

[Plates]

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Plate I

- Fig. 1 *Patinopecten caurinus* (Gould). Inner ventral view of the shell (x0,3) showing outline of plicate ribbing and inside it the ridges and grooves of the inner shell surface. On all the plates arrows point marginally.
- Fig. 2 *Megathura crenulata* (Sowerby). Dorsal-marginal view (x0,5). A gastropod with distinct peripheral denticles.
- Fig. 3 *Trachycardium (Dallocardia) quadrigenarium* (Conrad). Inner view of anterior-ventral margin of shell (x0,5), showing narrow, excavate denticles with pointed tips.
- Fig. 4 *Trachycardium (Dallocardia) quadrigenarium* (Conrad). Marginal and inner-marginal view of the ventral shell marginal region (x0,5) showing the composite ribbing with narrow, excavate denticles and spines on top of the ribs.
- Fig. 5 *Cardium costatum* Linnaeus. Inner surface near marginal region (x0,5) showing broad, excavate denticles. Peripherally to the grooves elongate notches open into the cavities of the ribs.
- Fig. 6 *Protothaca staminea* (Conrad). Marginal-exterior view of the marginal region (x2), showing two sets of denticles, subperipheral and supraperipheral, that are positionally unrelated. The last is continuous with the outer ribbing.
- Fig. 7 *Venericardia laticostata* (Sowerby). Transverse section across a rib (x10). The outer (dark) layer is the ectostracum, the inner the mesostracum. Concentric pattern of growth lines in the «center of the rib» results from a cavity in the marginal face of the groove deposits as shown in Pl. V, fig. 8. Short partitions appear only near the mesectostracal boundary where a more or less rectangular structure is present. Mesostracal tubules show poorly here.
- Fig. 8 *Venericardia laticostata* (Sowerby). Longitudinal section near marginal region (x15). Ectostracum in upper right portion of section, mesostracum in lower left. Tubules are visible in the mesostracum.
- Fig. 9 *Venericardia laticostata* (Sowerby). Marginal-inner view of the ventral marginal region (x3). Denticles with low, narrow bulbous marginal segment and broad, raised planate main segment. Deposits in the indentations with a vertical marginal surface and a planate inner surface.
- Fig. 10 *Venericardia laticostata* (Sowerby). Marginal-inner view of the ventral marginal region (x7). The squarish main segments of the denticles show very distinct secondary flanges (only those to the right of the denticles appear in this figure). The secondary flanges originate on the flanks of the primary flanges and «curling upward» eventually reach the lateral portion of the denticular summit, thus forming with the primary flanges hook-shaped structures. The secondary flanges give rise to the secondary partitions, such as in Pl. V, fig. 7.
- Fig. 11 *Glycymeris* sp. Inner view of shell marginal region (x3) showing the denticles. These are composed of a narrow marginal segment (at top of figure) and a wide main segment, the latter of which is itself composed of a raised and longitudinally convex marginal portion and an excavate apical portion.

- Fig. 12 *Septifer bifurcatus* (Conrad). Longitudinal section (x30) showing densely tubulated zones in the endostracum.
- Fig. 13 *Lyonsia saxicola* Baird. Longitudinal section (x30). Ectostracum granular (black in figure) and below this both the mesostracum and endostracum are nacreous. The growth lines of the two inner layers meet at an angle. The tubules are restricted to the two inner layers and are markedly sinuous.
- Fig. 14 *Codakia orbicularis* (Linnaeus). Longitudinal section (x15), showing the three major layers and the serrate mesectostracal boundary; some endostracal tubules may be observed.

Plate II

- Fig. 1 *Anadara trilineata* (Conrad). Longitudinal section (x30) of endostracum, showing tubules, growth lines and, vaguely, the complex structure.
- Fig. 2 *Noetia ponderosa* (Say). Longitudinal section (x15) showing crossed-lamellar mesectostracum (dark) and complex endostracum (light). The tubules in the endostracum are more or less perpendicular to the growth-lines, their extensions in the mesectostracum being perpendicular to the base of that combined layer. The endostracal portions of the tubules are wider than the mesectostracal portions and are sinuous.
- Fig. 3 *Spondylus pictorum* Chemnitz. View of the inner surface of the endostracum (x12) showing the tubular openings and the prism outlines. The tubules are located mostly between the prisms and are less numerous than the prisms.
- Fig. 4 *Anadara multcostata* (Sowerby). View of the inner surface of the endostracum (x6) showing the tubular openings arranged in rows. The rows do not positionally correspond to the ribs but are situated on slightly raised ridges (muscle attachments?) of the endostracum. Here a few tubules appear between the rows. Closer to the pallial line tubules occur only on the ridges, while apically from the area figured the tubules are very irregularly distributed.
- Fig. 5 *Meleagrina margaritifera* (Linnaeus). Tangential section of the prismatic layer (x25). The tubules are all located within the prisms and there are many tubules for each prism.
- Fig. 6 *VolSELLA capax* (Conrad). Tangential section of the endostracum (x30). The tubules are almost all located between the prisms and there are more tubules than prisms.
- Fig. 7 *Mytilus californianus* Conrad. Longitudinal section through endostracum (x25) showing some flabellae.
- Fig. 8 *Panope generosa* Gould. Outer surface of shell with most of the periostracum removed (x4) showing irregular «beaded ribbing» and oblique riblets which may form cross-like patterns and are composed of more or less fused «beads».
- Fig. 9 *Lyropecten terminus* Arnold. Transverse section across most of a rib (x5) showing interlocking structure in the center of the rib area.

- Fig. 10 *Semele decisa* (Conrad). Longitudinal section across part of the ectostracum (x 30) showing complex, fan-wise arrangements of the fibrillae.
- Fig. 11 *Aequipecten circularis* (Sowerby). Transverse section (x 4,1) showing distinct rib and interspace areas, slightly oblique partitions, and in each rib area two stacks of folia outwardly convex which meet in the center of the area along an interlocking suture.

Plate III

- Fig. 1 *Lyropecten estrellanus* (Conrad). Transverse section from peel (x2). Both ribs and interribs present and two sets of up-arching folia in both rib and interspace areas, the sets of each pair meeting in an interlocking suture.
- Fig. 2 *Aequipecten circularis* (Sowerby). Longitudinal section from peel (x3). En = Endostracum; MeEc = Mesectostracum; AdMy = Adductor myostracum; a = thin crossed-lamellar sublayer at the bottom of the mesectostracum.
- Fig. 3 *Pecten vogdesi* Arnold. Transverse section of left valve from peel (x3) showing angulated patterns of outer mesectostracum (light) and partitions (p).
- Fig. 4 *Patinopecten caurinus* (Gould). Transverse section of left valve from peel (x3). The bands of alternately reclined and inclined folia are very prominent here, with no intermediate «indistinct» zones.
- Fig. 5 *Pecten vogdesi* (Arnold). Transverse polished section, by reflected light (x3) across two ribs and an interspace showing the complex angular structures of the outer mesectostracum, the white inverted commas on the sides of rib areas, the bands of alternately inclined and reclined folia in the inner mesectostracum (light) separated from each other by zones with indistinct structure (black). The white inverted comma on the right side of the left rib is the most regularly developed in this figure.
- Fig. 6 *Pecten vogdesi* (Arnold). Horizontal rough section, by reflected light (x6) showing twisting of the folia.
- Fig. 7 *Pecten vogdesi* (Arnold). Inner surface of shell near marginal region, by reflected light (x6), including in the upper portion of the figure the bases of three denticles, the two white areas in the upper right portion being the areas where the inverted commas seen in Fig. 5 are secreted. The bands of alternately inclined and reclined folia in the inner mesectostracum are reflected on this inner surface by systems of white curving lines. These lines appear to represent a continuous counter-clockwise rotation pattern by sources moving at the same time in a marginal direction.
- Fig. 8 *Aequipecten circularis* (Sowerby). Inner surface of shell along the margin, by reflected light (x7,6). The zigzag lines within the grooves on each side of the central denticle correspond to the shifting boundaries between the sets of folia in each half of the grooves. The shifting of the boundaries between the two sets produce an interlocking suture. The folia near the tips of the den-

ticles are very irregular, as are the outer mesectostracal folia in other pectinids. Near the bases of the denticles may be seen curving lines, much as in *Pecten vogdesi*.

Plate IV

- Fig. 1 *Botula falcata* (Gould). Longitudinal section (x49). The upper dark layer is the periostracum; below this, the granulated ectostracum shows coarse tubule-like structures; both the non-tubulated mesostracum and the tubulated endostracum appear below the ectostracum.
- Fig. 2 *Acila castrensis* (Hinds). Longitudinal section of marginal region of shell (x49) showing periostracum (black), prismatic ectostracum and mesostracum composed of nacre with very faint prismatic wedges in its outer portion.
- Fig. 3 *Sondylus* sp. Longitudinal section (x7) showing the foliated layer (upper $\frac{2}{3}$ of section), below this the crossed-lamellar portion of the mesostracum (dark), the pallial myostracum (white) and the endostracum (gray). In the outer portion of the foliated layer the folia are more or less parallel to the trend of the layer. The gently inclined lines in that layer are growth lines, the dark reclined lines are tubules. In the innermost portion of the foliated layer the folia are very steeply inclined and in the inner layers of the shell the tubules are more or less vertical. Tubules show poorly in the very opaque outer portions of the shell.
- Fig. 4 *Sondylus* sp. Longitudinal section (x45) showing tubules running through the endostracum (dark gray in lower portion of figure), the pallial myostracum (light central portion of figure), and the crossed-lamellar inner mesectostracum (dark upper left portion of figure). Note widening of tubules at the endomyostracal boundary.
- Fig. 5 *Sondylus* sp. Inner surface, crossed-lamellar layer. The first-order lamellae are in many cases interrupted and their shape suddenly altered where tubules (black dots) occur (x8).
- Fig. 6 *Semele decisa* (Conrad). Vertical view of the marginal region (x4) showing irregular denticulation with pronounced bead-like denticles on the top portion of this region.
- Fig. 7 *Semele decisa* (Conrad). Outer surface (x4,6) showing highly irregular «beaded ribbing» corresponding to the irregular denticulation of fig. 6.
- Fig. 8 *Trachycardium (Dallocardia) quadrigenarium* (Conrad). Transverse polished section, etched with acid, by reflected light (x4,8) showing ribbing structures. Slow-growth laminae in relief, fast-growth laminae depressed. The conspicuous paired downwardly diverging depressions are the fast-growth «inverted commas» deposited on the summits of the flanges. The partitions are the ridges bordering these depressions on their rib-facing sides. Note the strong obliquity of the secondary partitions, which are continuous with the steeply oblique lower ends of the primary partitions.

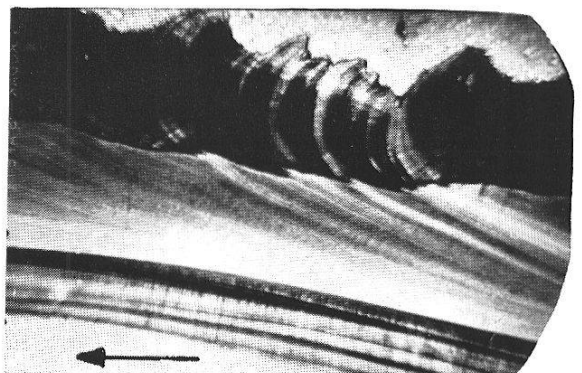
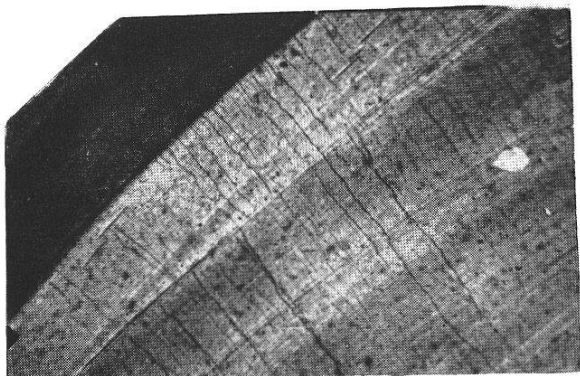
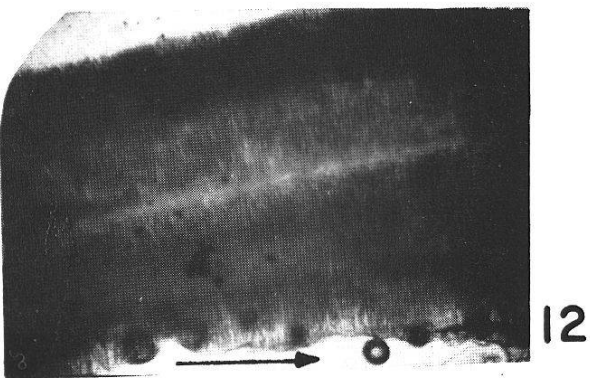
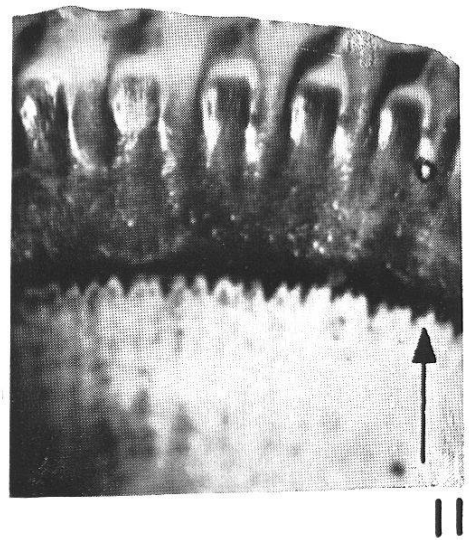
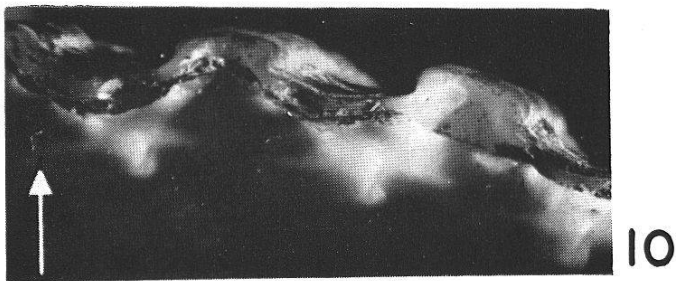
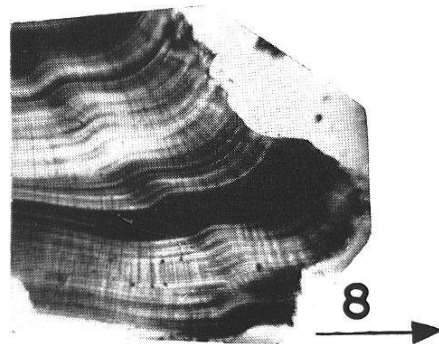
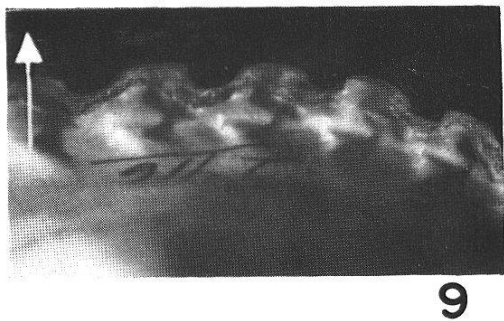
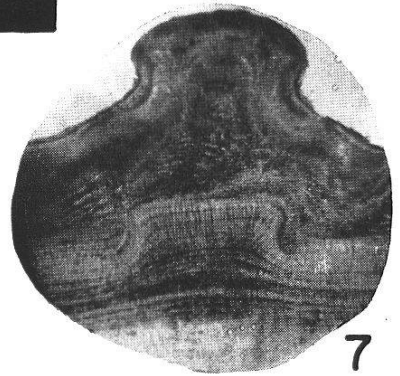
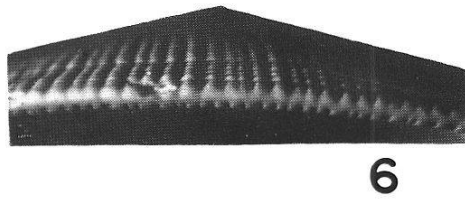
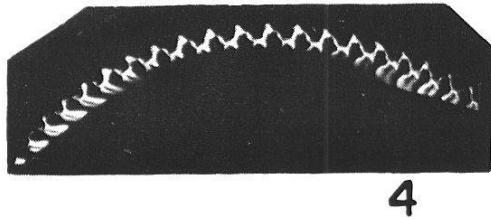
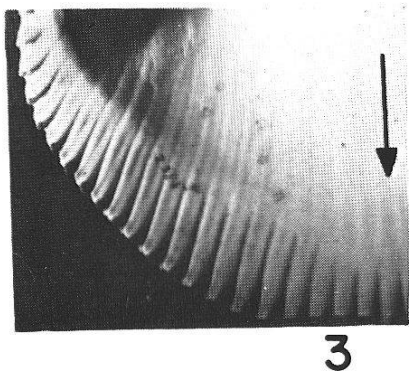
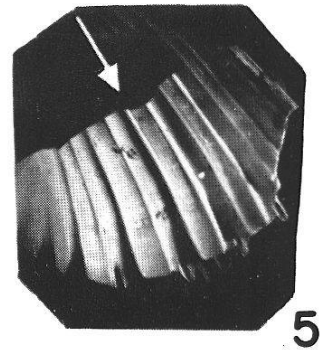
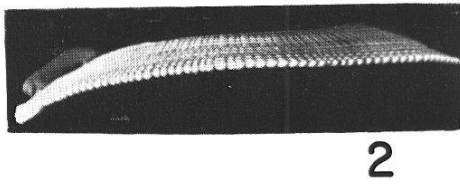
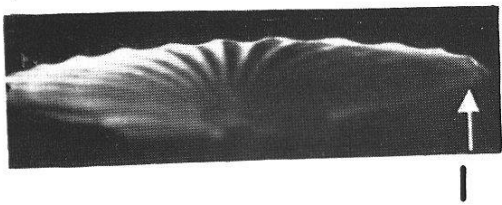
Fig. 9 *Clinocardium nuttallii* (Conrad). Longitudinal section ($\times 35$). Outer mesectostracum (dark) fibrillar, inner portion crossed-lamellar. The mesendostracal boundary shows up vaguely as a slightly oblique line about $\frac{1}{3}$ of the way down into the light lower portion of the figure. The endostracum is complex.

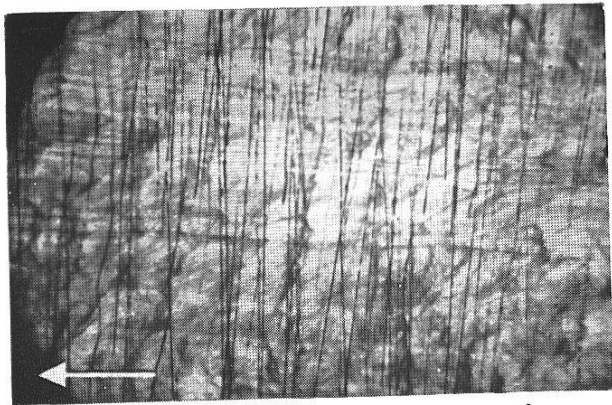
Plate V

- Fig. 1 *Trachycardium (Dallocardia) quadrigenarium* (Conrad). Outer surface of the shell along the posterior ventral margin ($\times 1,4$) showing «additive» spines.
- Fig. 2 *Mexicardia procerum* (Sowerby). Inner surface of shell in marginal region ($\times 2$) showing denticles, primary flanges (1) and secondary flanges (2).
- Fig. 3 *Trachycardium (Trachycardium) consors* (Sowerby). Outer surface of the shell along the posterior ventral margin ($\times 1,4$). Spines or imbrications not reflected.
- Fig. 4 *Trachycardium (Trachycardium) consors* (Sowerby). Outer surface of the shell along the anterior ventral margin ($\times 1,4$). Spines or imbrications reflected.
- Fig. 5 *Schizothaerus nuttallii* (Conrad). Longitudinal section ($\times 15,6$) showing the ectostracum (uppermost left of figure), the reclined «crossed-lamellae» of the outer mesostracum which bend sharply near the middle of the layer to become markedly inclined in the inner portion of the layer; where the lamellae bend in the middle of the mesostracum they show a very irregular twisted and tangled pattern.
- Fig. 6 *Anadara* sp. Radial section of the marginal half of the shell, mostly mesectostracum. Dark $\frac{2}{3}$ of shell to the right actually opaque, due to presence of tubulation. Boundary of dark region steeply oblique, almost vertical, corresponds to outer ends of tubules in mesectostracum. Pallial line on lower surface of shell, at limit of light and dark regions: endostracum represented here by a thin zone (not clearly visible) along lower shell surface to right of pallial line.
- Fig. 7 *Venericardia laticostata* (Sowerby). Transverse section through the outer mesostracum in the region of the boundary between a denticle and an indentation ($\times 30$). The curving, nearly vertical clear zones near the center of the figure are partitions; an upper sigmoid primary partition, with a secondary partition originating from the first about $\frac{2}{3}$ of the way down from its upper extremity and curving widely to the left and around the base of the primary partition. To the left of the partitions is the rib area, to the right the interspace area.
- Fig. 8 *Cardita* sp. Inner surface view of the marginal region ($\times 8$). The vertical marginal surface of the deposits in the grooves show very distinct depressions.

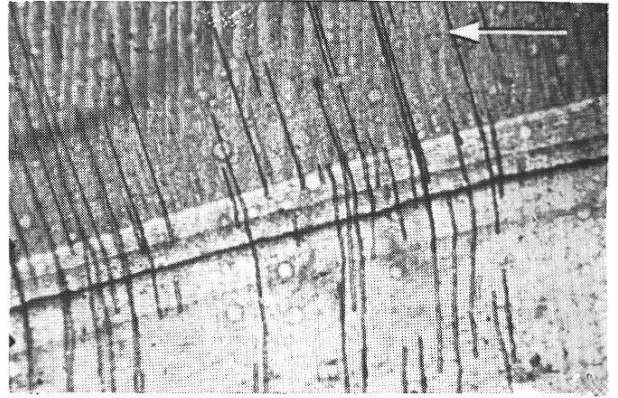
Plate VI

- Fig. 1 *Trachycardium consors* (Sowerby). Transverse section from peel (x5) showing distinct rib and interspace areas. The growth laminae show clearly in the center of the rib areas, the dark bands being the slow-growth laminae, the light bands the fast-growth laminae. The conspicuous radiating lines on the sides of the rib areas are not laminae but first-order lamellae. The partitions delimiting the rib and interspace areas are very oblique. The inverted commas appear on the interspace side of the partitions.
- Fig. 2 *Trachycardium consors* (Sowerby). Vertical, almost longitudinal section from peel (x10) showing mesectostracum and spines. The complex pattern of the growth lines results from the ribbing structures being transected at a low angle. The first-order lamellae are almost horizontal in the upper half of the section.
- Fig. 3 *Trachycardium consors* (Sowerby). Vertical, almost longitudinal section (x10) showing the crossed-lamellar mesectostracum (upper $\frac{1}{2}$ of figure) and the complex endostracum with typical chevron-shaped patterns. The white oblique line in the mesectostracum is a partition, the area to its left a rib area, that to its right an interspace area.
- Fig. 4 *Protothaca staminea* (Conrad). Hypotype no. 36284. Longitudinal section (x26). Ectostracum thick, fibrillar, with growth lines therein slightly reflected, but also tending to show a subperipheral inflection (especially in central portion of figure). Mesostracum mostly homogeneous, including about half the shell thickness below the ectostracum in the figure. Endostracum with an indistinct complex structure.
- Fig. 5 *Chama echinata* Broderip. Inner surface of shell (x1,4) showing dendritic penetrations of the endostracum into the muscle scars and doubling of the pallial line.
- Fig. 6 *Chama pellucida* Broderip. Longitudinal section (x49) showing funnel-tipped tubules in endostracum and (in upper part of section) a portion of the mesostracum.
- Fig. 7 *Chama pellucida* Broderip. Longitudinal section (x100) showing some funnel-tipped tubules. The second tubule from the left bifurcates near its upper extremity.
- Fig. 8 *Trachycardium consors* (Sowerby). Transverse section from peel (x4). The white vertical band in the middle of the rib area is caused by the rapid filling of the groove or indentation.

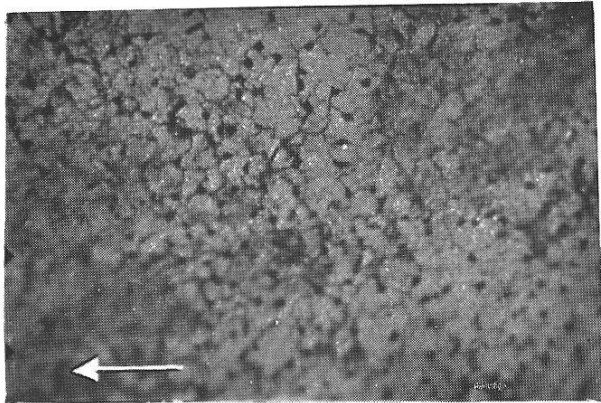




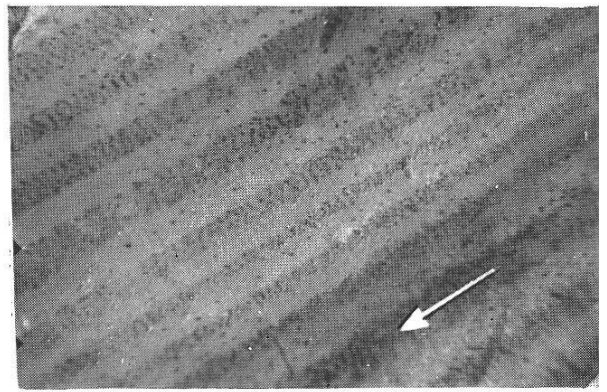
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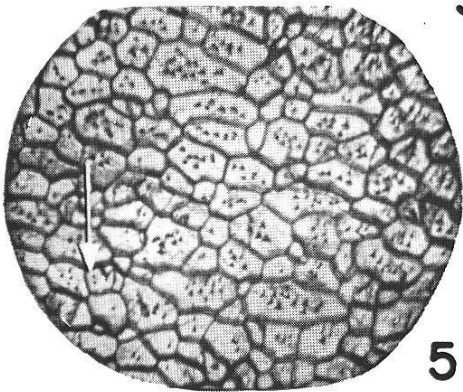
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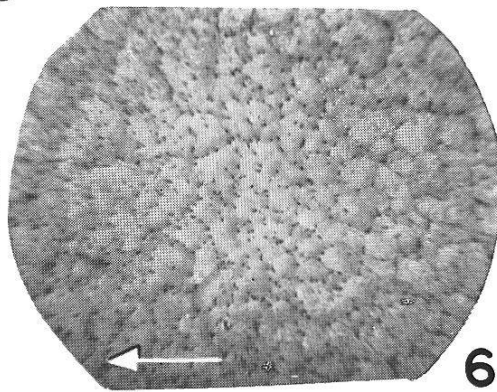
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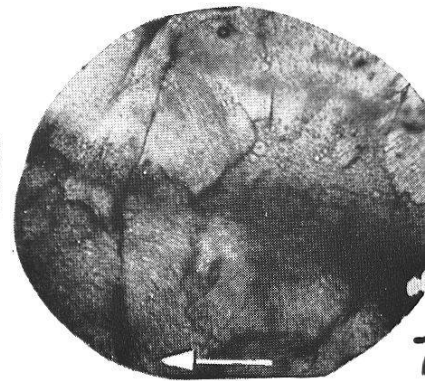
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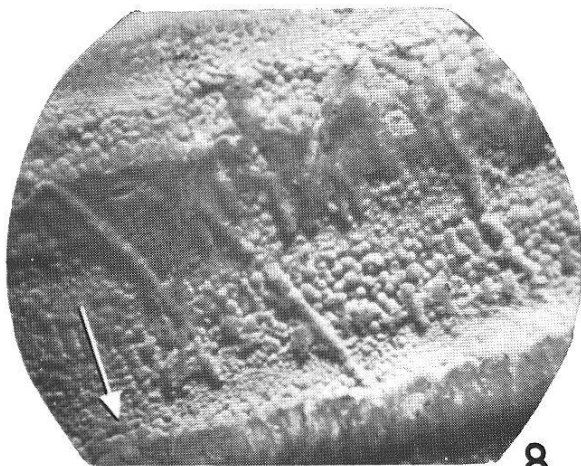
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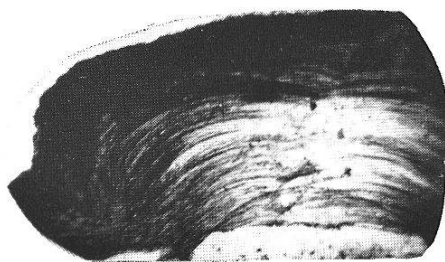
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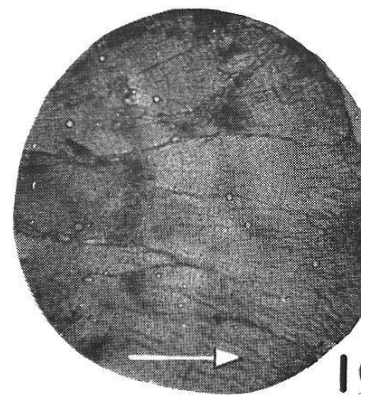
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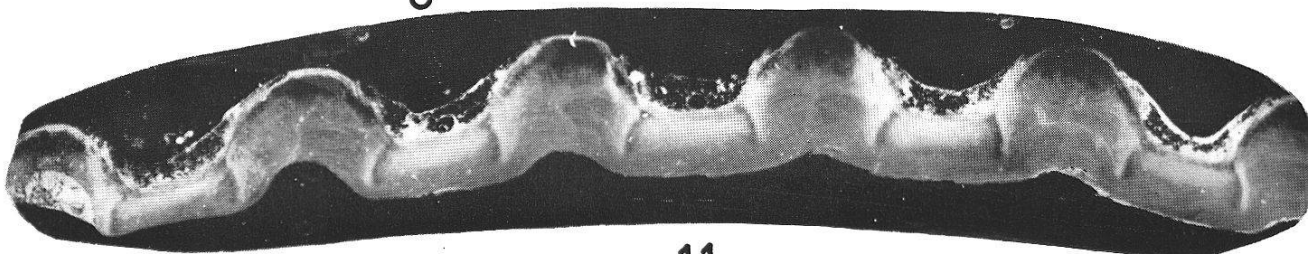
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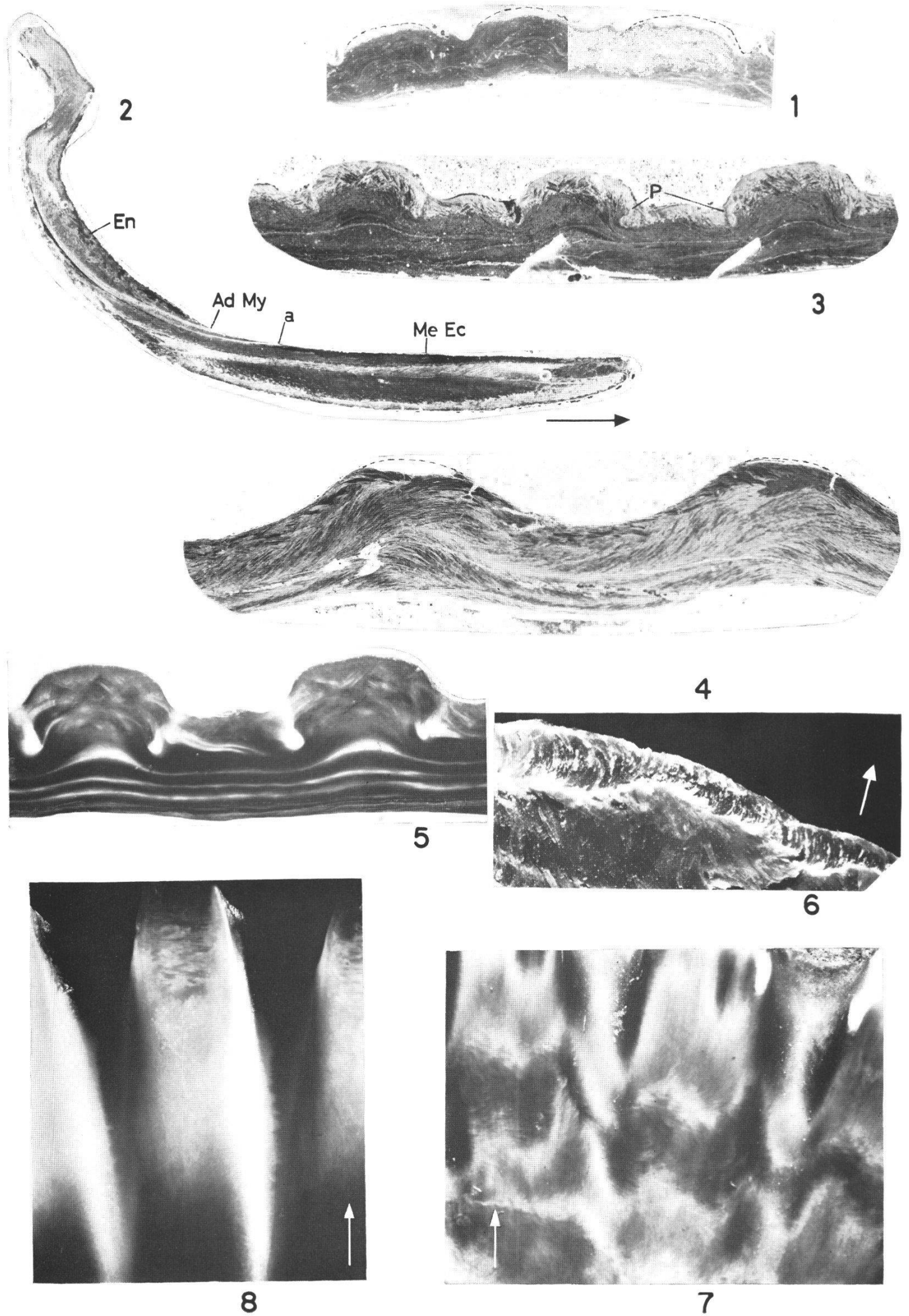
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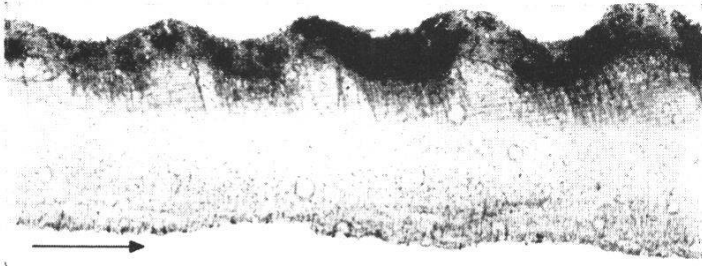


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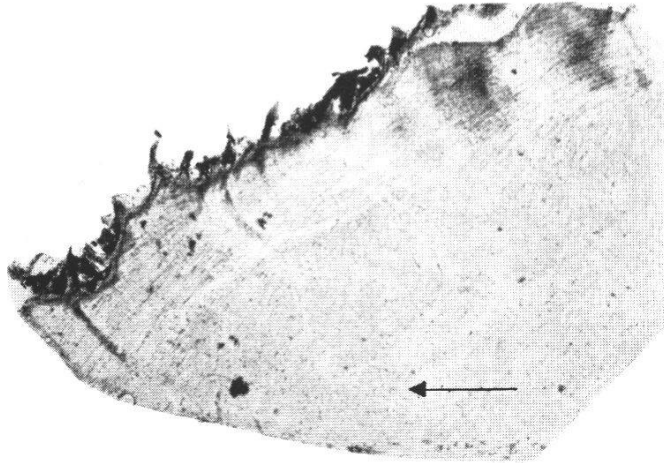


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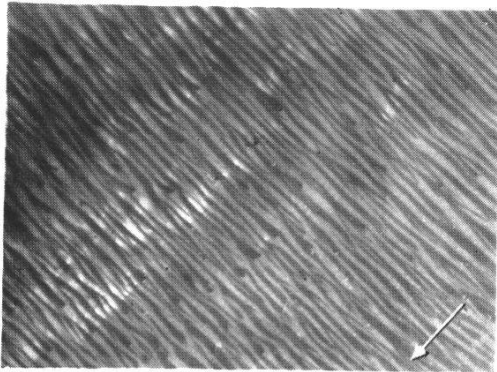
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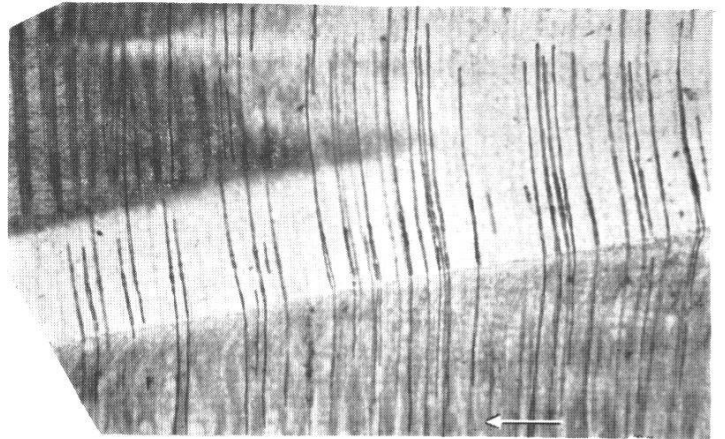
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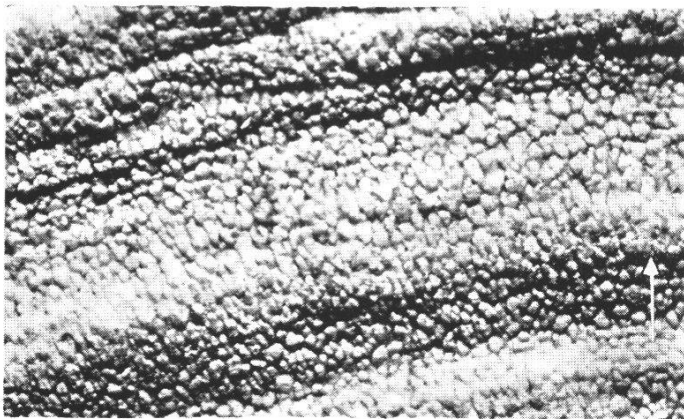
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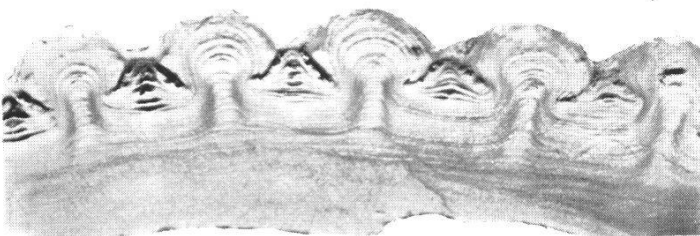
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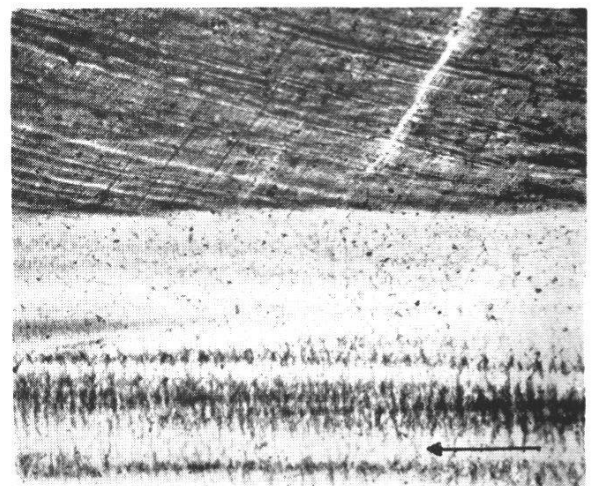
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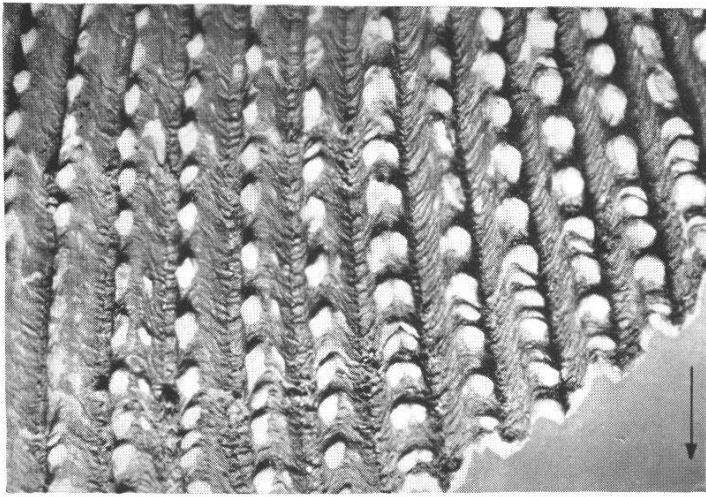
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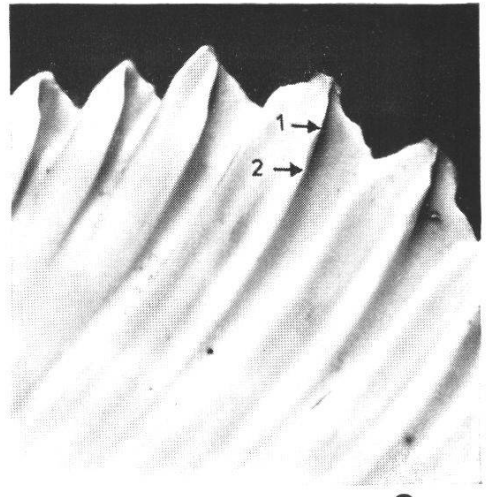
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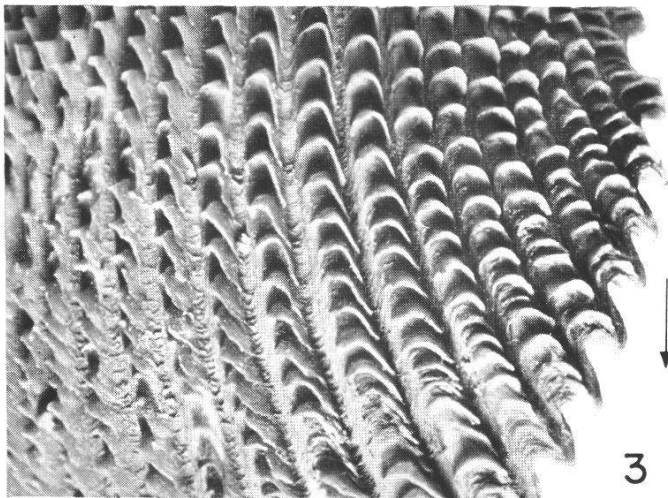
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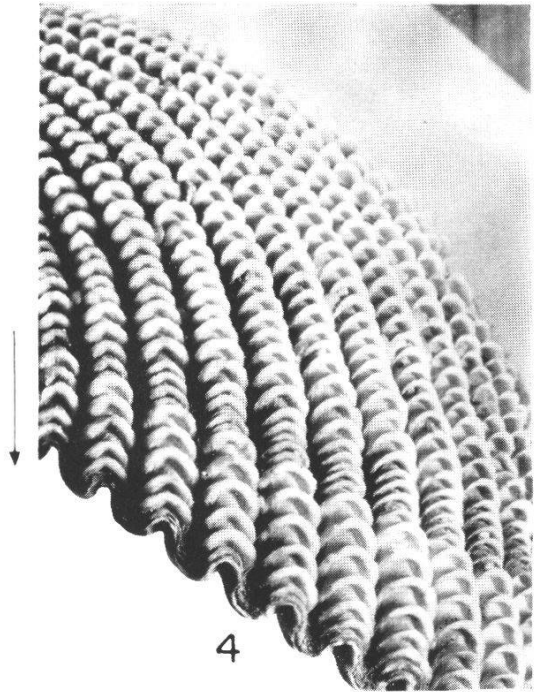
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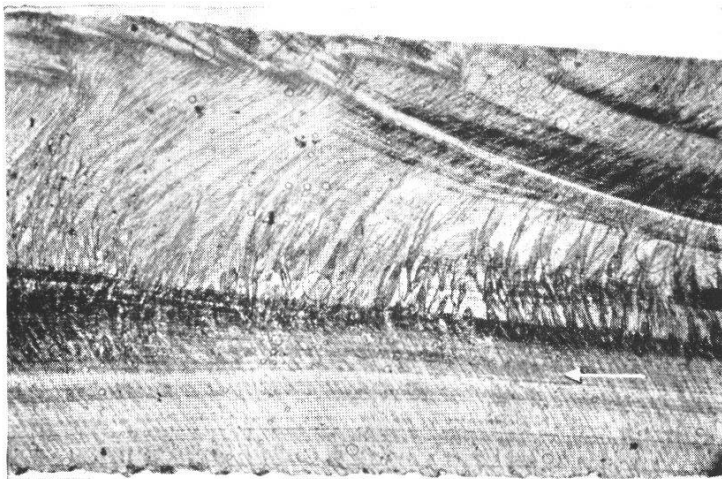
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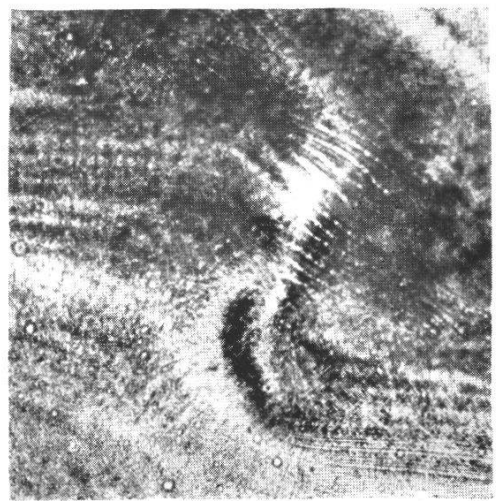
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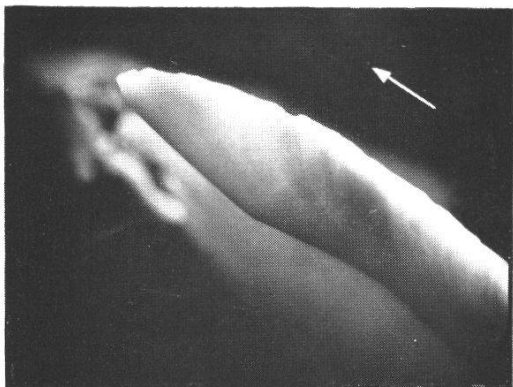
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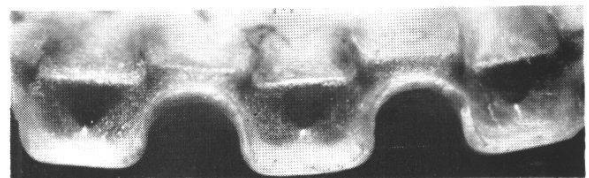
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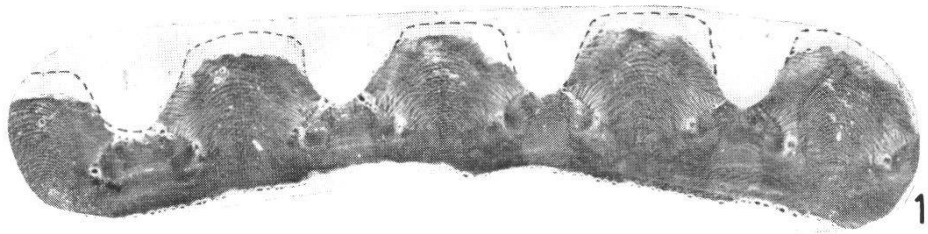
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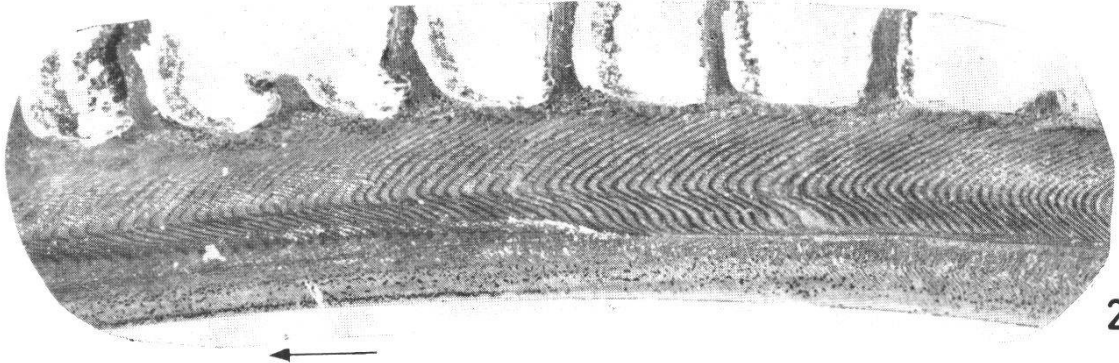
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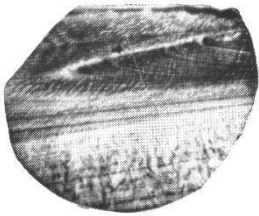
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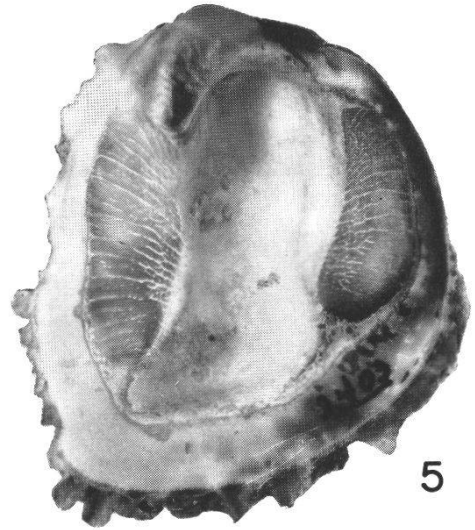
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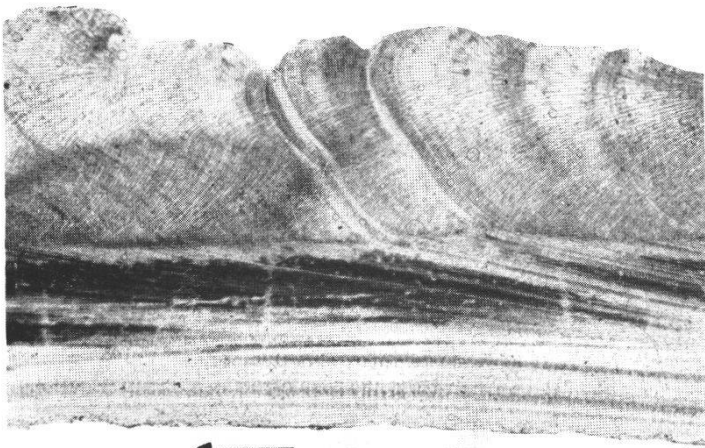
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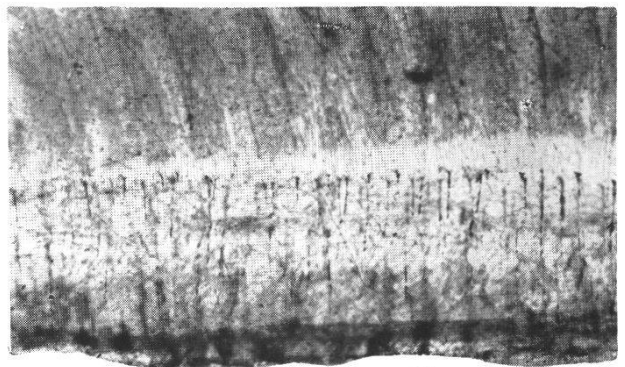
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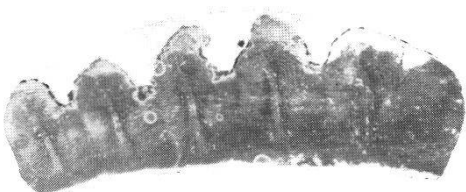
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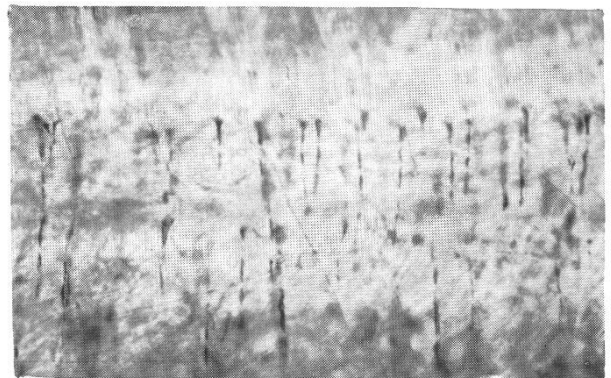
4



6



8



7