specimen shows four blades arranged in a cruciform pattern.

Discussion.—The short bullet-shaped form of the endosiphuncle is without parallel elsewhere in the endoceroids. Fortunately, several specimens of the genotype are available, suggesting the specimens to be mature. The suggestion of short necks, on the basis of which this genus is tentatively assigned to the Proterocameroceratidae, is of course not strictly conclusive, but it is the best suggestion of relationship offered by the present available material.

Kugeloceras obtusum Flower, n. sp.

Plate 4, figs. 1-9, 15

This species is based upon portions of four siphuncles showing a broadly rounded apex beyond which the siphuncle is nearly tubular. The holotype (pl. 4, figs. 1-3, 8) is a specimen showing a blunt, rounded, slightly oblique tip, the rounded apex 6 mm long ventrally and 4 mm dorsally, at the adoral end of which the siphuncle is 11 mm, expanding to 1$_2$ mm in the remaining 16 mm. The surface is marked with finely incised oblique lines, the most prominent of which are 4-5 mm apart, though somewhat fainter lines occur, most apparent dorsally, about one third the distance forward from one strong line to the next. These lines together pertain to the siphuncle wall structure, and the stronger probably indicate septal ridges, but it is uncertain whether the fainter lines represent the limit of the neck or the ring. An anterior section shows a tube dorsad of the center and numerous fine, radiating lines, most indistinct, among which more prominent lines representing blades are so indistinct that their pattern cannot be ascertained.

A second specimen, a paratype (pl. 4, fig. 4, U.S.N.M. No. 160198), has essentially the rounded apex and later tubular form of the holotype. It was sectioned vertically and shows in the longitudinal surface traces of the endosiphosheaths. The surface shown is a transverse longitudinal section. Of particular interest is the slight apical indentation marking the tip of the endosiphotube.

A second paratype (U.S.N.M. No. 160199, shown in pl. 4, figs. 5-7) is of similar general size but shows somewhat different proportions from the two previously described specimens, having a deeper, more steeply inclined rounded apex beyond which the siphuncle expands slightly more rapidly. The specimen, 18 mm long, has an apex 4 mm long dorsally and 6 mm ventrally, expanding to only 9 mm at its anterior end and expanding in the remaining length of the siphuncle to 12 mm. Four prominent incised bands occur 4-5 mm apart but between them are several fainter incised bands, most prominent on the dorsal side of the first segment beyond the rounded apex. The anterior end shows the tube dorsad of the center, fine radiating lamellae of which four, two vertical and two horizontal, make a cruciform pattern. This specimen could conceivably represent a distinct species, but the differences may, in the absence of more specimens, be reasonably interpreted as variation within the species.

A fourth specimen is figured only in cross section (pl. 4, fig. 15); it shows only a short apical fragment, agreeing in roundness with the holotype and the second paratype, but no additional features. The anterior end, cut, shows cruciform blades against a background of fainter radial markings.

Discussion.—What little can be deduced from the present evidence of this species as to its position in the Endoceratida has been noted under the generic discussion. It is not altogether clear whether the last paratype, with a smaller apex and a siphuncle somewhat conical rather than tubular, should be considered conspecific or not, data on variation in siphuncle proportions in Endoceratida being practically nonexistent. It has been found, however, that siphuncles alone of slender endoceroids show less difference in proportions than do whole shells, and these differences may prove to be specific. There seems no point, however, in coining another name for this specimen at the present time. The four specimens are from a single association, which is of course really meaningless in terms of specific decisions, in spite of much nonsense written to the contrary.

Types.—Holotype and three paratypes, U.S. National Museum, Nos. 1601 97-160120.

Occurrence.—From limestones of probably late Canadian age, west of King River, 2.6 miles north of Cape York, altitude 1225 feet, Univ. Trans. Merc. Coord., zone 3; E 386, 120 m; N. 7,260 850 m. Teller (B-5) quadrangle, 1/63, 360 scale, Alaska. U.S.G.S. collection D903-CO, U.S.G.S. locality 61-ASn-371.

FAMILY YORKOCERATIDAE FLOWER, n. fam.

Here are placed endoceroids known as yet only from siphuncles that are strongly annulated, resembling shells formerly assigned to *"Cycloceras."* Siphuncles are slender, straight, slightly depressed to circular in cross section. Septal ridges show that the septa join the siphuncle at neither the point of greatest expansion nor of the maximum contraction of the segment. That the septal ridges and the annuli are little inclined, if at all, suggests that these siphuncles were located close to the center of the shell rather than close to the margin, or else that septa and sutures slope strongly forward from venter to dorsum so that segmentation of the siphuncle passes through a part of the septum that is essentially transverse.

Three genera are here included. Of these, *Yorkoceras* shows short endocones with simple conical surfaces. *Sewardoceras* shows endocones that are sinuate in longitudinal section. *T ellerocerasshows* endocones the peripheral parts of which show rhythmic alteration between margins extended strongly forward and others that are slightly recurved. Again the pattern is somewhat undulate as seen in longitudinal section.

The affinities of the Yorkoceratidae are yet somewhat uncertain. If the siphuncle wall here figured is correctly attributed, the family belongs in the Proterocameroceratina. At present, there is no described genus close to the Yorkoceratidae. However, there are somewhat similar siphuncles, though annulations are more oblique and the tube is quite close to the dorsum, in the Jeffersonian part of the El Paso group. One such form was briefly described (Ulrich, Forerste, Miller, and Unklesbay, 1944) as *McQueenoceras franklinense.* This form is not a true *McQueenoceras* and will eventually be recognized as a distinct genus. It is specialized by having the endosiphuncle apparently extended forward and thickened on one side and for this reason was attributd to *McQueenoceras.*

Tasmanoceras was described by Teichert and Glenister (1952) from the Ordovician of Tasmania as an endoceroid with the siphuncle segments expanded and convex in profile between the septa, and with endocones greatly extended forward on one side of the siphuncle. In outline of segments and in the structure of the endosiphuncle, this genus is very similar to the Silurian *Donacoceras.* It has been found that Do*nacoceras, Tasmanoceras, Narthecoceras,* and *Calhounoceras* constitute the family Narthecoceratidae and that they are not endoceroids, as was formerly supposed for both *Tasmanoceras* and *Narthecoceras,* although their endosiphuncles are remarkably like those of the endoceroids in aspect; this is, however, homeomorphy. *Narthecoceras* has been found to have short septal necks, thin homogeneous rings, and thin cameral deposits; homogeneous rings and cameral deposits are unknown in the Endoceratida. Further study shows the endosiphuncles to differ materially from those of endoceroids in habit *(see* Flower, 1964A), fine structure of the cones, and some remarkable specializations within the tube.

YORKOCERAS FLOWER, n. gen.

Genotype: *Yorkoceras discordium* Flower, n. sp.

This endoceroid is known as yet only from the siphuncte. The ectosiphuncle is lost, but the surface of the endosiphuncle shows low, rounded, closely spaced annuli, directly transverse, and thus fails to indicate the dorsum or venter.

The siphuncle is broadly depressed in section; the endosiphocone is short and conical and terminates in a small, central, slightly depressed tube. No diaphragms crossing the tube are known. An anterior section shows a pair of horizontal blades; an apical section shows blades irregular, apparently more numerous, but obscure; also, simple sheaths are evident.

Discussion.—Though not much is known of the blade pattern of this genus, it is unique among endoceroids in that the siphuncle shows low but conspicuous closely spaced annuli, very much closer and sharper, though their elevation is not great, than in *Tasmanoceras.* Clearly, the endocones are not materially steepened on one side of the siphuncle, as in that genus.

Yorkoceras discordium Flower, n. sp.

Plate 3, figs. 4-8

The type is a siphuncle 79 mm long, increasing in that length from 10 and 12 mm to 17 and 19 mm and bearing on its surface close, rounded annuli with rounded concave interspaces; throughout the length of the type, there are four annuli in a length of 10 mm. The anterior end of the specimen shows the endosiphocone, which is 14 mm deep, the tip being centrally located and terminating in a tube only partly exposed, but it shows no trace of diaphragms. A cross section just apicad of the endosiphocone shows the tube small and depressed, and from it two blades pass laterally to the siphuncle margin. A section near the apex shows a similar depressed tube, a considerable series of growth lines of endocones, and some faint radial markings, among which clear blades cannot be made out. It is evident that one of the surfaces shows radial bands suggesting blades that are nearly vertical, but the traces that remain fail to show a convincingly bilaterally symmetrical pattern.

Holotype.—U .S. National Museum, No. 160201.

Occurrence.—U.S.G.S. locality 61-ASn-448. Head of Mint River, altitude 725 feet, northern flank of York Mountains, Univ. Trans. Merc. Metric Coord. zone 3: E 393, 590; N7, 266, 530 m. Teller (B5) quadrangle, Alaska.

SEWARDOCERAS FLOWER, n. gen.

Genotype: *Sewardoceras tellerense* Flower, n. sp.

This endoceroid is known from endosiphuncle fragments. The endosiphuncle is slightly depressed in section, and segments are gently convex in outline, with septal ridges in the concavities. Segments are essentially transverse, not inclined, and identification of dorsum and venter is uncertain. Endocones are sinuate in vertical section, steep centrally, curving to a broader cone at midlength and steepening again distally; there is no rhythmic variation in the slope or extent of the distal part. The tube is central and small; one specimen shows a suggestion of diaphragms in the tube, but it is not strictly conclusive. There is indication of a trifid blade pattern.

Discussion.—This genus has expanded siphuncle segments like those of *Yorkoceras* but longer and more gently rounded. Unlike *Yorkoceras,* the endocones are sinuate in vertical section and long and slender. The sinuate cones suggest those of *Telleroceras,* but there is no suggestion of the rhythmic variation in the slope of the distal parts of the cones which characterizes that genus. A further difference is found in the fact that in *Telleroceras,* the septa join the siphuncle in the middle of the convex part of each segment rather than in the concave portion.

Sewardoceras tellerense Flower, n. sp.

Plate 3, figs. 1-3; Plate 4, figs. 10-12

The holotype (pl. 4, figs. 11-12) is a portion of siphuncle with an anterior 40 mm sectioned longitudinally, apparently oblique to the horizontal plane, expanding from 12 to 16 mm in that length, and an apical portion 16 mm long, weathered above, but showing at its anterior end a cross section 14 mm wide with an estimated height of 12 mm.

The anterior end shows gently convex siphuncle segments, 4.5 to 5.0 mm long. The section shows numerous endocones, fairly simple apically, but adorally with the apex steep, the middle part more rapidly expanding, the distal part steepening again, and with a suggestion of rhythmic variation in steepness of the sheaths here. The tube, shown apically, has dark walls and no apparent diaphragms. The cross section intersects several sheaths of variable clarity but shows no clear blade pattern.

A paratype (pl. 4, fig. 10) is a portion of an endosiphuncle from an earlier part of the shell showing smaller diameters; it is 60 mm long. In the anterior 40 mm, it expands in the plane of the section from 10 to 12 mm; one side is incomplete apically. Sheaths are steep centrally, more gently sloping and more rapidly expanded in the middle portion; the distal parts are not clearly preserved. One side shows, as in the holotype, short segments slightly convex in outline.

A third specimen, also a paratype (pl. 3, figs. 1-3), is a portion of a siphuncle etched from the matrix showing segments of a similar outline and proportion. The specimen is 11 and 12 mm across at the base, expanding to a width of 14 mm, with the height estimated at 12 mm. It retains parts of seven segments, averaging 6.5 mm long. A joint passes obliquely through the specimen, displacing the parts on either side from one another, but it is evident that the segments are broadly and gently convex between the septal ridges, which are nearly transverse. The anterior end shows a small tube, central, with two lateral blades, not quite horizontal, a portion of a third median blade, suggesting a trifid blade pattern such as prevails in a number of endoceroid genera.

All from limestones regarded as late Canadian, from the Teller (B5) quadrangle, 1/63, 360, Alaska.

Holotype.—U .S.N.M. No. 160202, U.S.G.S. collection D909-CO (61-ASn- 7o), from the northwest flank of ridge on southeast side of tributary of Cassiterite Creek, altitude 1325 feet. Coordinates: r000m Univ. Trans. Merc. grid, zone 3, E402,426 m; N7, 263, 274 m.

First paratype.—U.S.N.M. No. 160203, U.S.G.S. collection D907-CO (61-ASn-386), limestone east of King River on tributary 2.6 miles north of coast, altitude 400 feet, coordinates: w00 Univ. Trans. Merc. grid, zone 3, E389,810 M; N7,259,3 0 m.

Second paratype.—U.S.N.M. No. 160204, U.S.G.S. collection D904-CO (61-ASn-242a), limestone southwest side of Cassiterite Peak, altitude 1750 feet, coordinates: Univ. Trans. Merc. grid, zone 3, E406,790 m; N7,261,430 m.

Sewardoceras? sp.

Plate 4, figs. 13, 14

Our single specimen of this form is a portion of weathered phragmocone containing a siphuncle; in all, 70 mm long. The siphuncle is circular in section, expanding from 10 to 11 mm in 40 mm in the same length; a horizontal section through the siphuncle shows the conch expanding from 29 to 31 mm. Septa are close, with two camerae occupying a length equal to the siphuncle diameter from 9 mm apically to 10 mm adorally. The cross section of the conch is evidently slightly depressed, but exact dimensions cannot be ascertained, the shell being too incomplete from weathering, but it would appear that the siphuncle is appreciably removed from the venter.

The siphuncle wall is well preserved, and part of the specimen was used to make a thinsection; this shows, in spite of dolomitization, necks that are largely hemichoanitic in length, supplemented by thick rings with a sharply differentiated inner (siphonal) layer. Septa join the siphuncle just apicad of the point of maximum expansion of each segment.

The endosiphuncle is largely recrystallized but shows a short endosiphocone scarcely longer than the diameter of the siphuncle, its anterior surface slightly sinuate in longitudinal section, and reminiscent of that of *Sewardoceras tellerense.*

Discussion.—It was hoped that this specimen might be identified with isolated endosiphuncles, but while it shows some resemblance to *Sewardoceras tellerense,* proportions are enough different to cast doubt on the specific and even the generic identity of the present specimen; it seems unsafe to attribute the structure shown by the siphuncle wall to *Sewardoceras.* There are also slight apparent differences in the configuration of the siphuncle segments, which add to this doubt. The present specimen, being the only endoceroid in the collections from the Canadian of Alaska showing the siphuncle wall, is, nevertheless, important enough to be figured and described, though giving it a specific name would have no point.

Figured specimen.—U.S. National Museum No. 160205, from Canadian light gray dolomite, U.S.G.S. collection D421-CO (61-ASn-221B), "Ordovician limestone on crest of ridge east of Lost River," 4500 feet north of hill 2035. Coord: 1000 m. Univ. Trans. Merc. grid, zone 3, E401260 m, N. 259610, Teller (B5) quadrangle, 1 /63,36o, Alaska.

TELLEROCERAS FLOWER, *n. gen.*

Genotype: *Telleroceras undulatum* Flower, n. sp.

This genus is known only from endoceroid siphuncles, which are straight, slender, and subcircular in section and show low round annuli, giving the siphuncle the aspect of the form-genus *Cycloceras* in the broad sense. Annuli are very faintly oblique. Apically, septal ridges join the siphuncle in concavities so that each segment is slightly swollen near its apical end, but adorally, the ridges are on the anterior third of the convexities.

The endosiphuncle shows in the young stages rather short, rapidly expanding cones that become sinuate, as seen in longitudinal section, upon approaching the siphuncle margin. At rhythmic intervals, corresponding to the concavities of the siphuncle exterior initially, the margins of the sheaths curve outward and meet the siphuncle edge nearly horizontally, to be followed quite abruptly by a new series that is steeply inclined forward initially and merges adorally into a second horizontal curvature. Astonishingly, at the anterior end of the mature endosiphuncle, there is a long interval of sheaths steep marginally, but more rapid expansion and some outward curvature is evident at the extreme anterior limit. At maturity, the small central tube is calcite-filled, and diaphragms may occupy the base of the endosiphocone.

Discussion.—Affinities of this form are inferrential in the absence of definite evidence of the siphuncle wall. The exterior of the siphuncle does, however, suggest the short necks of the Proterocameroceratina. Endocones that turn horizon tally at rhythmic intervals upon approaching the siphuncle margin are not known in other Endoceratida, but it may be noted that cones slightly sinuate in longitudinal section have been found in *Vaningenoceras,* a genus thus far known only from the Chazy limestone.

Yorkoceras is somewhat similar in the exterior of the siphuncle, but the segments are shorter, and this siphuncle looks more like a *"Cycloceras"* with more strongly elevated and much more closely spaced annuli. That genus is probably related; it shows short, rapidly expanding cones, but they are not undulate in pattern in longitudinal section nor is there the rhythmically repeated horizontal bending of their margins.

Telleroceras undulatum Flower, n. sp.

Plate 3, figs. 9-16

The holotype is a portion of a siphuncle 110 mm long; the surface shows low round annuli, obscure apically, more prominent adorally; the siphuncle expands from 18 mm apically, where expansion from the annuli is negligible, to the anterior end, where an annulation expands the siphuncle from 24 to 25 mm. Adorally, septal ridges lie on the anterior third of the expansions; apically, the condition is more obscure, but they seem to lie at the anterior end of the concave interspaces instead. Annuli and septal ridges are very faintly oblique.

A section shows in the apical part endocones with sheaths extending from a small, central, round tube. At rhythmic but rather irregular intervals, the central parts of the sheaths are clear; they form rather broad, short cones. Near the periphery, however, more sheaths are evident. They are sinuate in vertical section and at regular intervals, corresponding to the concavities in the siphuncle surface, the sheaths curve strongly outward, joining the siphuncle wall essentially horizontally. (Pl. 3, fig. 14-16.)

The anterior 45 mm are very different. Here is seen an endosiphocone, the anterior margins obliquely truncated, paralleling the generally short, broad cones of the early part, but over most of its length the endosiphocone is very slender, and structures in its wall are not clear. Near its tip, it is filled with several short subconical diaphragms. Apparently at maturity, the endosiphuncle develops a long, slender series of cones that, however, curve abruptly outward near their tips. (Pl. 3, fig. 11.)

A second fragment of a siphuncle shows an earlier growth stage, a portion 36 mm long expanding from 13 to probably 15 mm. The exterior is ridged but the surface is weathered, and interpretation of septal ridges and annuli is uncertain, except that it is evident that there are segmental expansions. The section made, normal to the weathered surface, shows extensive replacement centrally, but marginally fine lamellae can be seen that curve, meeting the wall horizontally instead of obliquely at intervals 14-15 mm apart. Though this is an earlier growth stage and a fragment of smaller diameter than the earliest part of the holotype, the rhythmically repeated marginal features occur somewhat farther apart; in the holotype, they are 10-12 mm apart. This form might, then, be a different species, but it is certainly closely related to the holotype. Its assignment to this species is therefore tentative.

A third fragment, also tentatively included, is a small weathered fragment 30 mm long, slightly depressed, 7 and 8

mm across basally, 9.5 and 11 mm wide adorally. It shows low annuli on which are septal ridges, 4-5 mm apart. The endosiphuncle shows a central tube but no peripheral structures are retained, and assignment rests on the rather distant annuli.

Holotype.—U.S.N.M. No. 160206, loc. 61-ASn-173, collection D907-CO, 1.4 miles east of site of Lost River Mines, on crest of divide between tributary of Cassiterite Creek, head of Tin Creek, and easterly drainage. Altitude, 1457 feet. Universal Mercator grid, zone 3: E 402330 m; N 7,263,630 m. Teller (B-5) quadrangle, Alaska.

Paratype.— U. S. N. M. No. 160918, U.S.G.S. loc. 6 -ASn-386, collection D1420-CO, east of King River, along tributary 2.6 miles north of coast, altitude 475 feet. Univ. Merc. grid, zone 3, E 390, 100 m; N 7,259510 m. Teller (B-5) quadrangle, Alaska.

Third specimen.—U.S.N.M. No. 160919, U.S.G.S. loc. 61-ASn-1 58a, collection D894-CO, on south side of hill between headwaters of Cassiterite Creek, altitude 1125 feet, Univ. Merc. grid zone 3, E 401, 850 m; N 7,265,200 m. Teller quadrangle, (B-5) Alaska.

UNDETERMINED ENDOCEROIDS

It should be noted that the collection also contains some simple endoceroid siphuncles of undetermined generic affinities.

Locality 61-ASn-242a, which yielded the type of *Sewardoceras tellerense,* also yielded a small fragment of a siphuncle, smooth except for slightly oblique septal ridges, circular in section, with a circular cone and apparently a central tube. This could belong to the genus *Proendoceras,* but similar simple endosiphuncles appear in *Cotteroceras* and may even represent some genus not as yet recognized. The fragment is slender, 6 mm across the anterior end, and 23 mm long.

Another small endosiphuncle is from locality 61-ASn-371, in association with the types of *Kugeloceras obtusum.* This is a small silicified siphuncle expanding from 4 to 6 mm in diameter in 21 mm; the surface lacks septal ridges. The interior is poor, but there is a suggestion of a tube that is slightly off center.

PART IV

A CHAZYAN CEPHALOPOD FAUNA FROM ALASKA

Abstract

A small association in the Seward Peninsula of Alaska has yielded one new species of *Franklinoceras* and two new species of *Proteoceras.* The association is indicative of equivalence with the Crown Point and Valcour limestones of the Chazyan of the Champlain Valley.

Introduction

A small collection from the Seward Peninsula of Alaska has yielded orthoconic cephalopods, including one new species of *Franklinoceras* and two of *Proteoceras. Franklinoceras* Flower *(in* Flower and Teichert, 1957) has been known formerly only from *F. elongatum,* from the Crown Point limestone of the Champlain Valley. Though I had regarded the genus Frank*linoceras* as a compressed modification of the more abundant *Ruedemannoceras,* it now seems likely that the compressed rather than the broad section, by which *Franklinoceras* is set apart from *Ruedemannoceras,* may be a primitive feature, hearkening back to ancestral Plectronoceratina. As yet, it is still separated from any ancestral types by a considerable stratigraphic gap comprising the entire Middle and Upper Canadian, as well as the Whiterock Stage. Nevertheless, it is worth noting that any further finds of *Franklinoceras* outside of the range of the one previously known specimen would probably be in older than in younger beds. The broad section of *Ruedemannoceras* is found also in *Madiganella* of the Ruedemannoceratidae and is continued into the Mohawkian genus *Ulrichoceras* of the Cyrtogomphoceratidae.

It now seems probable that *Cyrtogomphoceras* is directly derived from *Ulrichoceras,* rather than being derived through *Strandoceras* as indicated in my earlier diagram *(see* Flower and Teichert, 1957, p. 39), and that forms in which the shell section becomes narrow, including some species of *Cyrtogomphoceras* itself, are derived.

Proteoceras, Flower (1955), based on *Oanocems perkinsi* Ruedemann of the Chazy limestone, is known from several described species from the Chazyan of the Champlain valley and one species yet undescribed from the lower Copenhagen limestone of Nevada, which Cooper (1956) considers equivalent to the Arline limestone of the Appalachian valley and places in the Porterfield Stage. Thus *Proteoceras* is known to make a first appearance in the Middle Chazy Crown Point limestone but extends into higher beds. It should be noted that in spite of extensive material, no Proteoceratidae, the first of the Michelinoceratida to develop expanded siphuncle segments, have been found in the Whiterock Stage. Thus the combination of *Franklinoceras* and *Proteoceras* is one strongly indicative of equivalence with the Chazy Crown Point and Valcour limestones.

The material here described was collected by Dr. C. L. Sainsbury of the U.S. Geological Survey in connection with mapping of the Teller quadrangle in the Seward Peninsula of Alaska and was submitted for study by Dr. Reuben Ross. The fauna has been found in one small region and is believed (Ross, *fide litt.)* to be a small residue of deposits that have else where been removed by erosion; it occurs in a klippe of a thrust plane. The material, comprising U.S.G.S. collection 4280-CO (locality 63-ASn-860), is from the top of hill 1830, west of Mint River, coordinates: l000 m. Univ. Trans. Mercator Grid, zone 3, E394, 780 m; N271, 110 m, Teller (C5) quadrangle, scale 1/63,360, Alaska.

Genus FRANKLINOCERAS FLOWER 1957

Franklinoceras tellerense Flower, n. sp.

Plate 5, figs. 1, 2

The holotype and only reasonably complete specimen consists of a silicified phragmocone 60 mm long expanding in height from 10 to 16 mm in the first 25 mm and to 22 mm in the remaining 35 mm. The section is compressed but with one side weathered; corresponding widths can only be estimated as about two thirds the height. Clearly, the cross section is more narrowly rounded on the venter, which is only faintly concave and very nearly straight, than on the dorsum, in which curvature is convex and more evident. The type contains 16 camerae in the basal 25 mm, and 32 in the adoral 32 mm. Septa slope dorsorad and show vertically amazingly slight curvature. Cameral deposits are developed, thinning adorally, and make difficult the exact measurements; in much of the specimen they suggest, on the silicified and weathered surface, double septa. The siphuncle lies between the venter and the center. In the basal part, a segment 1.5 mm long expands from 1.5 to 4.0 mm; the segments are short, broad, broadly expanded, with broad areas of adnation, and essentially like those of the younger stages of *Ruedemannoceras.* Silicification precludes any study of layers in the rings, which are evidently of moderate thickness. Where the expanded segment is 4 mm high, it lies 5 mm from the venter and 7 mm from the dorsum.

A second specimen is a mere fragment, failing to show the siphuncle, and is identifiable mainly by the very close, slightly oblique, nearly flat septa.

Discussion.—This species shows the siphonal structure of the Ruedemannoceratidae, and siphuncle segments are essentially identical with those of *Ruedemannoceras* at commensurate growth stages. The compressed cross section shows, however, that the species is to be referred instead to the genus *Franklinoceras,* in which the only previously known species shows the siphuncle at a slightly later growth stage. A peculiarity of the species is the extremely close and only very

faintly curved septa, which recall the condition found in the young but not later stages of *Ruedemannoceras;* commensurate early stages of *Franklinoceras elongatum,* the only previously known species, have not yet been observed.

A first glance at this specimen suggested a member of the Ellesmeroceratida and, particularly, of the Ellesmeroceratidae. It may be suggested that *Franklinoceras,* being compressed, is possibly more primitive than the better known *Ruedemannoceras,* as in this respect it approaches the ancestral Plectronoceratidae in a way that *Ruedemannoceras* does not.

Holotype.—U.S. National Museum No. 142794. Specimen attributed to the species, 142795. Both are from U.S.G.S. collection 4280-CO.

Genus PROTEOCERAS FLOWER 1955

Proteoceras obliquum Flower, n. sp.

Plate 5, figs. 3-8, 10-12

This is a *Proteoceras* slightly depressed in section, very faintly exogastric, then straight adorally, with septa that are nearly transverse apically but slope dorsorad strongly in the adoral part.

The holotype (pl. 5, figs. 3-5) is a conically expanding phragmocone increasing in height from 6 to 18 mm in 57 mm. Originally, a lateral surface was exposed (pl. 5, fig. 5) showing the above dimensions, and apically a small portion of three camerae, weathered, so that it seems to decrease to a blunt tip 5 mm long, containing three camerae, which is adventitious. In the first 12 mm, there are 6 camerae; adorally, 6 camerae occupy a length equal to the adoral shell height of 18 mm.

At a shell height of 6 mm, the siphuncle has biconvex segments, more expanded ventrally than dorsally; a segment here is 2 mm long, expanding from 1.0 to 1.8 mm; the expanded part lies 2 mm from the venter and 5 mm from the dorsum. Adorally, the siphuncle becomes more eccentric; anteriorly, a segment 3 mm long expands from 2.5 to 3.0 mm and lies 3 mm from the venter and 12 mm from the dorsum. Siphonal deposits in the type are somewhat obscured, but ventrad of the siphuncle there are clear episeptal deposits throughout; they thicken apically as usual, and are there supplemented by hyposeptal deposits. There are deposits also dorsad of the siphuncle, but they are there supplemented by inorganic calcite, and silicification of both makes difficult the reconstruction of the exact organic pattern. Siphonal deposits are preserved, thin adorally, thick apically, that agree closely with those previously reported for the genus.

A paratype that was etched from the matrix (pl. 5, figs. 7, 8, 10-12) is a portion of a phragmocone of 40 mm containing 15 camerae. The dorsum shows a slightly concave profile, clearer here than in the holotype, and the anterior end shows a clear cross section; it is 17 mm high, 19 mm wide, with the siphuncle here 2.5 mm, 5.5 mm from the venter, 10.0 mm from the dorsum. Cameral deposits show pronounced thickening on the venter. The specimen is weathered to progressively greater depths on the venter from the anterior to the apical end and shows at midlength slender, biconvex, siphuncle segments. Cameral deposits are well developed, but siphonal deposits, if originally present, are lost.

A third fragment tentatively assigned to the species is shown on Plate 5, fig. 6. It is a fragment of phragmocone, weathered largely below the middle, but retaining a few siphuncle segments; it is 42 mm long and retains parts of 16 camerae. Weathering has exaggerated the original slight exogastric curvature.

Discussion.—The rather rapid conical expansion, the faint endogastric curvature, and the markedly oblique adoral septa make this species distinctive. Presumably an anterior part of the phragmocone, which may be safely inferred from the advanced condition of the cameral and siphonal deposits of the type, was essentially straight and developed segments tubular in outline, as has been found true for other species of the genus. The type shows adoral simplification of the form of the siphuncle segments.

Types.—Holotype, paratype, and a specimen tentively assigned to the species, here figured, U.S. National Museum 142797-142800. From U.S.G.S. collection 4280-CO, as noted above.

Proteoceras tubulare Flower, n. sp.

Plate 5, fig. 9

This is a small, very slender, straight *Proteoceras* with transverse septa and rather long camerae. The type is a portion of a phragmocone, considerably weathered, evidently slender, increasing in height from 12 to 15 mm in 30 mm. Septa are transverse and show slight curvature; a septum is between 2 and 3 mm deep where the shell height is 14 mm. Here the siphuncle is 2 mm high at the septal foramen; the segment, 4 mm long, is straight dorsally, slightly convex ventrally, expanding from 2 to 3 mm. At the septal foramen, it is 4 mm from the venter and 7 mm from the dorsum. Parts of five such segments are preserved; at this growth stage, as in other forms, cameral and siphonal deposits are not evident. There are three and a half camerae in a length equal to the adoral shell height. The specimen is inadequate to show the cross section clearly; evidently, however, height and width are nearly, if not completely, equal.

Discussion.—This form is distinctive in being a small species, for submature segments occur at a shell height of 15 mm, with transverse sutures, and a shell showing only the gentlest enlargement. In both enlargement and the transverse sutures, it contrasts markedly with the associated *P. obliquum.* Early possibly cyrtoconic stages have not been found.

Holotype.—U.S. National Museum No. 142796, from U.S.G.S. collection 4280-CO.

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PLATES 1-5

PLATE 1

Botryceras enigma Flower, n. sp.

P. 4

1. Weathered surface of holotype, × 1, part of an endosiphuncle showing part of the surface of an endosiphocone at the anterior end; letters indicate the position of various other figures, which follow, all × 2

Apical end of cut at *d,* showing two groups of tubes

3, 4 Anterior and apical sides of cut at b, showing one dark prominent sheath and two groups of tubes at the center

5. A side view of a section apicad of *b,* showing part of the surface of the dark prominent sheath, here exfoliated, and showing faint longitudinal ridges and one prominent angle

6. Looking into a natural irregular break across the siphuncle at *c*

7. Break at *a,* looking at the base of the anterior piece

8. Adoral surface of cut at *d*

9, 10 Opposite sides of a longitudinal section between *d* and *e;* the anterior end is below

11. Apical side of the cut at *d;* two groups of tubes are not distinct

12, 13. Cut at *e;* adoral side in 12, apical side in 13

14. A longitudinal break between *e* and *f,* showing the tubes to be free of diaphragms

15, 16. Anterior and apical sides of the cut at *f*

17. Apical side of the cut at *g*

18. Apical side of the cut at *h*

No. 1136, from the basal sandy bed of the Upham limestone, transitional into the Cable Canyon sandstone below; Montoya group, Cooks Range, New Mexico.

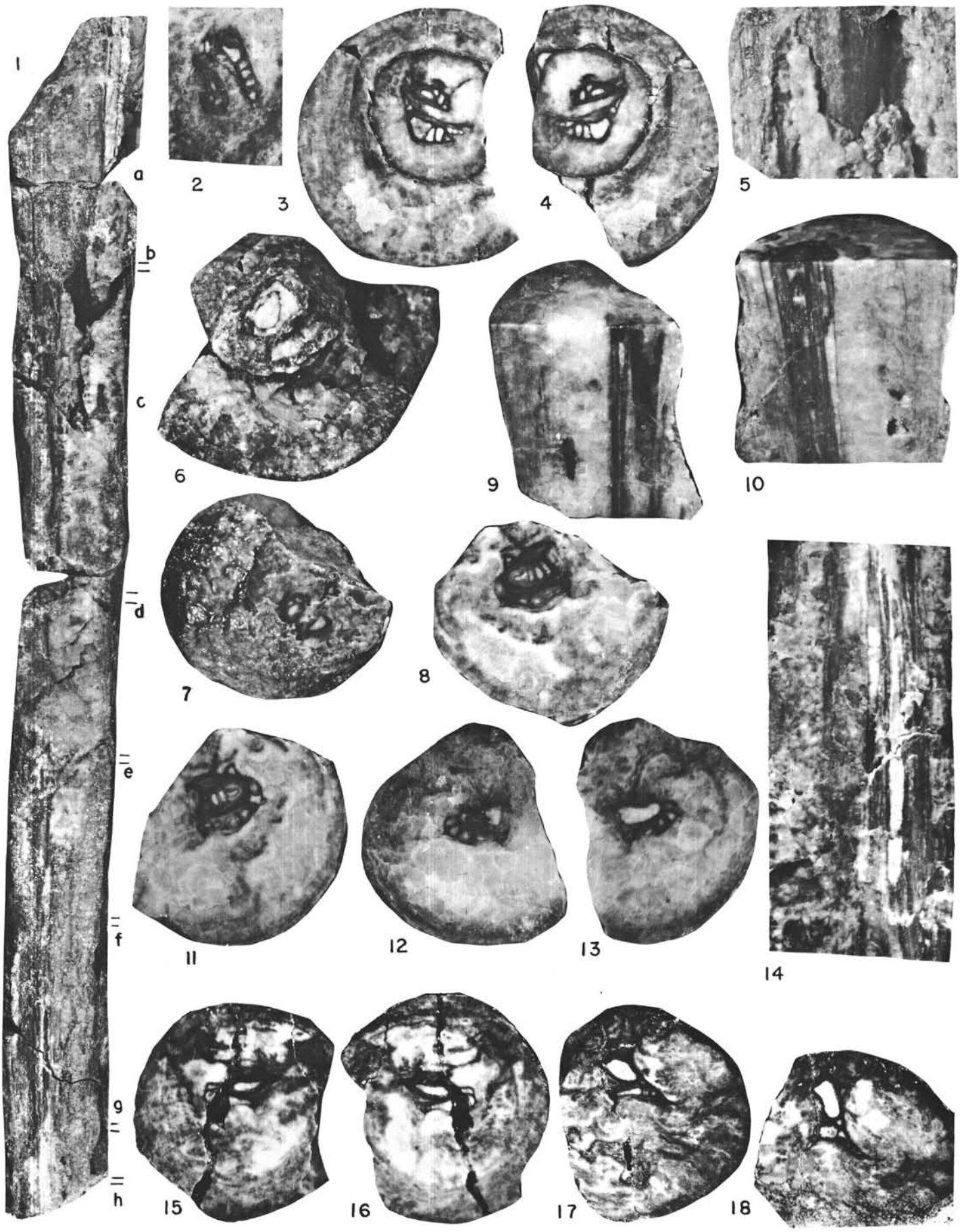
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PLATE 2

Cameroceras alternatum Flower, n. sp.

P. 9

1. Enlargement, about × 9, of a portion of the siphuncle wall
2. Portion of the venter, × 1, showing aspect of septal necks on a weathered surface
3. Vertical section from the apical part of the specimen, × o.6; venter at right
4. Cross section from second break from the anterior end of the specimen; × 0.4
5. Cross section at anterior break at middle end of the apical part (middle of fig. 3) before sectioning it vertically; × 0.4
6. Cross section at base of specimen; × 1
7. Entire specimen, reduced about × 0.4, length 65 cm, from the ventral side

Holotype, Redpath Museum, McGill University, from the Black River Limestone, St. Raymond, Quebec.

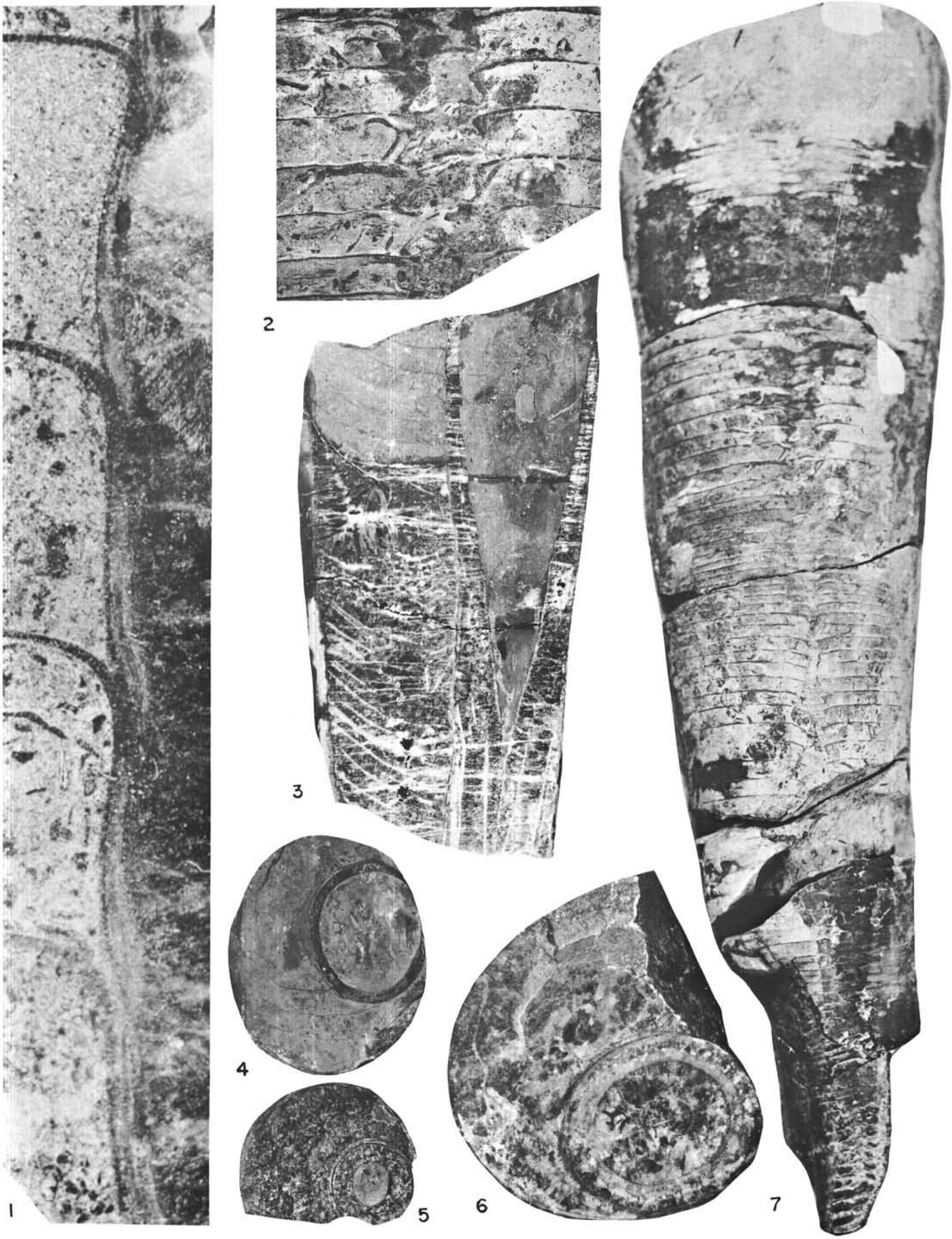
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PLATE 3

Figures *Page*

1 - 3. *Sewardoceras tellerense* Flower, n. sp. 15
A paratype, U.S.N.M., no. 160204, a portion of a siphuncle.

1. longitudinal view, × 2.

2. adoral end, × 2 showing trifid blade pattern.

3. apical end, showing tube but without preserved blade pattern.

U.S.G.S. collection D904-CO, (6 I -ASn-242a).

4 - 8. *Yorkoceras discordium* Flower, n. sp. 15
Holotype, U.S.N.M. no. 160201.

4. longitudinal view, from one of the more strongly rounded sides, assumed to be lateral.

5. longitudinal section of the anterior portion, × 2.

6. cross section near base, × 2.

7. 8. cross sections near midlength, × 2, showing section of tube and traces of blades tube.

Two sides of a single cut. U.S.G.S. collection D902-CO.

9 - 16. *Telleroceras undulatunt* Flower, n. sp. 16

9. Assumed ventral side of holotype U.S.N.M. 160206, loc. 61-ASn-173.

10. lateral view, venter to right.

11 horizontal longitudinal section of the anterior part, × 2, showing long anterior endosiphocone with secondary filling at base. Both from the holotype.

12, 13. opposite sides of a section of a specimen tentatively assigned to the species, × 2, U.S.N.M. 160918 U.S.G.S. loc. 61-ASn-386, collection D1420-CO, showing rhythmic changes in distal parts of the cones, suggesting radial canals.

14, 15. apical part of the holotype, × 1.5, the apical part shown at two different levels and showing different aspects of endosheaths in longitudinal section.

16. same, × 2, ground to the tube, which is small, irregular, and evident only at two points, at the anterior end and below the middle.

U.S.G.S. collection D 420-CO, loc. 61-ASn-386 (paratype) and D907-CO, loc. 6 -ASn- 73 (holotype).

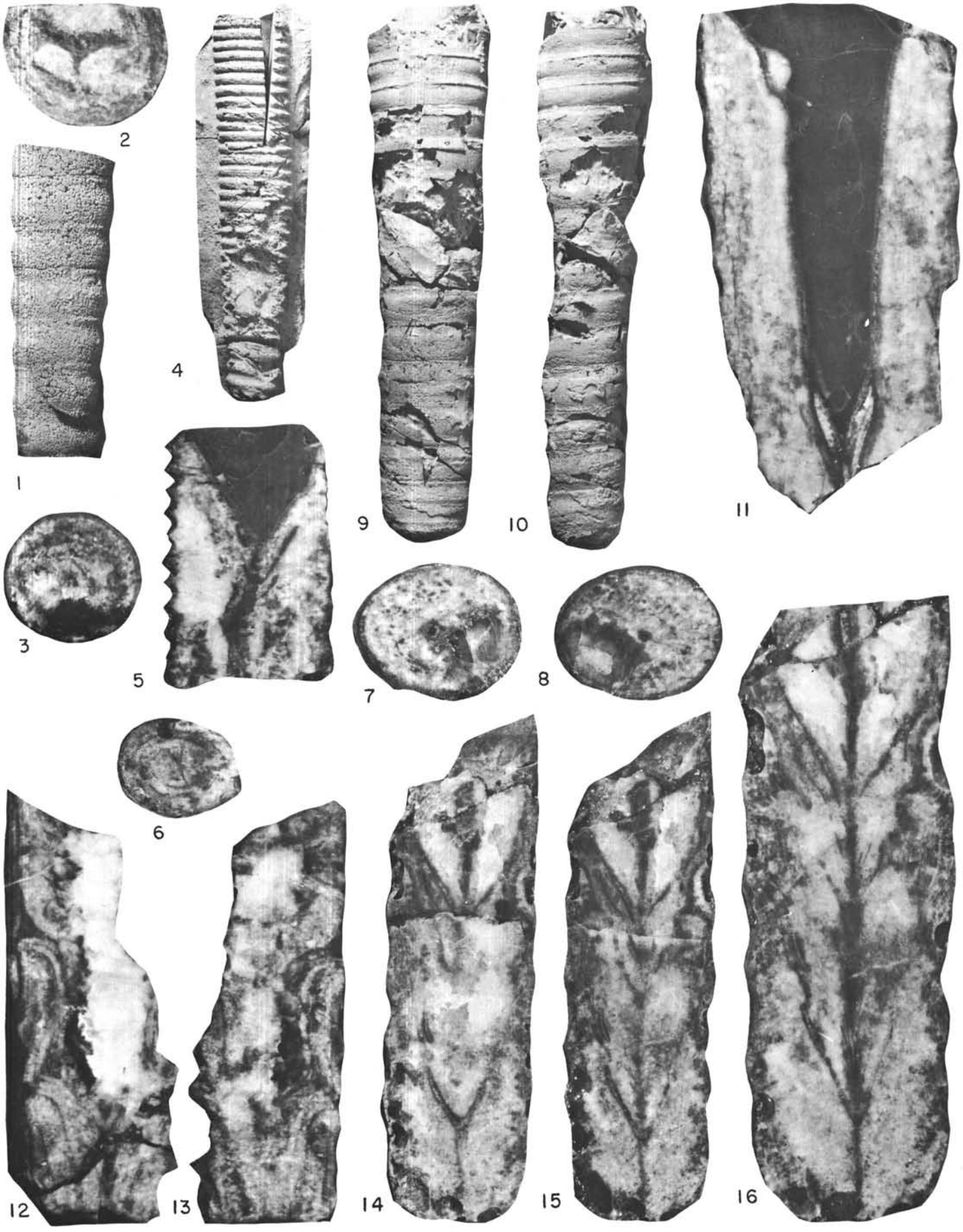
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PLATE 4

Figures Page

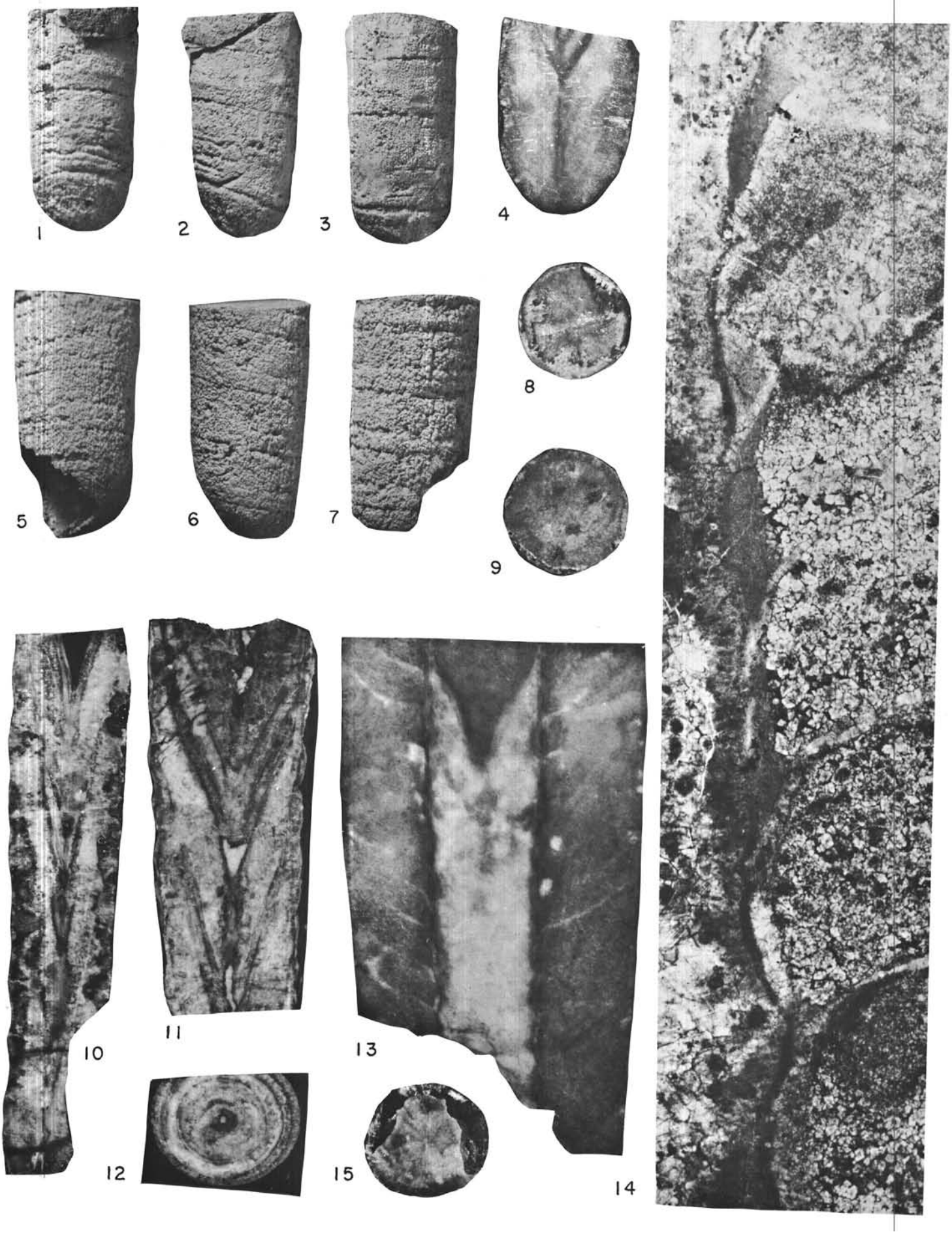
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PLATE 5

Figures *Page*

1-2. Franklinoceras tellerense Flower, n. sp. 21

1. Holotype as received, showing a weathered lateral surface, venter, faintly endogastric, on right, × 1.

2. Composite enlargement including basal sectioned part, and anterior weathered part of the phragmocone, showing position and form of the siphuncle, × 2. U.S.N.M. no. 142797.

3-8, 0-12. *Proteoceras obliquum* Flower, n. sp. 22

3. Holotype, weathered lateral surface, venter on left, × 1. U.S.N.M. no. 142797.

4. Same specimen, sectioned vertically, venter on left, × 2.

5. Further enlargement of the siphuncle, showing anterior smoothing of form of segments, and annular deposits thinning adorally, about × 5.

6. A specimen tentatively assigned to the species, weathering below the middle exaggerates curvature and reduces the apparent rate of expansion. U.S.N.M. No. 124799.

7. Paratype, U.S.N.M. no. 124798, a specimen weathered from the ventral side, prior to removal from matrix by etching, × 1.

8. Anterior end, × 2, venter below, showing size and position of the siphuncle.

10. Same specimen, × 2, removed from matrix, ventral view.

11. Lateral view of the same specimen, × 2.

12. Dorsal view, × 2.

9. *Proteoceras tubulare* Flower, n. sp. 22

Holotype, lateral view, venter on left, × 2. U.S.N.M. No. 142796.

All from U.S.G.S. collection D4280-CO, from limestones near top of Hill 183o, west of Mint River; coordinates 1000 m, Univ. Trans. Mercator grid, zone 3, E394, 780 m; N271, 110 m, Teller (C5) quadrangle; scale 1/63,36o, Alaska.


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Numbers in **boldface** indicate main sections.