

International Code for Phytolith Nomenclature (ICPN) 2.0

International Committee for Phytolith Taxonomy (ICPT)
(Katharina Neumann, Caroline Strömberg, Terry Ball,
Rosa Maria Albert, Luc Vrydaghs, Linda Scott Cummings)

Supplementary Information: Glossary of Descriptive Terms

General Suggestions for Using this Glossary

- 1) These terms are intended to be used for describing phytolith morphologies and should not be confused with morphotype names. However, a descriptor can be used as part of name for a new morphotype as per ICPN 2.0 naming and describing directions.
- 2) It is often helpful to combine descriptors to indicate the range, transitional forms, and plasticity of shapes, ornamentations, textures or margins when describing phytoliths. For example, descriptions such as “processes are echinate to baculate,” “surface texture is granulate to nodulate,” or “margins are dentate to clavate” may be useful in describing a particular phytolith type and the variance within the type or even a single phytolith. This can also help ameliorate problems with the naturally subjective nature of descriptions.
- 3) Many of the term definitions below are accompanied by a list of similar terms that researchers may find useful in describing a particular phytolith type and its range of variance.
- 4) Because a given term/descriptor may encompass a range of forms (see photos below), it is often helpful to add explanatory text to descriptions. For example, a phytolith with “papillar” processes/ornamentation encompasses both forms with one large process or several processes.
- 5) Phytoliths are three-dimensional and they should be described as such whenever possible.
- 6) These terms should be used only for describing original shape and texture, not for characteristics associated with secondary processes such as dissolution, breakage, or diagenetic alteration.
- 7) An “Alphabetical List of All Descriptors” is found at the end of the Glossary.
- 8) When terms in this glossary are not adequate to describe a particular phytolith, consider consulting the sources listed at the end of the glossary for additional botanical Latin terms that may be useful, consulting Stearn’s Botanical Latin (Stearn 2013) first.

Descriptors

Data Base source or contributors name are listed under the images.

Shape Descriptors, 3-Dimensional

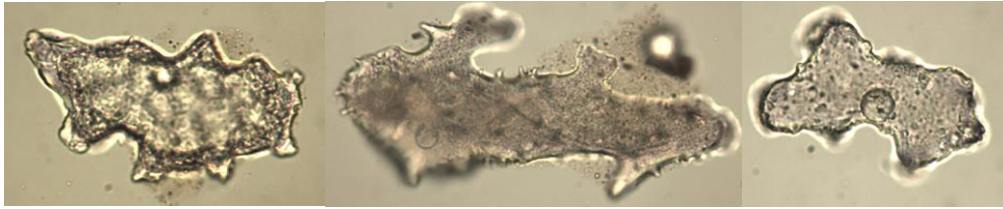
acicular: needle shaped, long and narrow, tapering to an acute apex, cf. acute (2-D)



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amoeboid: having an irregular shape with several rounded projections (projections are small relative to the body overall); cf. brachiata (2-D)



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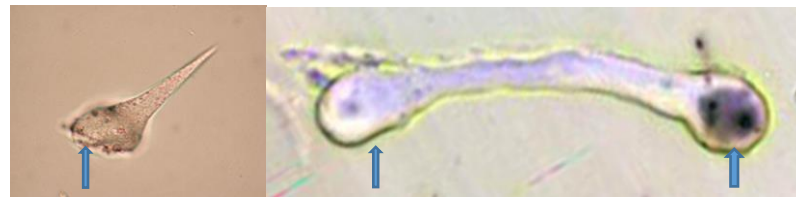
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bulbous: being swollen, rounded, ballooned, or bulging at some point; cf. claviform.



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carinate: keel shaped or having a keel shaped ridge



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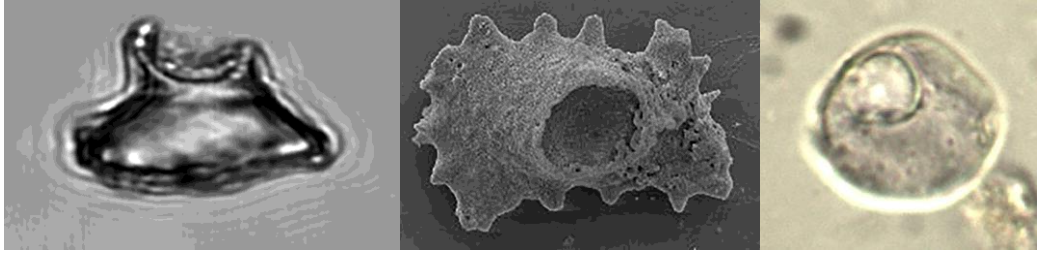
cavate: hollowed out; cf. conical



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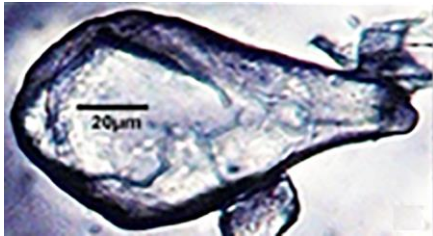


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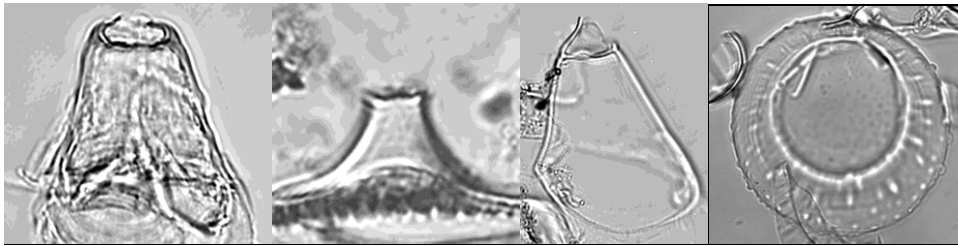
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claviform: club shaped; gradually thickening from a slender end to a wider, usually rounded end; cf. bulbous, flabellate (2-D)



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conical: cone-shaped, widest at the base and tapering to the apex from a more or less flat base, apex may be acute, truncated, rounded, or cavate

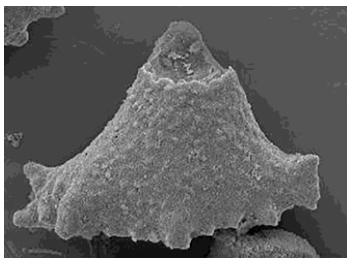


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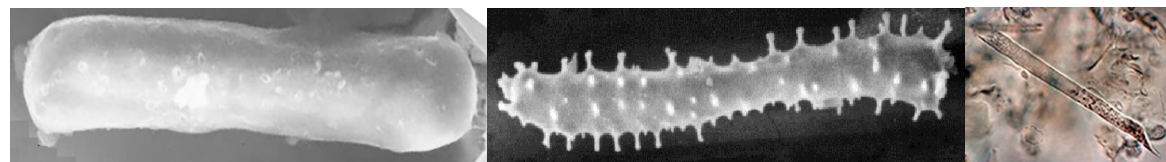
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cylindrical: circular to ellipsoidal in cross section, cylinder-shaped; cf. elongate (2-D)



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ellipsoidal: similar to spheroidal but stretched or elongated along one axis; forms ellipses or circles in cross section; cf. spheroidal, oblong (2-D)



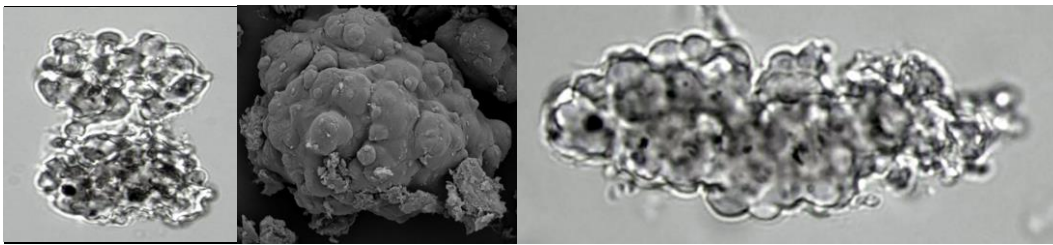
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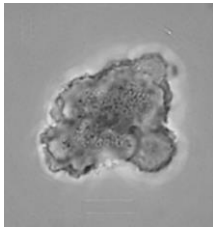
nodular: composed of rounded, somewhat irregular nodules or spheroids; cf. nodulate (rounded nodules on the surface)



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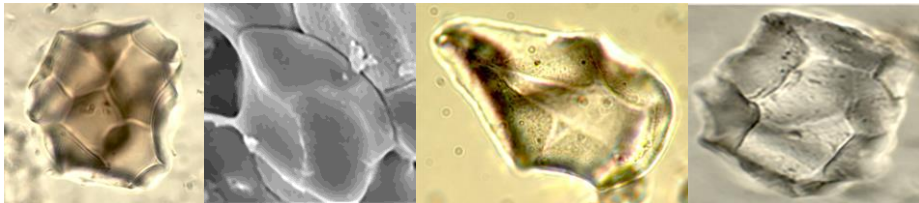
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polyhedral: having several distinctive, flat or concave faces, cf. polygonal (2-D), facetate (2-D)

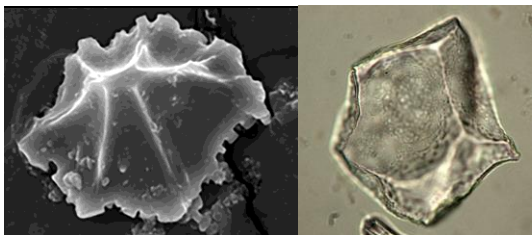


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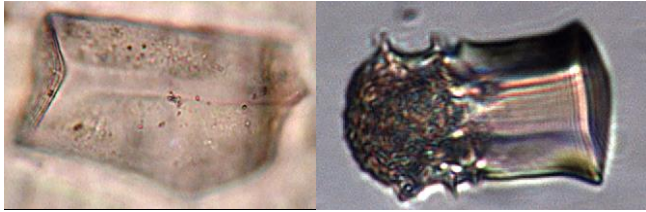
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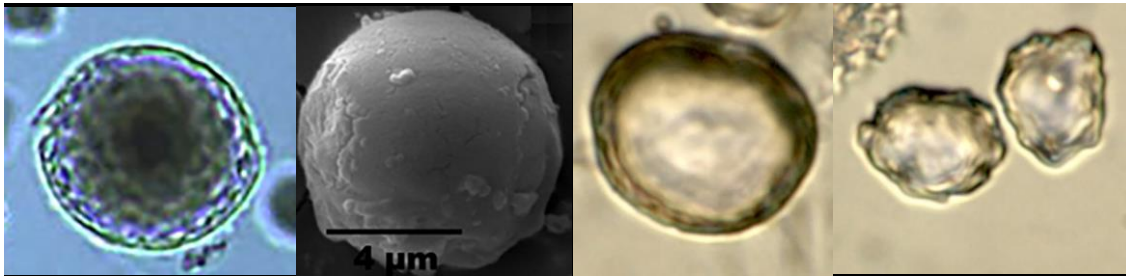
prismatic: having sides that are parallelograms, polygonal in cross section; cf. polyhedral (3-D);



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spheroidal: globe shaped, spherical or nearly so in 3 dimensions, circular or nearly so in cross section; cf. ellipsoid (3-D), circular (2-D)

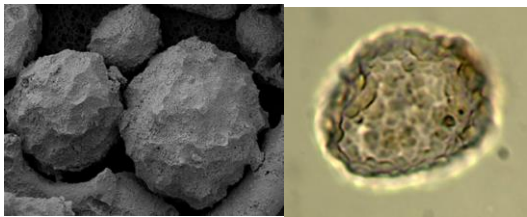


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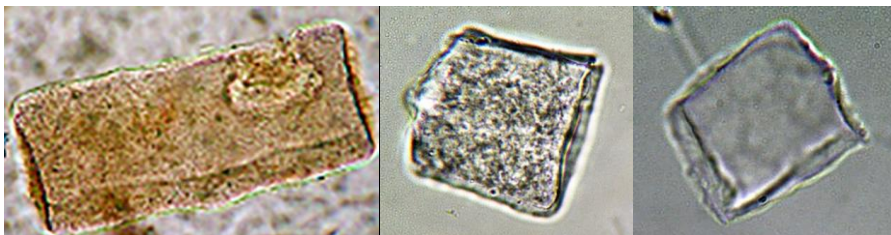
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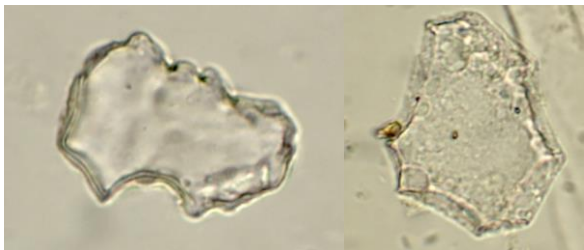
tabular: relatively thin, having two parallel flat faces (like a table top)



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Zsuzsa Lisztes-Szabó

Zsuzsa Lisztes-Szabó

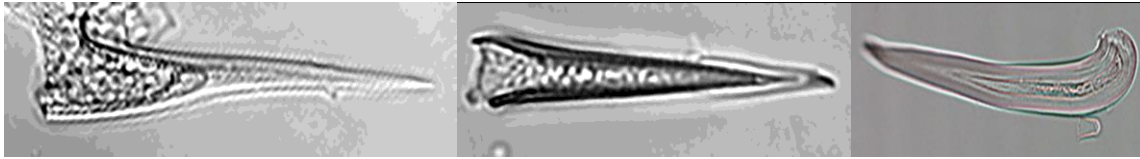


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Shape Descriptors, 2-Dimensional

acute: pointed, narrowing to a sharp apex with an angle of less than 90°; cf. acicular (3-D)



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arcuate: curved like a bow; cf. reniform, uncinata



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brachiate: branched; cf. amoeboid (3-D)

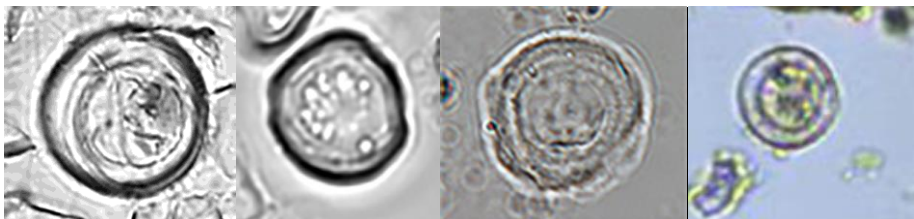


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circular: round, circle shaped or nearly so; cf. spheroid (3-D)



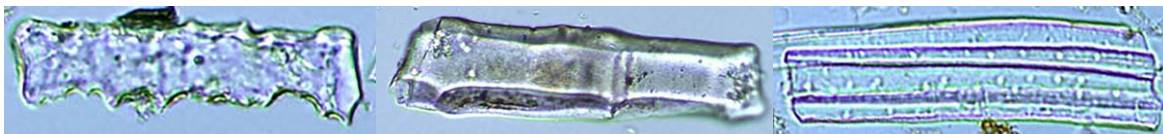
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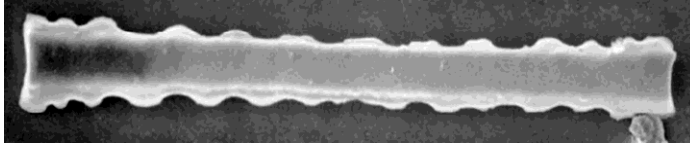
elongated: longer than wide; specifically, more than twice as long as wide; cf. cylindrical (3-D), oval (2-D), ovate (2-D), rectangular (2-D)



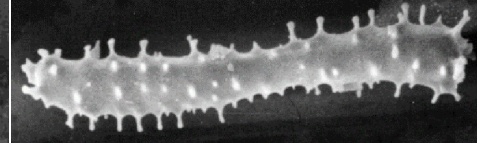
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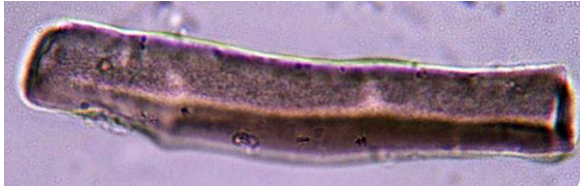
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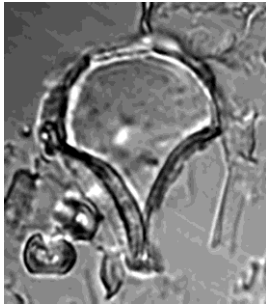


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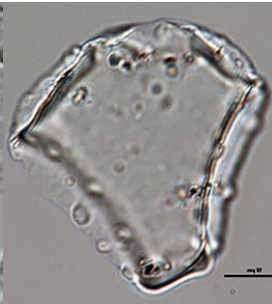


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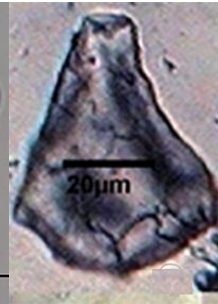
flabellate: fan-shaped; cf. clavate (3-D)



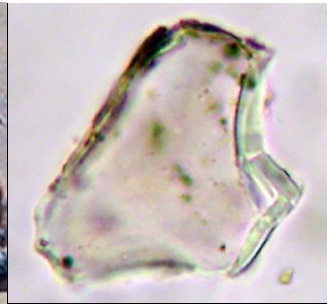
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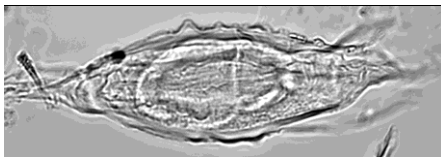


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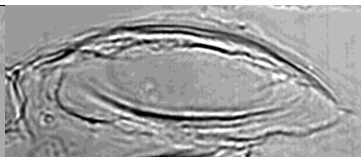


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fusiform: spindle-shaped, swollen in the middle and narrowing towards the ends, either symmetrically or as in a spindle used in textiles, asymmetrically, that is, narrowing more abruptly on one end.



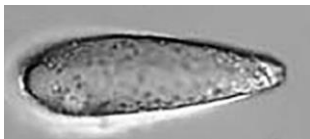
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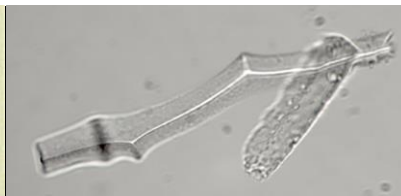


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geniculate: bent at an angle, knee-like.



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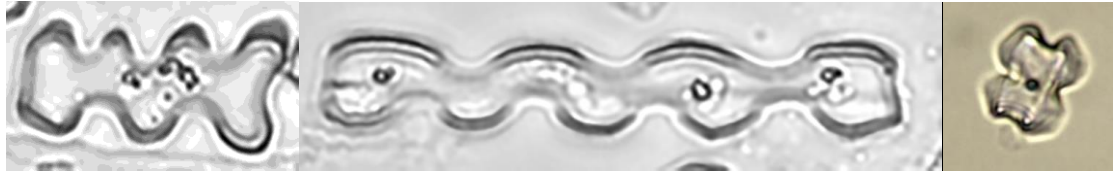


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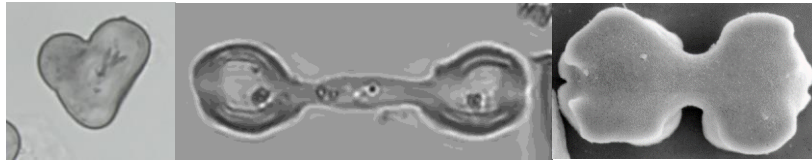
lobate: having two or more lobes, that is, wider rounded parts separated by a castula (waist)



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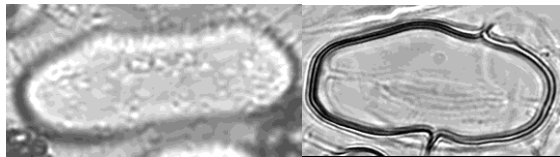


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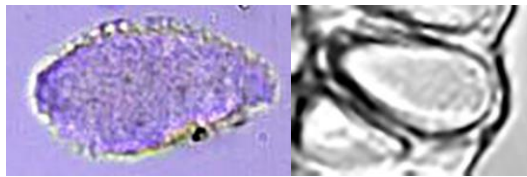
oblong: rectangular/elongated shape but with rounded corners or ends; cf. ellipsoidal (3-D)



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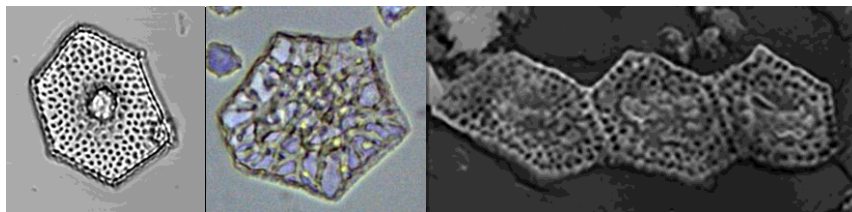
ovate: egg-shaped, elliptic with one end broader than the other; cf. oblong (2-D), reniform (2-D)



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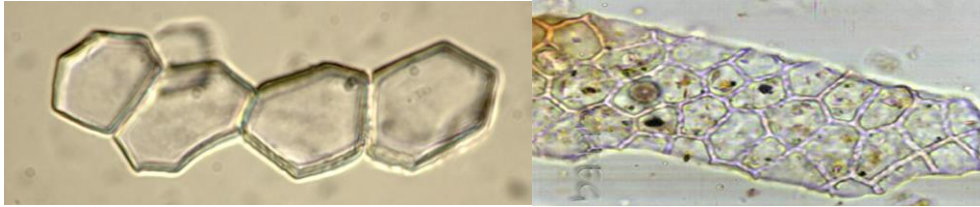
polygonal: having three or more straight sides, as in triangles, pentagons, hexagons, etc.; cf. polyhedral (3-D)



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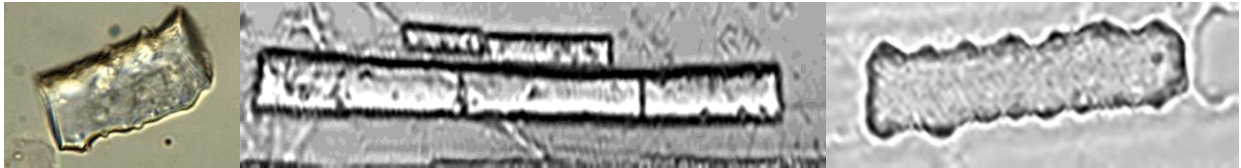
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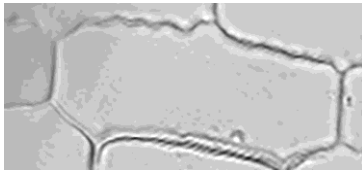
rectangular: having four \pm straight sides, of which two opposite sides are longer than the other ones, with four angles of $\pm 90^\circ$; cf. elongated



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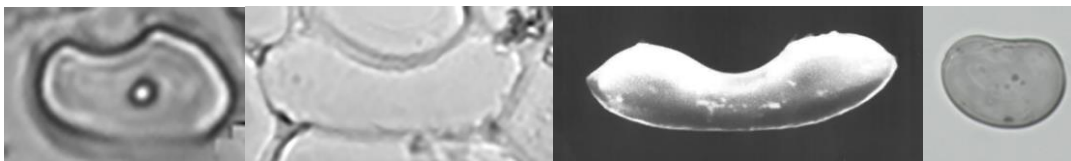
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reniform: kidney-shaped, oblong with one concave and one convex side; cf. oblong



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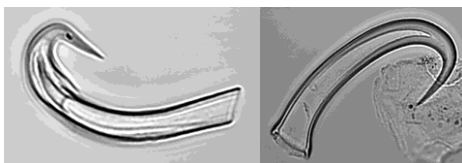
trapeziform: having four sides, two being parallel, and the other two not parallel



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uncinate: hook-shaped

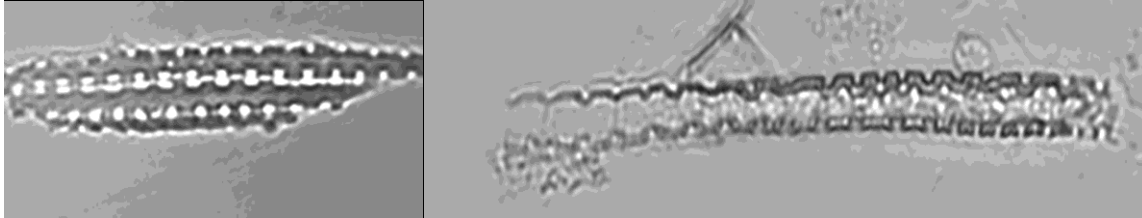


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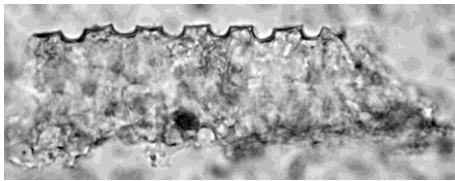
Margin Descriptors

castellate: having a pattern of square to rectangular projections along the margins, typically broader (along the main axis of the main body) than tall; cf. columnar,



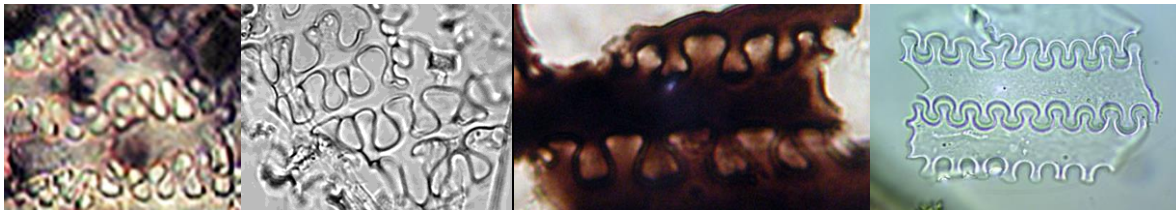
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clavate: having a pattern of club-shaped projections (thicker at distal end, constricted proximally) along the margins; cf. dentate, baculate



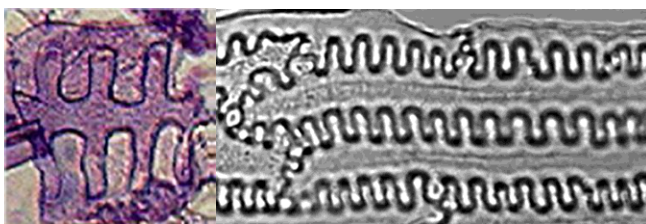
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columnar: having a pattern of straight-sided, square to rounded, strap like projections along the margins that are longer than broad; cf. castellate, clavate, dentate



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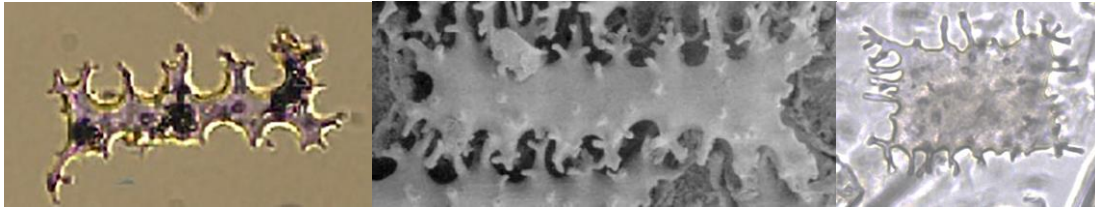
crenate: having rounded teeth; cf. sinuate



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dendritic: having branched projections along the margins; cf. dentate, echinate

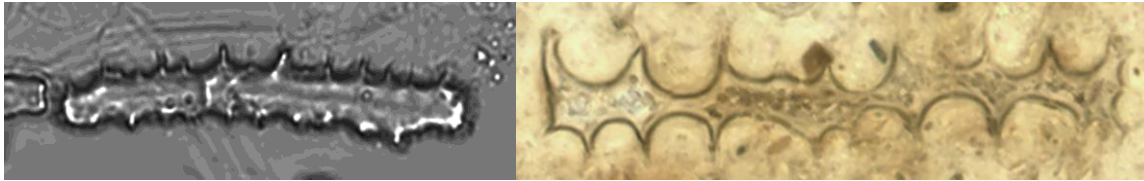


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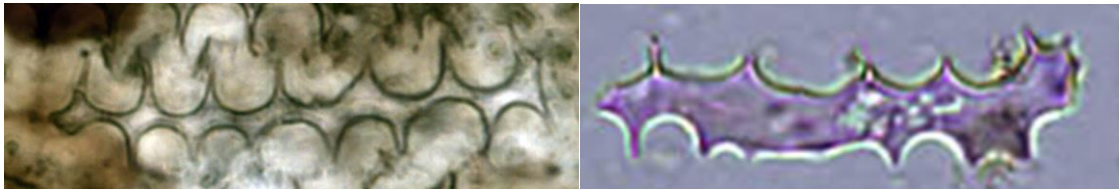
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dentate: having “teeth,” that is, narrow, often acute processes with concave or straight sides along the margins; cf. clavate, columnar, echinate



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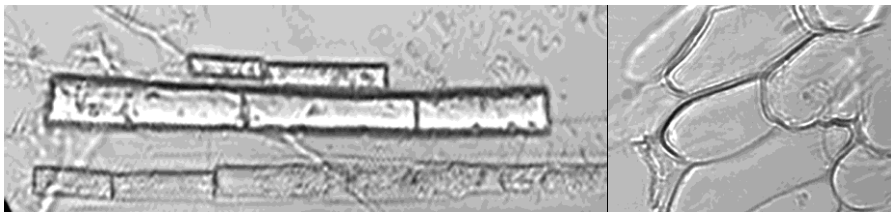
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entire: having smooth margins, without any projections, indentations, or unevenness



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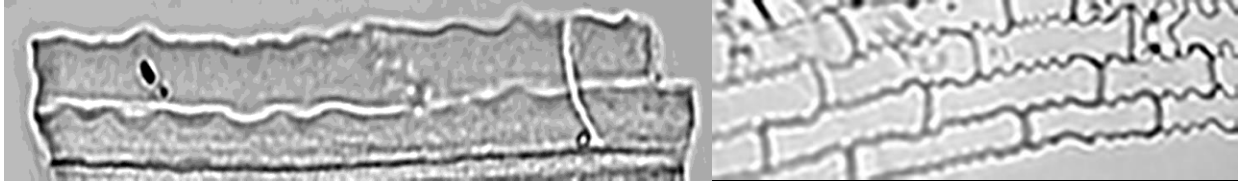
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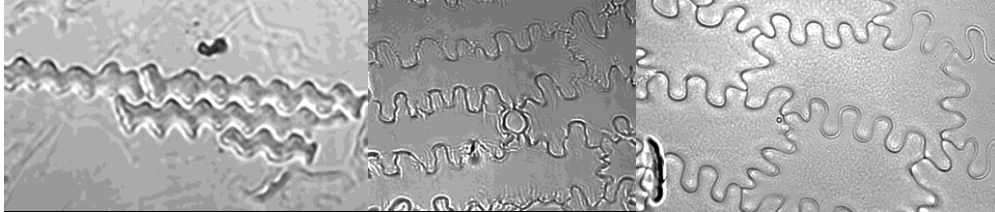
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sinuate: having a margin with alternating concavities and convexities; cf. clavate, columnar, crenate, dentate



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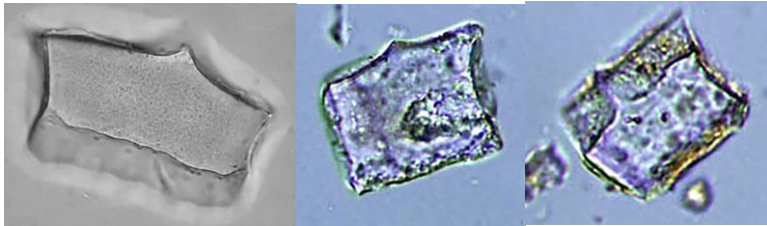


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velloate: having pinched point(s) along the margin (corresponding to an intersection between adjacent cells in tissue).



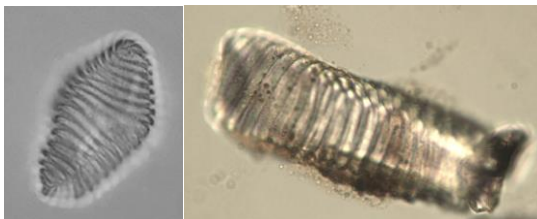
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Surface Texture and Ornamentation Descriptors

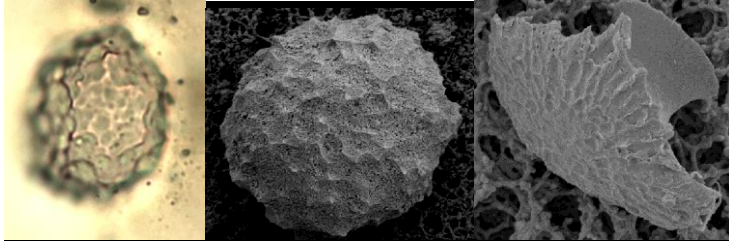
annulate: surface shaped into alternate, evenly spaced and sized ridges and furrows in a more or less regular, (sub)parallel pattern; cf. helical, plicate, rugose, striate



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areolate: surface divided into irregular spaces delimited by narrow ridges; cf. facetate, which has much larger, angular, and regular spaces in between ridges

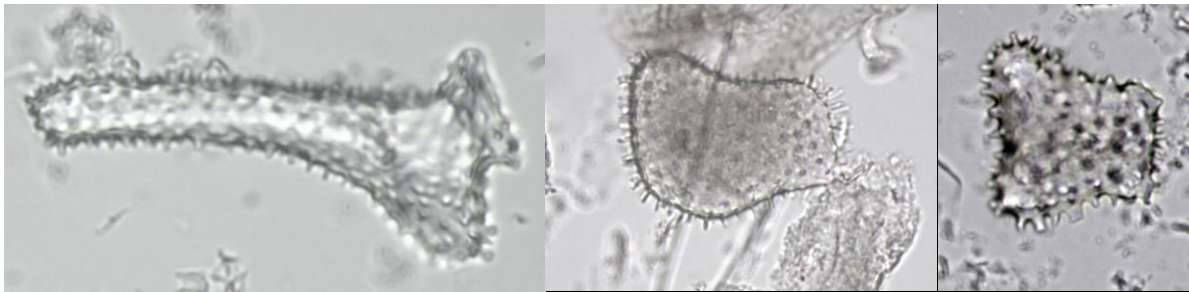


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baculate: having straight-sided cylindrical or pillar-like processes that are longer than broad; cf. echinate, pilate

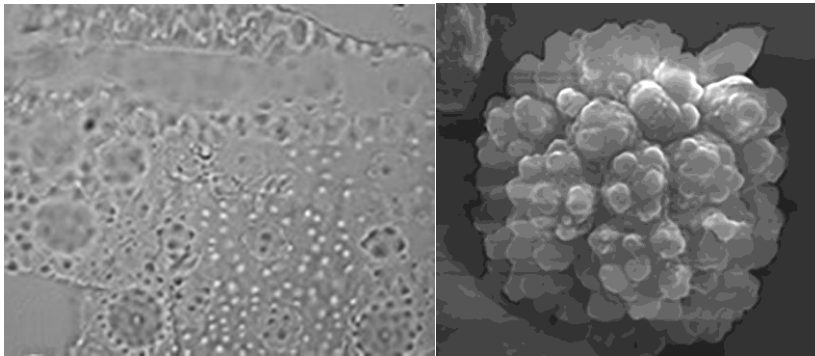


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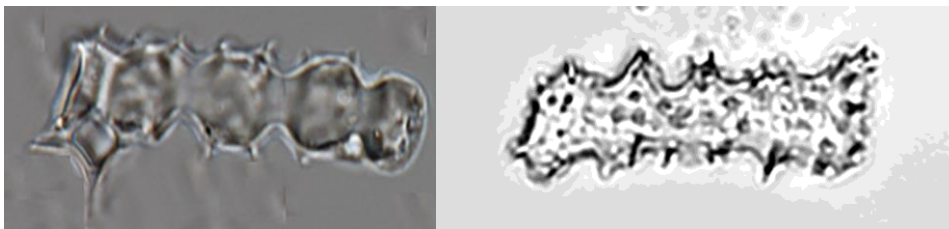
compound: structure consisting of two more simple parts in combination, for example larger processes covered in small processes.



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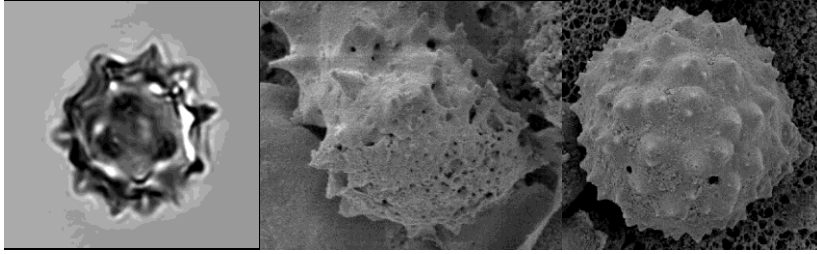
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echinate: having spiny, conical, more or less sharply acute projections; cf. tuberculate, baculate



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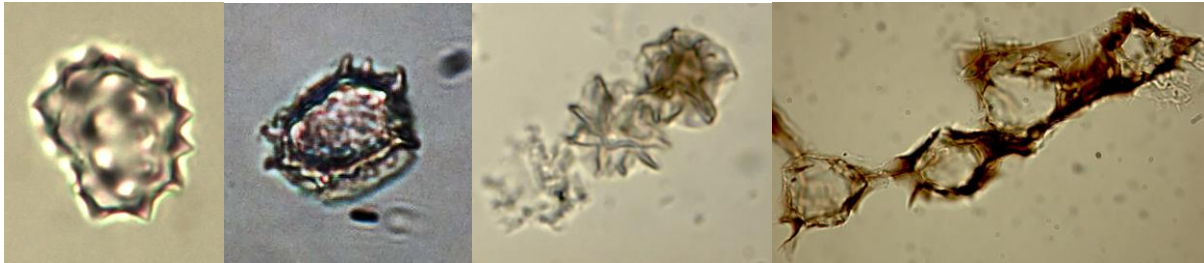
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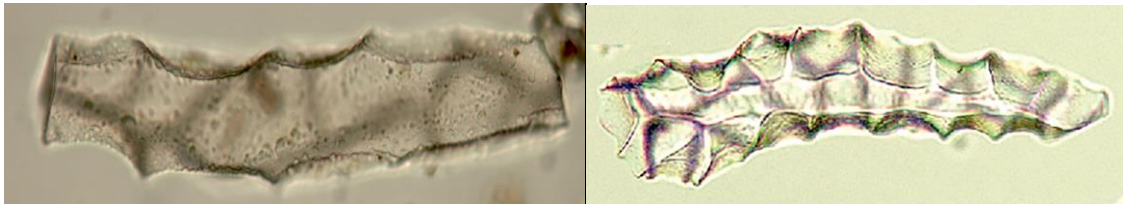
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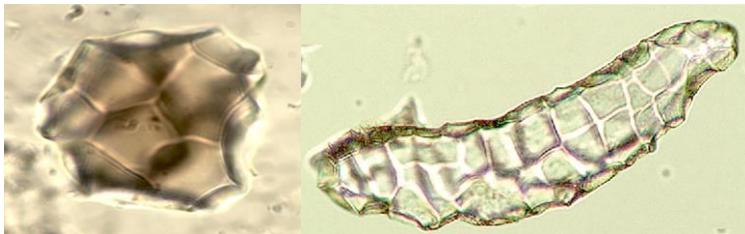
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facetate: having several flat to slightly concave areas forming the surface; cf. areolate, ruminata



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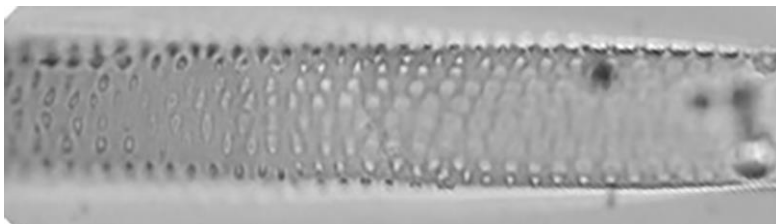
Aline Garnier



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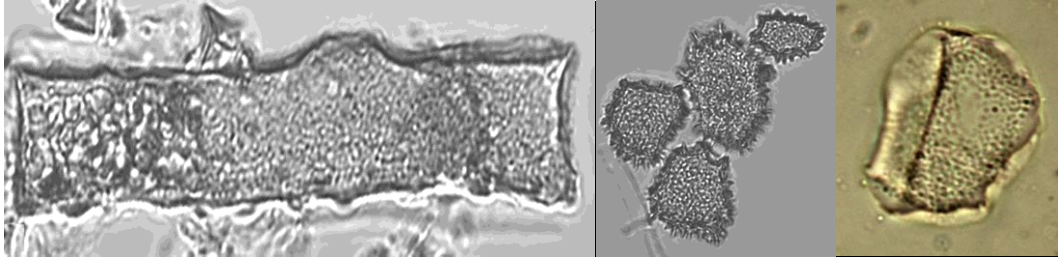
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gibbate: having short, knob like processes that are more or less circular, oval or spindle-shaped in cross section and having flat or rounded ends, typically broader than long; cf. pilate, baculate



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granulate: having fine grains on the surface, creating a grainy texture; cf. nodulate, scrobiculate, granular (3-D)



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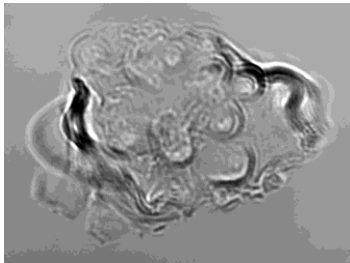
helical: having ridges that are arranged spirally around a typically cylindrical or rounded body, cf. annulate



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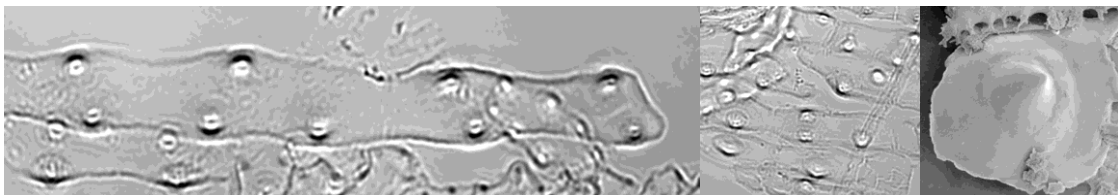
Katharina Neumann

nodulate: having rounded, somewhat irregular, nodules or spheroids on the surface; cf. nodular (3-D), verrucate, papillar, tuberculate



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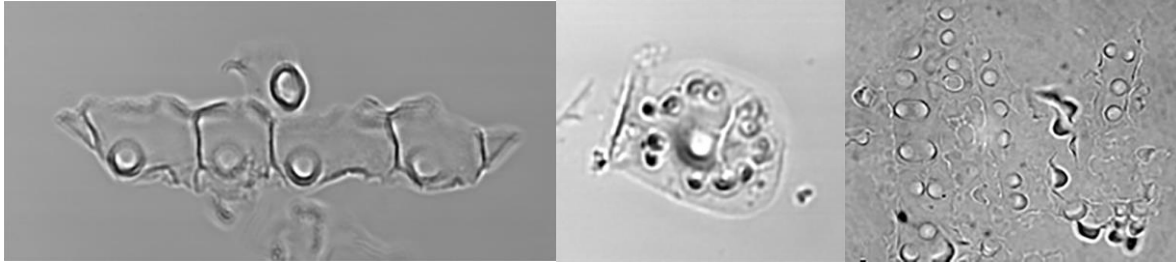
papillar: having one or more rounded, nipple-like processes on a planar surface; cf. echinate, tuberculate, nodulate, nodular (3-D)



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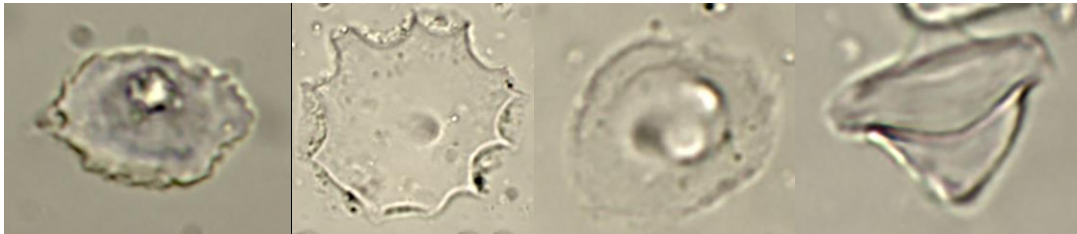
Terry Ball



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PhytCore Data Base



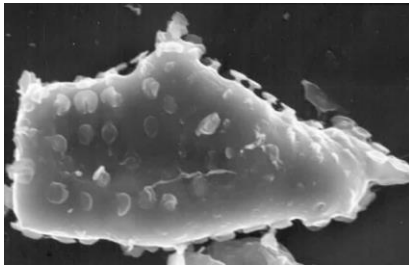
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pilate: having processes with concavities along the ends, tops or sides



Doreen Bowdery

plicate: crumpled, wrinkled, or irregularly folded surface; cf. rugose

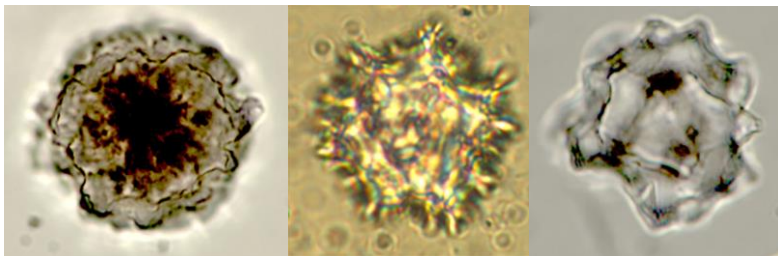


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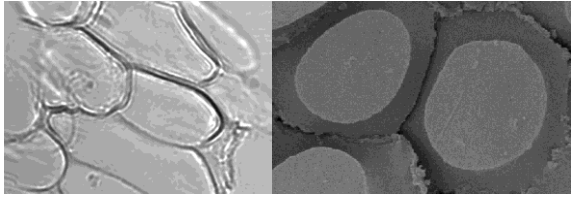


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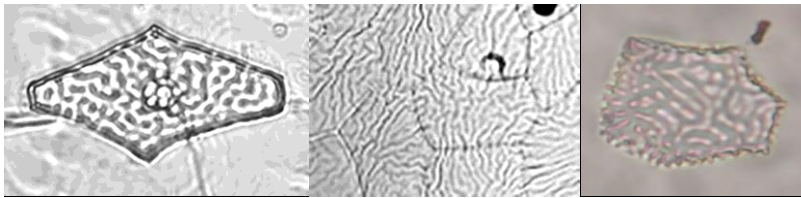
psilate: having a smooth surface



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rugose: covered with an irregular pattern of lines, ridges, or furrows on a planar surface; cf. plicate, striate

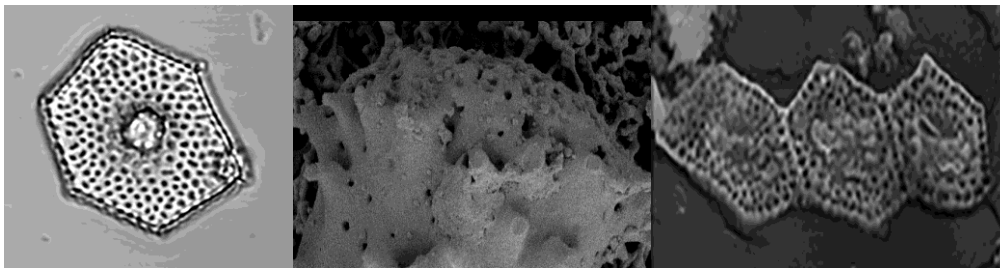


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Aline Emery-Barbier

scrobiculate: pitted, evenly to unevenly, densely to sparsely

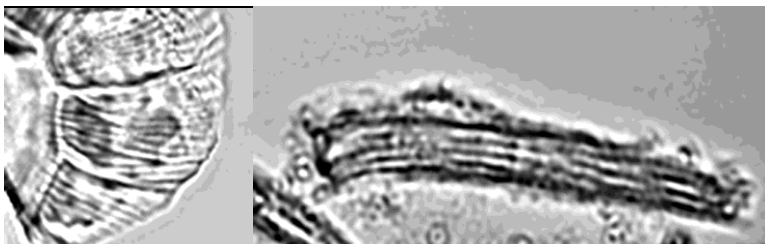


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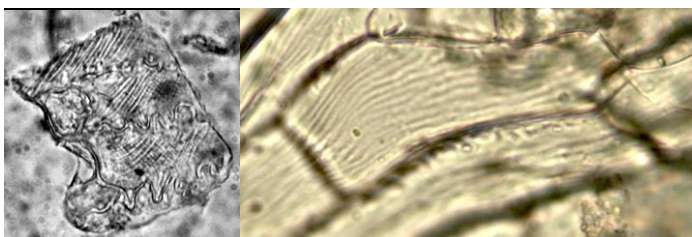
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striate: having lines or shallow furrows/ridges in a parallel pattern; cf. rugose



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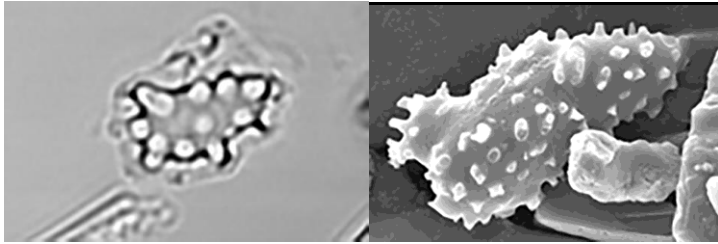
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Aline Emery-Barbier

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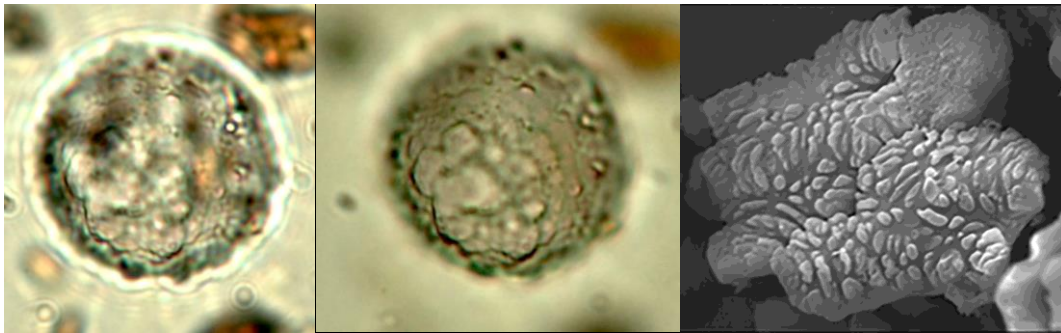
tuberculate: covered with rounded and tapering protrusions; cf. nodulate, gibbate, verrucate



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verrucate: having irregular shaped, wart-like processes; cf. tuberculate, nodulate,



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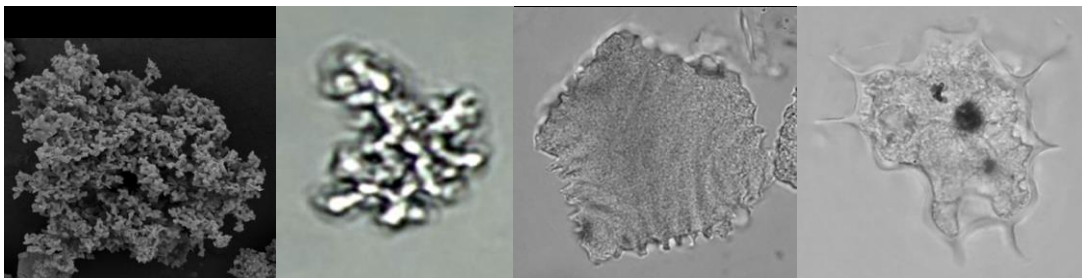
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Internal Material Texture Descriptors

The internal material texture refers to the (internal) microstructure (texture) of the silica that makes up phytoliths, as opposed to the texture of the surface of the phytolith. Although certain morphotypes display substantial variation in the internal material texture among or even within species, others tend to have fairly consistent, and diagnostic material texture. Examples include the homogeneous, translucent silica with a single organic inclusion characteristic of GSSCPs, or the homogeneous obscure to maculose silica typical of ACUTE BULBOSIS. Material texture is usually only visible in bright-field microscopy - not in SEM or with Differential Interference Contrast (Nomarski) microscopy - and most readily at high (1,000x) magnification and when focusing up and down through the phytolith.

granular: composed of minute spheroids or grains; cf. granulate (surface)



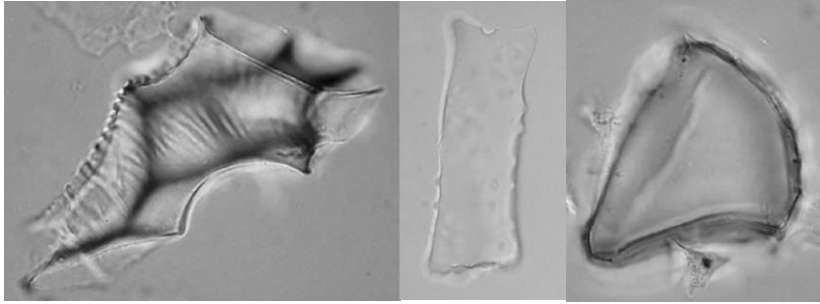
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homogeneous: no visible material texture (at 1,000x magnification). May be translucent (glass-like), opaline (opaque but light-colored, “milky”), or obscure (dark)

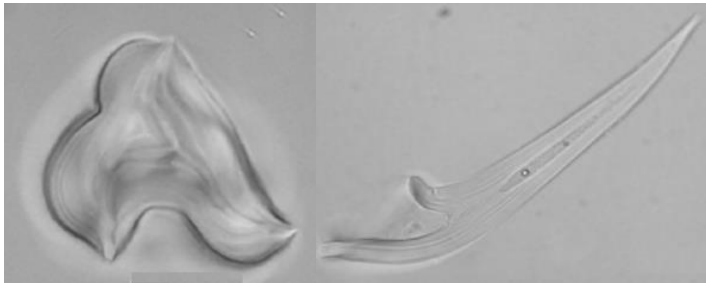


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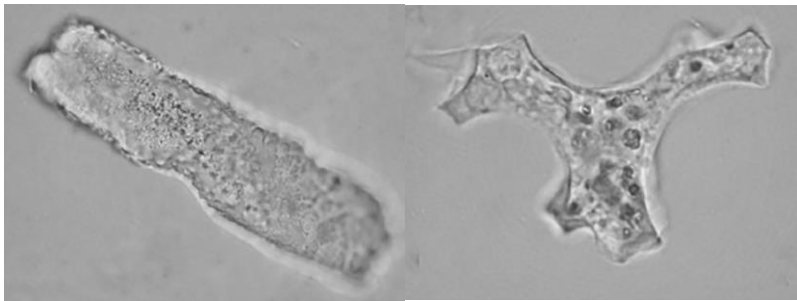
laminar: consisting of sub-micron, parallel layers of silica. Lamina can be straight, concentric, or irregular; cf. striated



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maculose: containing abundant, dark spots (presumably occluded organic material); cf. homogeneous obscure



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General Descriptors

abaxial: away from the axis or center

abnormal: departing from the usual

acentric: off center

adaxial; towards the axis or center

articulated: having two or more discrete phytolith “units” (often corresponding to a cell) joined together or attached

castula: waist, the narrow part in between lobes, of a GSSCP

compressed: flattened lengthwise

concave: curved inward

convex: curved outward

crassus: stout, thick

dense: closely spaced or compacted together

extended: stretched out, made longer or wider

gracile: slender, thin

GSSCP: Grass Silica Short Cell Phytolith

hollow: phytolith consisting of an outer (cell) wall or margin that is silicified, but with a center that is not

infilled/infilling: when the interior of a cell has been silicified, resulting in a solid, 3-D phytolith

irregular: without regular arrangement or distinguishable pattern or shape

isolated: separated from other phytoliths or plant tissue

lumen: the central cavity of a hollow structure or cell

margin: edge

ornate: having one or many types of ornamentation, such as a combination of surface textures and/or processes and transitional forms thereof

process: a protuberance, a 3-D projection (see below)

projection: a small structure that extends outward from a typically much larger structure; 2-D or 3-D

quadratic: shaped like a square, with four \pm equal sides

radiating: to spread from a central point

rectilinear: straight, or consisting of straight lines

regular: conforming in arrangement, symmetrical, recurring at fixed intervals, orderly

rounded: having an overall curved surface

solid: being completely silicified, creating a non-porous structure/phytolith; cf. infilled/infilling

sparse: thinly scattered or distributed, widely spaced, dispersed

truncated: abruptly shortened or cut off

Alphabetical List of All Descriptors

For GSSCP Descriptors see SI Morphotype Descriptions

Term	Category	Term	Category	Term	Category
abaxial	General	elongated	2-D	papillar	Surf. text. & orn.
abnormal	General	end	GSSCP	pilate	Surf. text. & orn.
acentric	General	end view	GSSCP	planar view	GSSCP
acicular	3-D	entire	margin	plicate	Surf. text. & orn.
acute	2-D	extended	General	polygonal	2-D
adaxial	General	facetate	Surf. text. & orn.	polyhedral	3-D
amoeboid	3-D	flabellate	2-D	prismatic	3-D
annulate	Surf. text. & orn.	fusiform	2-D	process	General
arcuate	2-D	geniculate	2-D	projection	General
areolate	Surf. text. & orn.	gibbate	Surf. text. & orn.	psilate	Surf. text. & orn.
articulated	General	gracile	General	quadratic	General
baculate	Surf. text. & orn.	granular	Int. mat. text	radiating	General
brachiate	2-D	granulate	Surf. text. & orn.	rectangular	2-D
bulbous	3-D	GSSCP	General	rectilinear	General
carinate	3-D	helical	Surf. text. & orn.	regular	General
castellate	margin	hollow	General	reniform	2-D
castula	General	homogeneous	Int. mat. text	rounded	General
cavate	3-D	infilled/infilling	General	rugose	Surf. text. & orn.
circular	2-D	IPS	GSSCP	scrobiculate	Surf. text. & orn.
clavate	margin	IPS view	GSSCP	side	GSSCP
claviform	3-D	irregular	General	side view	GSSCP
columnar	margin	isolated	General	sinuate	margin
compound	Surf. text. & orn.	laminar	Int. mat. text	solid	General
compressed	General	lobate	2-D	sparse	General
concave	General	longitudinal	GSSCP	spheroidal	3-D
conical	3-D	lumen	General	striate	Surf. text. & orn.
convex	General	maculose	Int. mat. text	tabular	3-D
crassus	General	margin	General	transverse	GSSCP
crenate	margin	nodular	3-D	trapeziform	2-D
cylindrical	3-D	nodulate	Surf. text. & orn.	truncated	General
dendritic	margin	oblong	2-D	tuberculate	Surf. text. & orn.
dense	General	OPS	GSSCP	uncinate	2-D
dentate	margin	OPS view	GSSCP	velloate	margin
echinate	Surf. text. & orn.	ornate	General	verrucate	Surf. text. & orn.
ellipsoidal	3-D	ovate	2-D		

Other Sources to Consult for Descriptors

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The International Code for Starch Nomenclature. 2011. Access at: <http://fossilfarm.org/ICSN/Code.html>