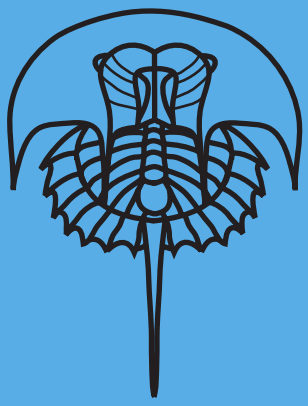

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Actinostromatida

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PART E, REVISED, VOLUME 4, CHAPTER 16D: ACTINOSTROMATIDA

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Order ACTINOSTROMATIDA Bogoyavlenskaya, 1969

[Actinostromatida BOGOYAVLENSKAYA, 1969b, p. 18]

Skeleton network of pillars or micropillars, and horizontal colliculi or microcolliculi that form hexactinellid pattern in tangential sections of most genera; microstructure compact to microreticulate. *Upper Ordovician (Katian)–Upper Devonian (Frasnian).*

Family ACTINOSTROMATIDAE Nicholson, 1886

[*nom. correct.* LECOMPTE, 1956, p. 127, *pro* Actinostromidae NICHOLSON, 1886b, p. 75]

Skeleton consists of well developed, parallel pillars, usually more prominent than colliculi; microstructure compact. *lower Silurian (Llandovery)–Upper Devonian (Frasnian).*

Actinostroma NICHOLSON, 1886b, p. 75 [**A. clathratum* NICHOLSON, 1886a, p. 226; OD] [=*Rosenia* WAAGEN & WENTZEL, 1887, p. 943 (type, *Stromatopora astroites* ROSEN *sensu* BARGATZKY, 1881, p. 284); =*Bullatella* BOGOYAVLENSKAYA, 1977, p. 13 (type, *B. crassa* BOGOYAVLENSKAYA, 1977, p. 14, OD); =*Auroriina* BOGOYAVLENSKAYA, 1977, p. 16 (type, *A. primigenia* BOGOYAVLENSKAYA, 1977, p. 17, OD)]. Pillars thick, usually long, continuous; colliculi horizontally aligned. [NICHOLSON (1886a, 1886b) published the type species before he published the initial description of the genus. STOCK in STEARN and others (1999) noted that there are two groups of species within *Actinostroma* that are atypical. One group has complexly arranged colliculi and mostly short pillars, as in *A. verrucosum* (GOLDFUSS, 1826). The other group has simple colliculi and mostly short pillars, as in *A. stellulatum* NICHOLSON, 1886a.] *Lower Devonian (Lochkovian)–Upper Devonian (Frasnian):* Russia (Kuznetsk Basin), Uzbekistan, *Lower Devonian;* Canada (Arctic islands), Russia (eastern Urals), *Lochkovian;* Australia (New South Wales, Queensland), Czech Republic, *Pragian;* Australia (New South Wales, Queensland), Austria, Czech Republic, Mongolia, Russia (northeastern Siberia, Ulakhan-Sis Range), Spain, *Emsian;* China (Hunan, northeastern China), Italy, Russia (Pechora Basin, Salair, Siberia, Urals), Vietnam, *Middle Devonian:* Australia (Queensland), Austria, Belgium, China (Guangxi, Xinjiang), Czech Republic, Germany, Mongolia, Russia (Altai, Kuznetsk Basin, Siberia), Slovenia, Spain, Uzbekistan, *Eifelian;* Afghanistan, Australia (Queensland), Austria, Belgium, Canada (Manitoba, Northwest Territories), China (Guangxi, Guizhou, Hunan, Sichuan, Xizang, Yunnan), Czech Republic, France, Germany, Poland, Russia (Kuznetsk Basin, Omolon Massif, Pechora Basin, Salair, Siberia, Ulakhan-Sis Range, Urals), Thailand, United States (Indiana), Uzbekistan, Vietnam, *Givetian;* Russia (Pechora Basin, Russian Platform), Turkey, *Upper Devonian;* Australia (Western Australia), Belgium, Canada (Alberta, Manitoba, Northwest Territories, Saskatchewan), China (Guangxi, Sichuan, Yunnan), Czech Republic, France, Germany, Iran, Mexico (Sonora), Poland, Russia (Kuznetsk Basin, northeastern Siberia, Russian Platform, St. Petersburg, Timan), United States (Alaska, Iowa, Montana, Nevada, Utah), Uzbekistan, Vietnam *Frasnian*.——FIG. 1*a–d.* **A. clathratum* NICHOLSON; *a–b,* lectotype, Givetian, Gerolstein, Eifel, Germany, NHM P5774; *a*, longitudinal section, showing long pillars and horizontally aligned colliculi; isolated dots, as in center of figure, represent cross sections of colliculi; *b*, tangential section, showing pillar cross sections as isolated dots, and dark bands with poorly preserved colliculi and pillars forming hexactinellid network, ×10; *c–d*, hypotype, Mason City Member, Shell Rock Formation, Frasnian, Nora Springs, Iowa, USNM 307172; *c*, longitudinal section; *d*, tangential section, better preserved than view *b;* hexactinellid network best displayed in lower half of figure, ×10 (new).

Bicolumnostratum STOCK in STOCK & BURRY-STOCK, 1998, p. 191 [**Actinodictyon mica* BOGOYAVLENSKAYA, 1969a, p. 20; OD; holotype, BOGOYALENSKAYA, 1969a, p. 20, pl. 4,*2a–b,* UGM 26-M 113 67, Ekaterinburg, Sverdlosk]. Pillars mix of two types, some long, continuous and thick, others short and thin; colliculi not horizontally aligned. *upper Silurian (Ludlow–Pridoli):* Ukraine (Podolia), *Ludlow;* United States (New York), *Pridoli.*——FIG. 2*a–d.* **B. micum* (BOGOYAVLENSKAYA); *a–b,* holotype, Sokol Beds, Malinovtsy Horizon, Ludlow, Podolia, Ukraine, UGM 26-M 113 67; *a,* longitudinal section; *b,* tangential section, ×30 (Bogoyavlenskaya, 1969a); *c–d,*

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Stock, Carl W. 2012. Part E, Revised, Volume 4, Chapter 16D: Actinostromatida. Treatise Online 42:1–12, 10 fig.

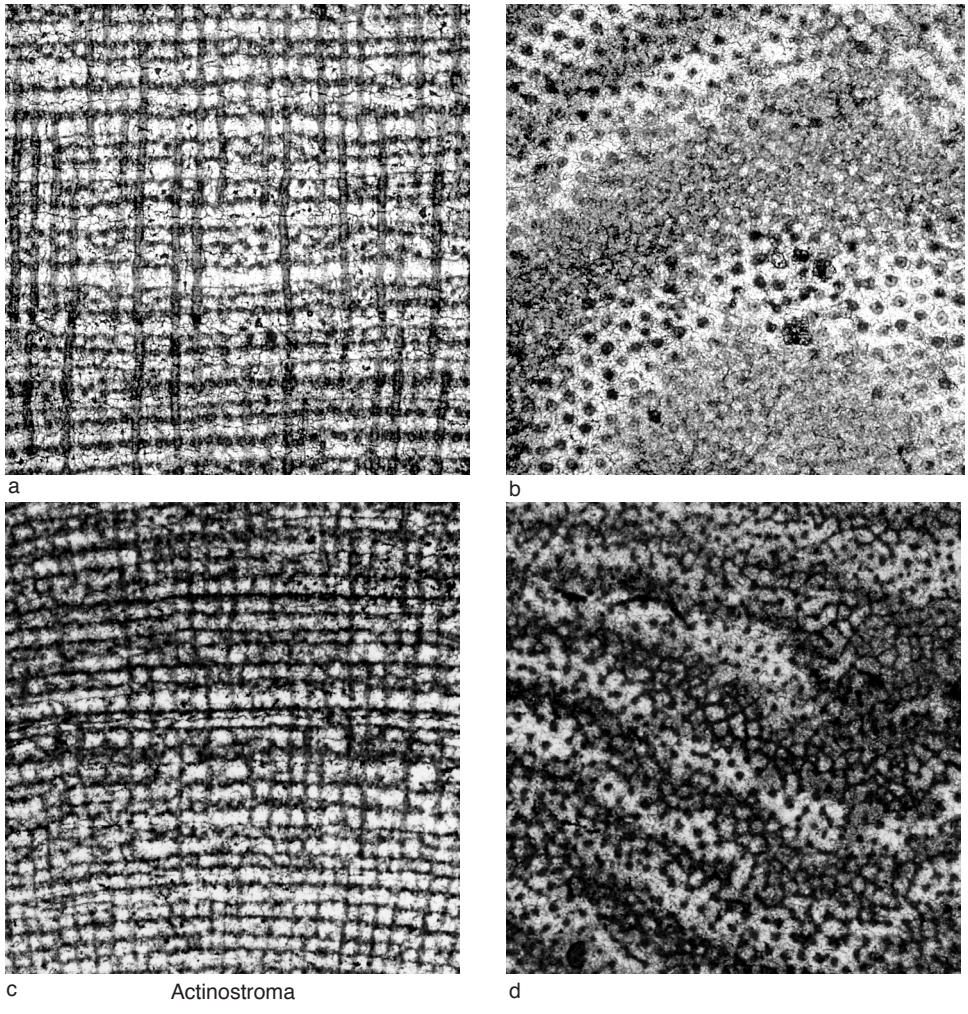


FIG. 1. Actinostromatidae (p. 1).

hypotype, Cobleskill Member, Rondout Formation, Pridoli, Cobleskill, New York, USNM 492553; *c*, longitudinal section, black dots represent air bubbles in thin section mounting medium; *d*, tangential section, black dots represent cross sections of well developed pillars, from which extend colliculi, ×30 (new).

Bifariostroma KHALFINA, 1968, p. 149 [**Actinostroma bifarium* NICHOLSON, 1886a, p. 231; OD]. Pillars mix of two types, some long, continuous, and thick, others short and thin; colliculi horizontally aligned. *Lower Devonian (Emsian)–Upper Devonian (Frasnian):* Austria, Spain, *Emsian;* Italy, *Middle Devonian;* Belgium, Spain, Uzbekistan, *Eifelian;* Belgium, China (Guangxi, Sichuan), Czech Republic, France, Poland, Germany, *Givetian;* Afghanistan, Belgium, Czech Republic, Poland, Russia (Timan), *Frasnian.*——FIG. 3,*1a–b.* **B. bifarium* (NICHOLSON); lectotype, Givetian, Büchel bei Bensberg, Paffrath-Mulde, Germany, NHM P5639; *a*, longitudinal section, Nicholson slide 165c, apparent cellules in pillars and some colliculi represent diagenetic alteration of original compact microstructure; *b*, tangential section, Nicholson slide 165b; hexactinellid pattern best developed in center to lower center of figure, ×10 (new).

Crumplestroma KHALFINA, 1972, p. 148 [**C. lacerilaminatum;* OD]. Skeleton consists of long pillars and steplike offsets of colliculi interrupted by paralaminae, thicker than colliculi. *upper Silurian (Ludlow):* Russia (Altai).——FIG. 3,*2a–b.* **C.*

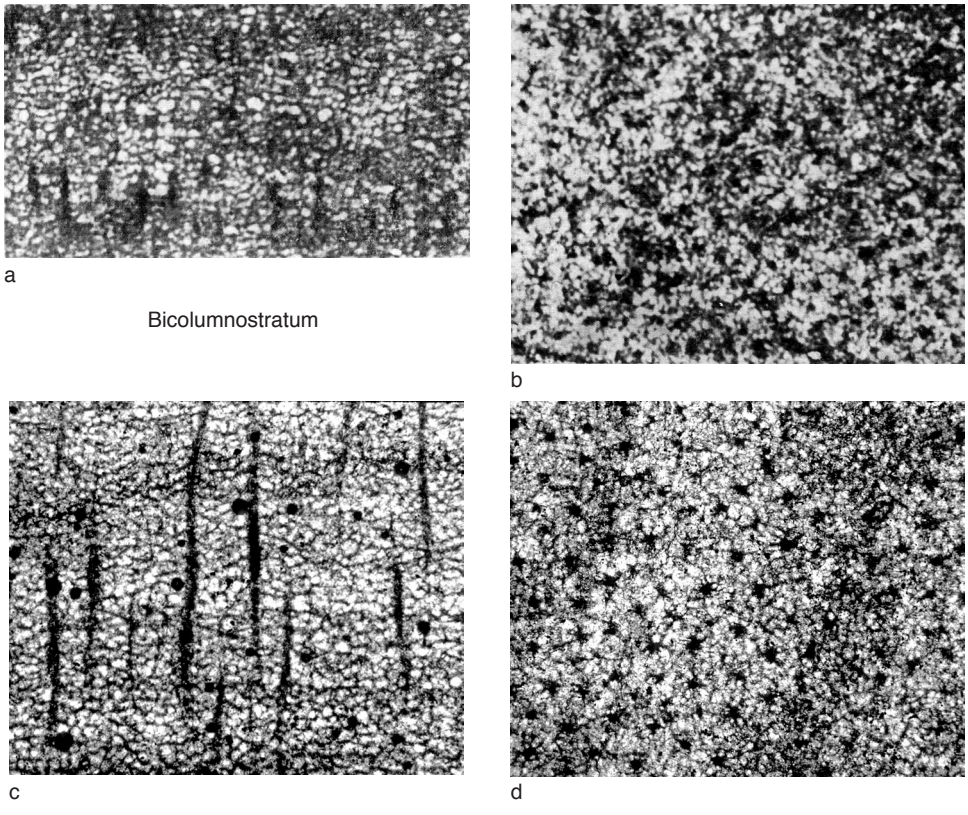


FIG. 2. Actinostromatidae (p. 1–2).

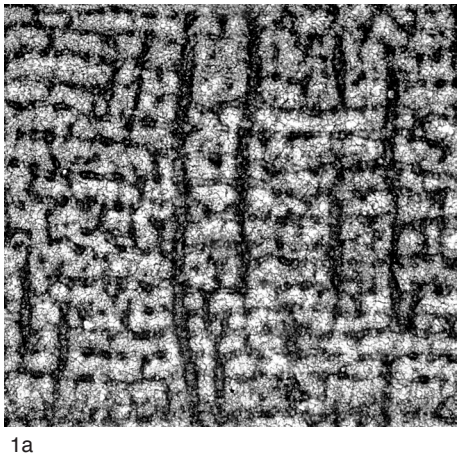
lacerilaminatum; holotype, photomicrographs, CSGM no. unknown; *a*, longitudinal section showing crumpled paralaminae between which pillars and colliculi developed; *b*, tangential section, poorly developed hexactinellid pattern in upper half of figure, ×10 (Khalfina, 1972, pl. C-II,*1–2*).

Plectostroma NESTOR, 1964, p. 78 [**Actinostroma intertextum* NICHOLSON, 1886a, p. 233; OD]. Pillars long, continuous; colliculi not horizontally aligned, in many cases not perfectly horizontal. *lower Silurian (Llandovery)–Upper Devonian (Frasnian):* Russia (Altai, Salair), *Silurian;* Estonia, Russia (Siberian Platform, Tuva, Urals), Sweden (Gotland), Uzbekistan, *Llandovery;* China*, middle Silurian;* Canada (Northwest Territories), Estonia, Mongolia, Norway, Russia (Kuznetsk Basin, Urals), Sweden (Gotland), United Kingdom, *Wenlock;* China, Russia (Kuznetsk Basin, Pechora Basin, Urals)*, upper Silurian;* Canada (Quebec), Estonia, Mongolia, Russia (Altai, Novaya Zemlya), Sweden (Gotland, Scania), Ukraine (Podolia), *Ludlow;* Canada (Quebec), Estonia, Mongolia, Ukraine (Podolia), *Pridoli;* Russia (northeastern Siberia), Uzbekistan, *Lower Devonian;* Canada (Arctic islands), Uzbekistan, *Lochkovian;* Australia (Victoria), *Pragian;* Canada (Arctic islands, Northwest Territories), Czech Republic, Spain, *Emsian;* Russia (Salair), *Middle Devonian;* Canada (Arctic islands, Northwest Territories), China (Guangxi), Czech Republic, Russia (Altai), Uzbekistan, *Eifelian;* China (Guangxi), Czech Republic, France, *Givetian;* Vietnam, *Frasnian*.——FIG. 3,*3a–b*. **P. intertextum* (NICHOLSON); holotype, Wenlock, Ironbridge, England, NHM P5620; *a*, longitudinal section, Nicholson slide 188b, latilaminar phases with short pillars low in figure and long pillars high in figure; *b*, tangential section, Nicholson slide 188, showing well developed hexactinellid pattern, ×10 (new).

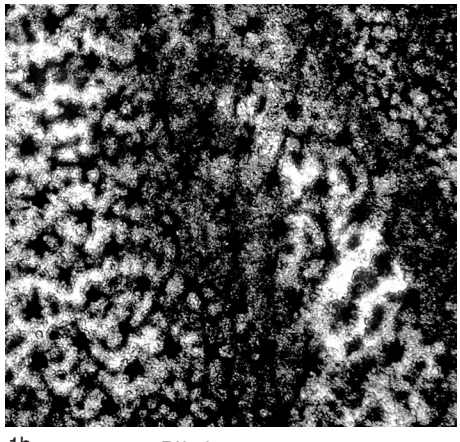
Family PSEUDOLABECHIIDAE Bogoyavlenskaya, 1969

[Pseudolabechiidae BOGOYAVLESKAYA, 1969a, p. 17]

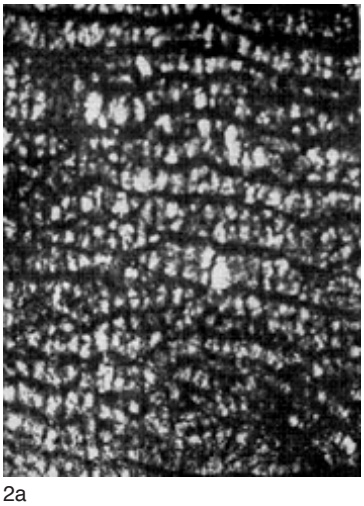
Skeleton contains pillars and colliculi, or micropillars and microcolliculi, clustered



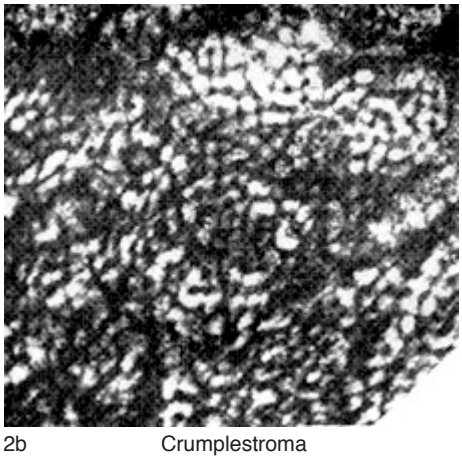
1a



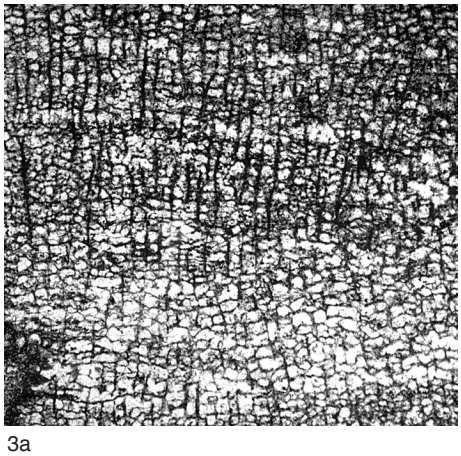
1b Bifariostroma



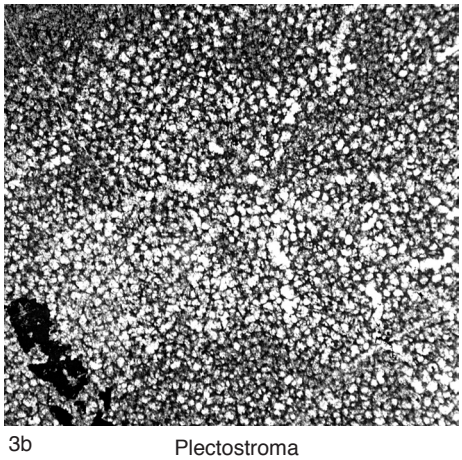
2a



2b Crumplestroma



3a



3b Plectostroma

FIG. 3. Actinostromatidae (p. 2–3).

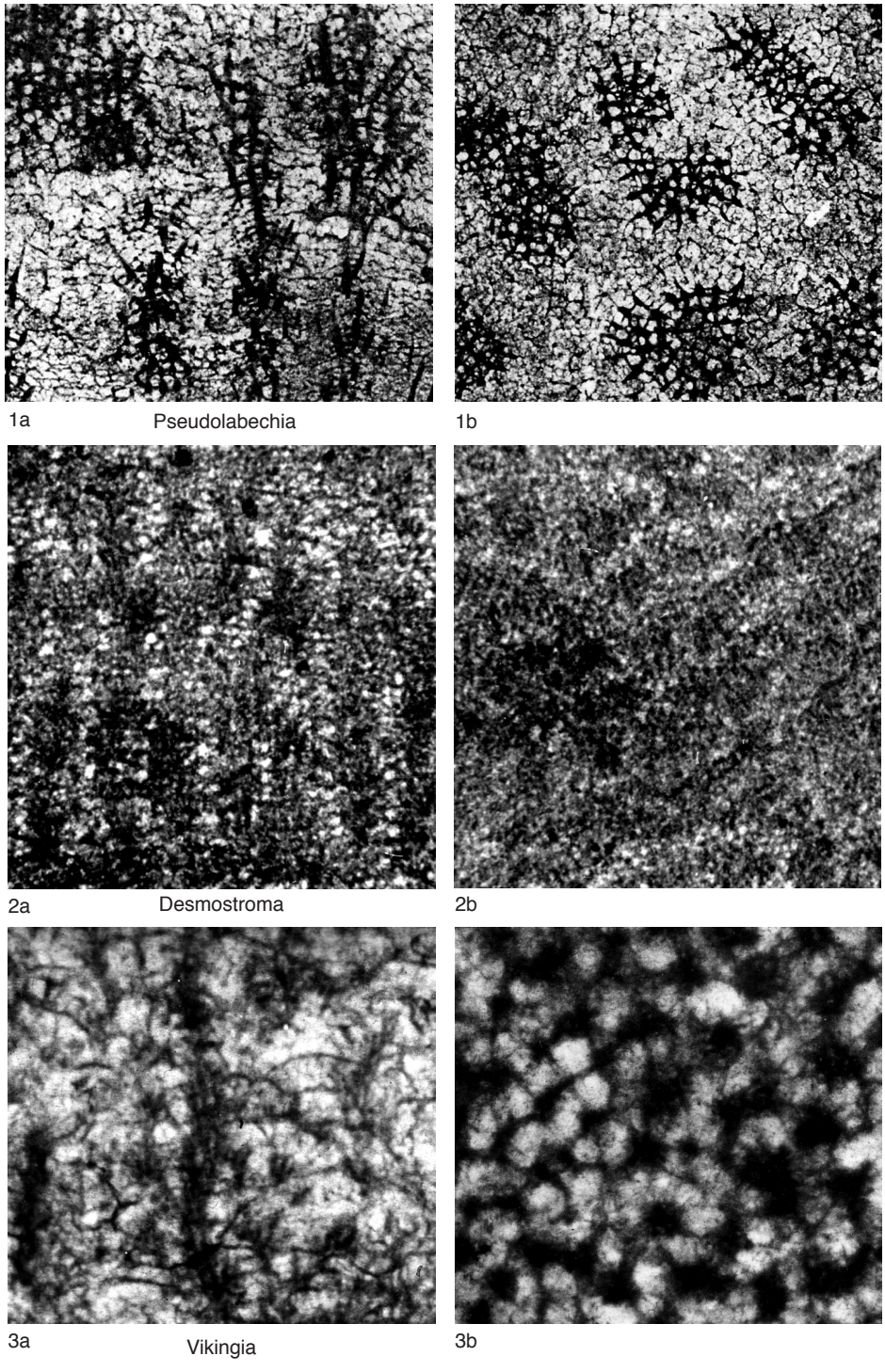


FIG. 4. Pseudolabechiidae (p. 6–8).

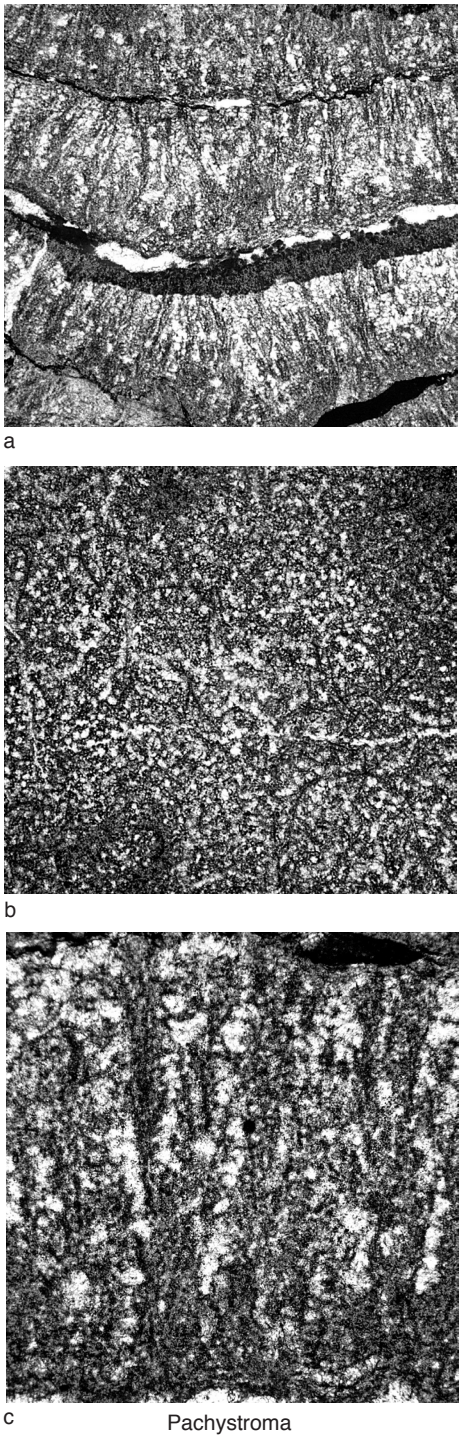


FIG. 5. Pseudolabechiidae (p. 7).

in columns or subcolumns respectively; pillars or micropillars diverge upward; areas between columns or subcolumns contain microlaminae and may contain few pillars; colliculi or microcolliculi occur in only columns or subcolumns; microstructure compact or microreticulate. *lower Silurian (Llandovery)–upper Silurian (Pridoli).*

Pseudolabechia YABE & SUGIYAMA, 1930, p. 59 [**P. granulata*; OD]. Vertical skeletal elements with pillars diverging upward in columns, horizontal elements with colliculi in columns; microstructure compact. *middle Silurian (Wenlock)–upper Silurian (Ludlow):* Russia (Urals), Ukraine (Podolia), *Wenlock;* Estonia, Russia (Novaya Zemlya), Sweden (Gotland), *Ludlow.*——FIG. 4,*1a–b*. **P. granulata*; holotype, Hemse Beds, Ludlow, Gotland, Sweden, TUM 720, photomicrographs; *a*, longitudinal section; *b*, tangential section, ×10 (Yabe & Sugiyama, 1930, pl. XXII,*11–12*).

Desmostroma BOL'SHAKOVA, 1969, p. 28 [**D. columnatum* BOL'SHAKOVA, 1969, p. 30; OD] [=*Hexastylostroma* DONG, 1984, p. 71 (type, *H. neimongolense*, OD)]. Clinoreticular subcolumns constitute more than half volume of skeleton; intercolumnar structures acosmoreticular. [*Desmostroma* was first published as a new genus in 1969 (p. 30, pl. 5,*1a–b*), with type species *D. columnatum,* holotype PIN 2336/629. However, BOL'SHAKOVA (1973, p. 82) again published *Desmostroma* as a new genus, with type species *D. columnum,* labeled as a so-called holotype, PIN 2336/628; however the illustrated "holotype" was cited as PIN 2336/628 in the text but PIN 2336/548 is listed in the figure caption of plate 12, fig. 2a–b (on p. 111). Notably, a copy of BOL'SHAKOVA (1973) that was presented to B. D. Webby about 1993 included a handwritten amendment of the specimen number in her text on p. 83, with the 628 part of the number crossed out and replaced by 548, so it was consistent with the original number in her figure caption. However this designation of *D. columnum* as the type species of *Desmostroma* does not represent a valid type fixation.] *lower Silurian (Llandovery)–upper Silurian (Pridoli):* Sweden (Gotland), United States (Iowa), *Llandovery;* Kirghizstan (Tien Shan), Mongolia, Sweden (Gotland), Ukraine (Podolia), United States (Kentucky), *Wenlock;* China (Inner Mongolia), *upper Silurian;* Australia (New South Wales), China (Inner Mongolia), Sweden (Gotland), Ukraine (Podolia), *Ludlow;* Russia (Urals), Ukraine (Podolia), *Pridoli.*——FIG. 4,*2a–b*. **D. columnatum*; holotype, Mukshinsky Horizon, Wenlock, Podolia, Ukraine, PIN 2336/629; *a*, longitudinal section; *b*, tangential section, ×30 (new, photos courtesy of Heldur Nestor).

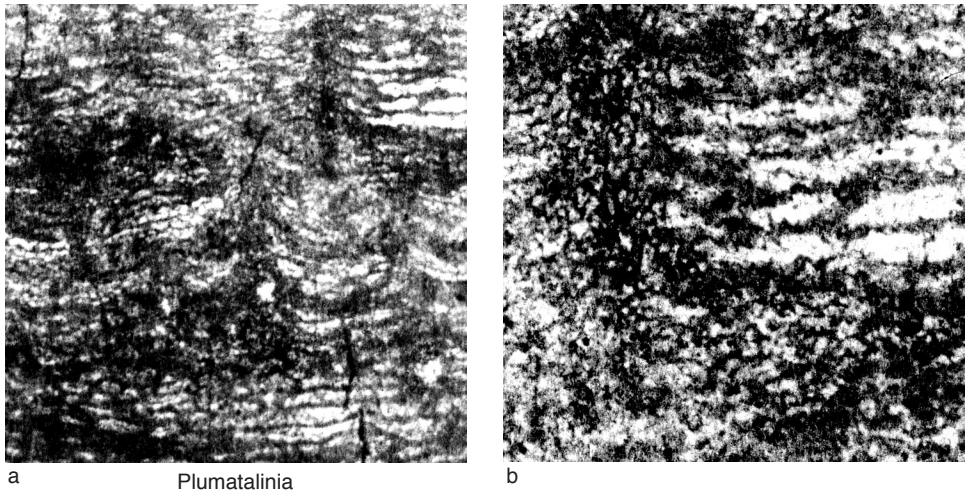


FIG. 6. Plumataliniidae (p. 8).

Pachystroma NICHOLSON & MURIE, 1878, p. 223 [**P. antiqua;* OD]. Skeleton latilaminate, irregular; clinoreticular subcolumns consist of fused micropillars and constitute about half volume of skeleton; microlaminae occur in intersubcolumnar space; thickened acosmoreticular structure developed at base of latilaminae. *lower Silurian (Llandovery)–middle Silurian (Wenlock):* Canada (Ontario), Estonia, United States (Michigan), *Llandovery;* Canada (Ontario, Quebec), United States (Kentucky), *Wenlock*.——FIG. 5*a–c*. **P. antiquum*; holotype, Niagara Limestone, Wenlock, Thorold, Ontario, Canada, NHM P6003; *a*, longitudinal section, note conspicuous latilamination; *b*, tangential section, ×10; *c*, longitudinal section, ×30 (new).

Vikingia BOGOYAVLENSKAYA 1969a, p. 19 [**Actinodictyon*? *vikingi* NESTOR, 1966, p. 62; OD]. Longitudinal skeletal elements composed of clinoreticular subcolumns with distinct to fused micropillars and microcolliculi, and constitute less than half volume of skeleton; intersubcolumnar structures cyst plates. *lower Silurian (Llandovery)–upper*

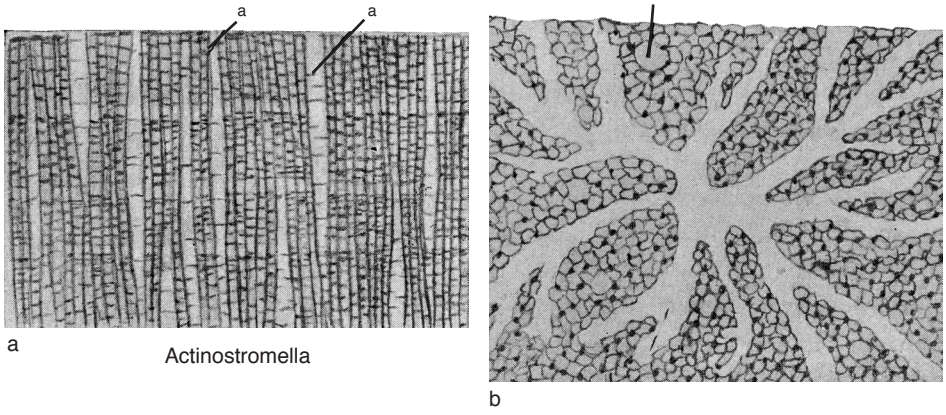
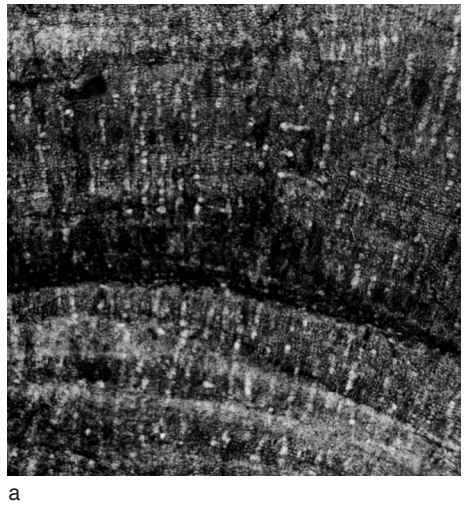
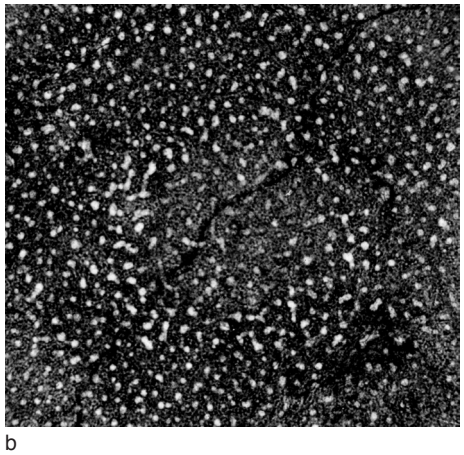


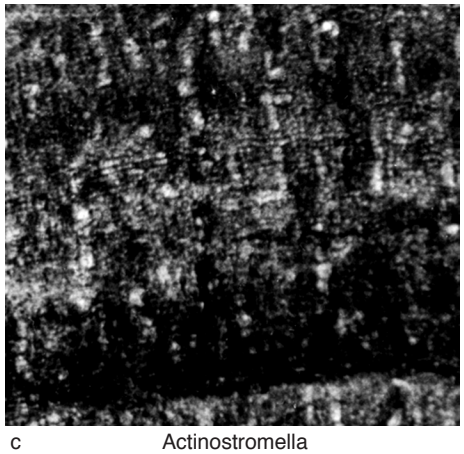
FIG. 7. Actinostromellidae (p. 8–9).



a



b



c Actinostromella

FIG. 8. Actinostromellidae (p. 8–9).

Silurian (Pridoli): Russia (Siberian Platform), Ukraine (Podolia), United States (Iowa), *Llandovery;* Estonia, Russia (Novaya Zemlya, Siberian Platform), Sweden (Gotland), Ukraine (Podolia), United States (Alaska), *Wenlock;* Ukraine (Podolia), *Pridoli*.——FIG. 4,*3a–b*. **V. vikingi* (NESTOR); holotype, Jaagarahu Stage, Wenlock, Estonia, IGTUT 114-51 (Co3146); *a*, longitudinal section; *b*, tangential section, ×30 (new, photos courtesy of Heldur Nestor).

Family PLUMATALINIIDAE Bogoyavlenskaya, 1969

[Plumataliniidae BOGOYAVLENSKAYA, 1969b, p. 17]

Skeleton contains micropillars and microcolliculi, clustered in subcolumns; areas between subcolumns contain cyst plates or microlaminae; microstructure of subcolumns acosmoreticular. *Upper Ordovician* (*Katian*).

Plumatalinia NESTOR, 1960, p. 225 [**P. ferax* NESTOR, 1960, p. 226; OD]. Skeleton of acosmoreticular subcolumns, and cyst plates or microlaminae. *Upper Ordovician (Katian):* Estonia.——FIG. 6*a–b*. **P. ferax*; holotype, Pirgu Stage, Ashgill, IGTUT 111-1 (Co3001); *a*, longitudinal section, ×10; *b*, longitudinal section, enlargement of upper right portion of view *a,* ×25 (new, photos courtesy of Heldur Nestor).

Family ACTINOSTROMELLIDAE Nestor, 1966

[Actinostromellidae NESTOR, 1966, p. 50] [=Pichiostromatidae BOGOYAVLENSKAYA, 1981, p. 31]

Skeleton a microreticulate mass pierced by elongate, vertical spaces. *middle Silurian (Wenlock)–Lower Devonian (Lochkovian).*

Actinostromella BOEHNKE, 1915, p. 162 [**A. tubulata* BOEHNKE, 1915, p. 163; OD]. Micropillars long, connected by microcolliculi that may or may not align horizontally; longitudinal spaces autotubes. [The holotype, and only known specimen of *A. tubulata* BOEHNKE, 1915, is from Silurian glacial erratics in eastern Prussia (=Kaliningrad District). All type material was lost during the Second World War. Subsequent authors did not report *A. tubulata* from other localities, so no potential neotype specimens are available. Silurian-age glacial erratics in northern Poland, Germany, and Kaliningrad District, Russia most likely originated in Sweden (Gotland), Estonia, or the floor of the Baltic Sea. Therefore, *A. vaiverensis* NESTOR, 1966, from western Estonia (Saarema) is used here as the

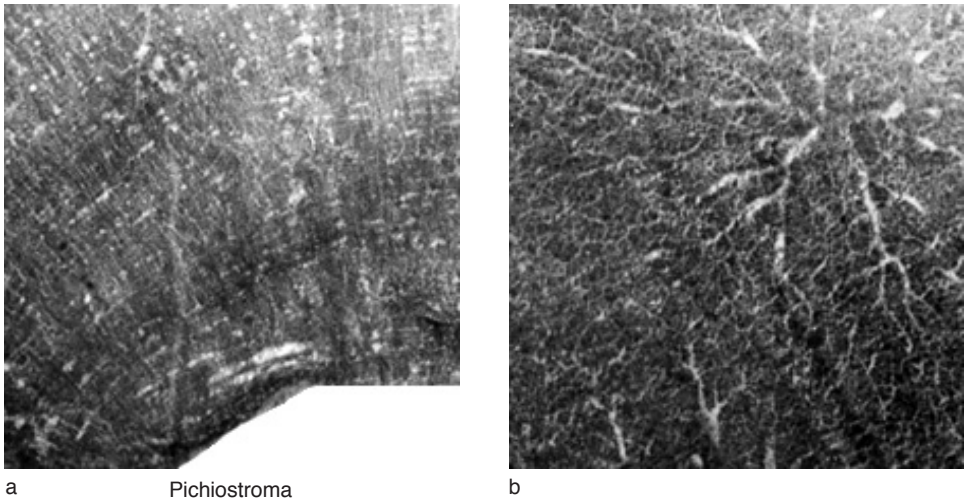


FIG. 9. Actinostromellidae (p. 9).

reference species.] *middle Silurian (Wenlock)–Lower Devonian (Lochkovian)*: Sweden (Gotland), *Wenlock;* Australia (New South Wales), China (Inner Mongolia), Sweden (Gotland), Ukraine (Podolia), *Ludlow;* Canada (Quebec), Estonia, United States (Alabama, New York), *Pridoli;* China (Inner Mongolia), *Lochkovian*.——FIG. 7*a–b*. **A. tubulata*; holotype, glacial erratic, Kaliningrad District, Russia, specimen no. unknown, micrographs, lower case *a* on photos indicates what BOEHNKE (1915) called zooidal tubes (=autotubes); *a*, longitudinal section; note some colliculi are horizontally aligned, but others are not; *b*, tangential section, magnification unknown, reproduced here at same size as original publication (Boehnke, 1915, fig. 6–7).——FIG. 8*a–c*. *A. vaiverensis* NESTOR; holotype, Kaugatuma stage, Pridoli, Saarema, Estonia, IGTUT 114-42 (Co3159); *a*, longitudinal section, note change in density of macrostructures associated with base of a latilamina about two-fifths above base of photomicrograph; *b,* tangential section, ×10; *c*, longitudinal section, note horizontal alignment of microcolliculi, ×20 (new, photos courtesy of Heldur Nestor).

Pichiostroma BOGOYAVLENSKAYA, 1972, p. 28 [**P. pichiense*; OD]. Skeleton microreticulate, pierced by vertical slitlike spaces. *middle Silurian (Wenlock)–upper Silurian (Ludlow)*: United States (?Kentucky), *Wenlock;* Russia (Tuva), Ukraine (Podolia), *Ludlow*.——FIG. 9*a–b*. **P. pichiense*; holotype, Ludlow, Tuva, Russia, UGM 2808/3, *a*, longitudinal section; *b*, tangential section, ramifications of extensive astrorhizae may be responsible for slitlike spaces noted in longitudinal section, ×10 (new, photos courtesy of Heldur Nestor).

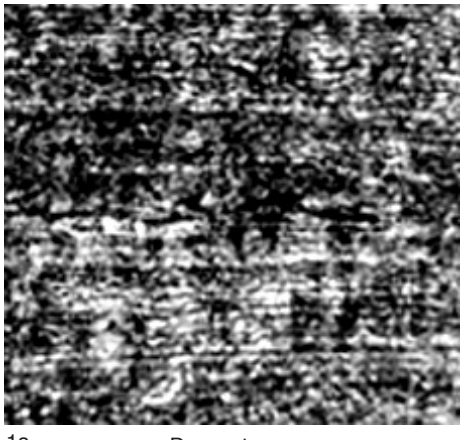
Family DENSASTROMATIDAE Bogoyavlenskaya, 1974

[Densastromatidae BOGOYAVLENSKAYA, 1974, p. 22]

Skeleton microreticulate, uninterrupted by accessory spaces. *lower Silurian (Llandovery)–Lower Devonian (Lochkovian).*

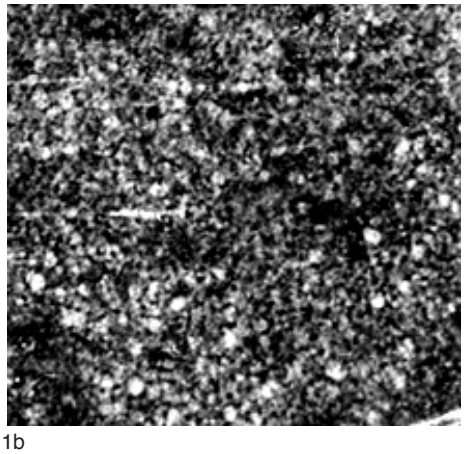
Densastroma FLÜGEL, 1959, p. 196 [**Stromatopora astroites* ROSEN, 1867, p. 62; OD] [=*Pycnodictyon* MORI, 1970, p. 103 (type, *P. densum,* OD)]. Microcolliculi horizontally aligned, giving impression of microlaminae; micropillars short; forming orthoreticular pattern. *lower Silurian (Llandovery)–upper Silurian (Pridoli)*: Sweden (Gotland), United States (Iowa), *Llandovery;* Canada (Quebec), Estonia, Sweden (Gotland), Ukraine (Podolia), United States (Kentucky), *Wenlock;* China (Inner Mongolia), *upper Silurian;* Australia (New South Wales), Canada (Quebec), Estonia, Russia (Siberian Platform, Urals), Sweden (Gotland), Ukraine (Podolia), Uzbekistan, *Ludlow;* Canada (Quebec), Estonia, Russia (Urals), Ukraine (Podolia), *Pridoli*.——FIG. 10,*1a–b*. **D. astroites* (ROSEN); lectotype, Ludlow, Saarema, Estonia, IGTUT 115-1 (Co3181); *a*, longitudinal section; *b*, tangential section, ×30 (new, photos courtesy of Heldur Nestor).

Acosmostroma STOCK in STOCK & BURRY-STOCK, 1998, p. 195 [**A. ataxium*; OD]. Skeleton acosmoreticular, to which micropillars added in some species. *upper Silurian (Pridoli)*: United States (New York, Tennessee, Virginia).——FIG. 10,*2a–b*. **A. ataxium*; holotype, Glasco Member, Rondout Formation, Alligerville, New

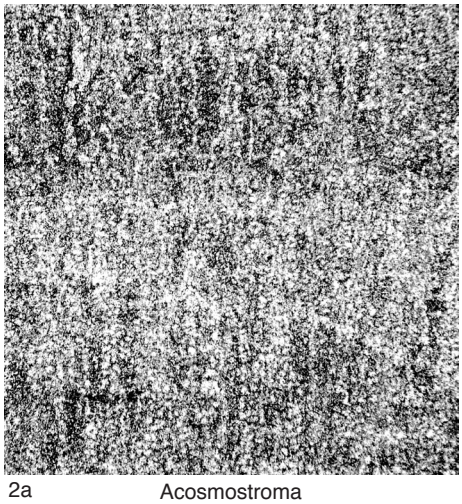


1a

Densastroma

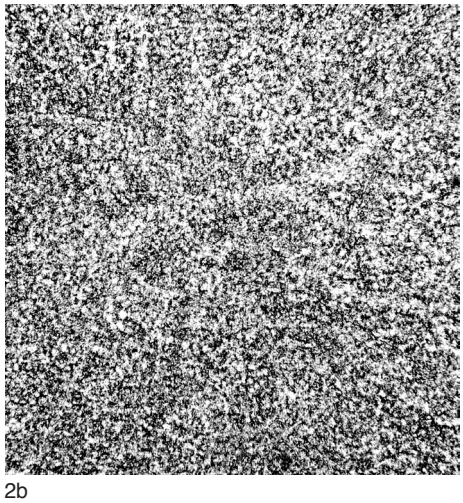


1b

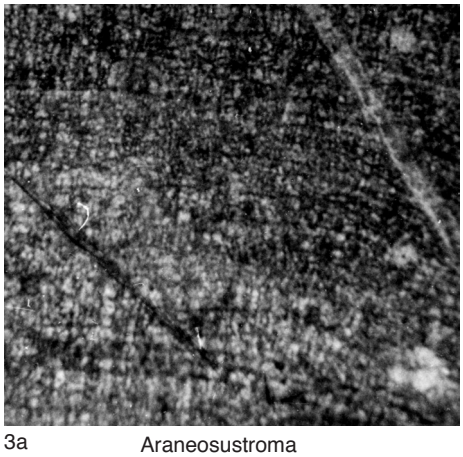


2a

Acosmostroma

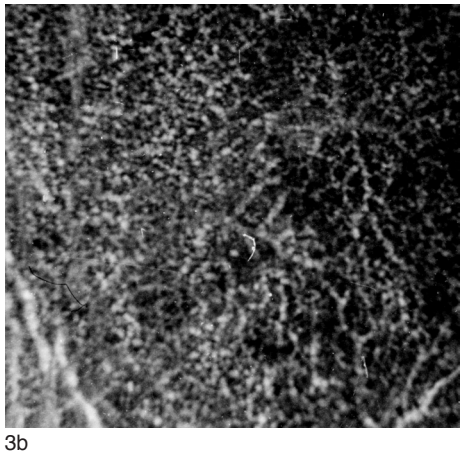


2b



3a

Araneosustroma



3b

Fig. 10. Densastromatidae (p. 9–11).

York, USNM 248115; *a*, longitudinal section; *b*, tangential section, ×30 (new).

Araneosustroma Lessovaya, 1970, p. 80 [**A. fistulosum* Lessovaya, 1970, p. 81; OD] [=*Petschorostroma* Bogoyavlenskaya, 1983, p. 84 (type, *P. kozhmiense,* OD)]. Microreticulate structure ortho- to acosmoreticular, in some species combined with microlaminae; microcolliculi horizontally aligned at some levels, not aligned at other levels; in some species, micropillars clustered into indistinct, narrow subcolumns, giving impression of closely packed microreticulate pillars. *middle Silurian (Wenlock)–Lower Devonian (Lochkovian)*: Estonia, Russia (Novaya Zemlya), Sweden (Gotland), Ukraine (Podolia), *Wenlock;* Estonia, Russia (Novaya Zemlya, Urals), Sweden (Gotland), Ukraine (Podolia), *Ludlow;* Ukraine (Podolia), *Pridoli;* Uzbekistan, *Lochkovian*.——Fig. 10,*3a–b*. **A. fistulosum*; holotype, Bursykhirman Horizon, Lochkovian, Uzbekistan, GMU 9994-6/149; *a*, longitudinal section; *b*, tangential section, ×20 (new, photos courtesy of Heldur Nestor).

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