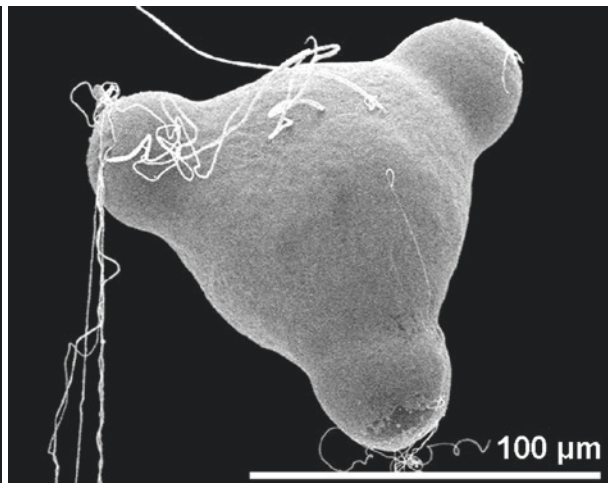
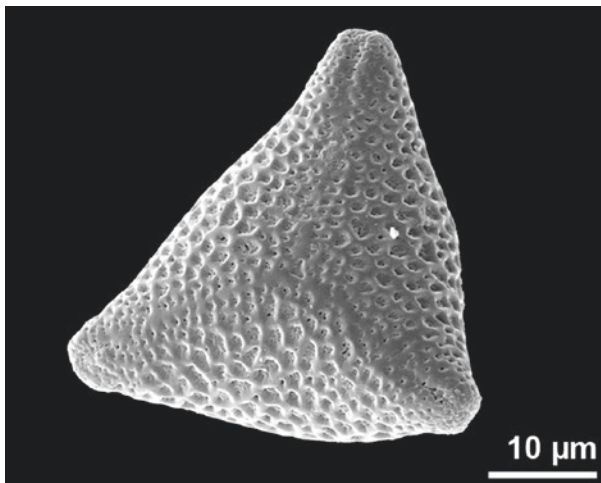
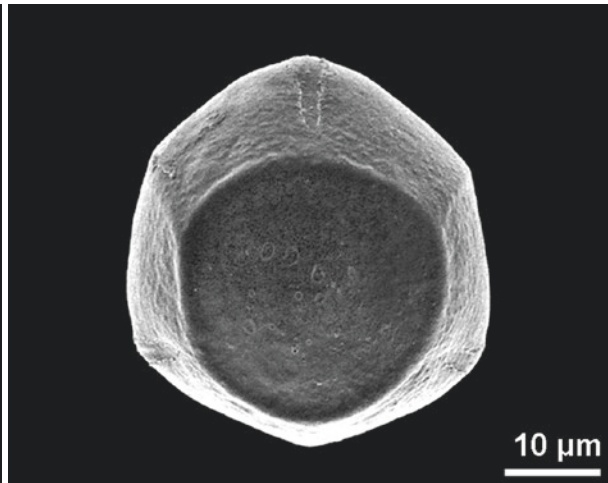
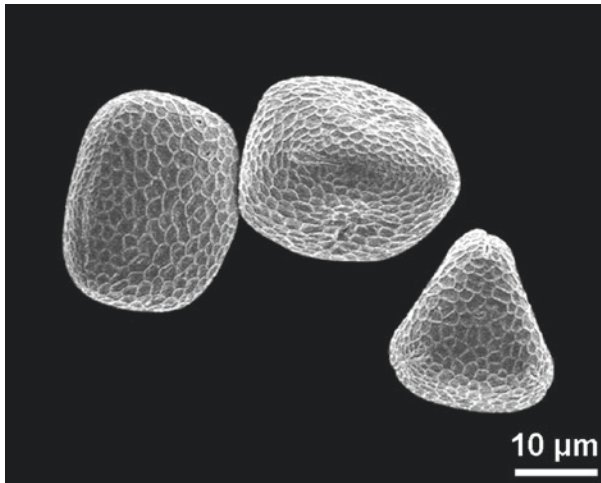
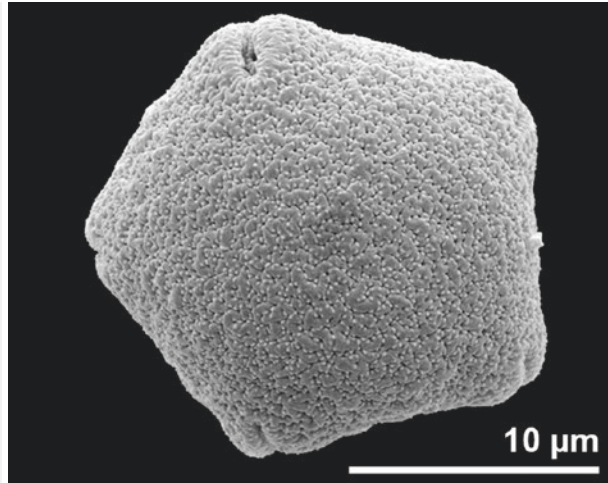
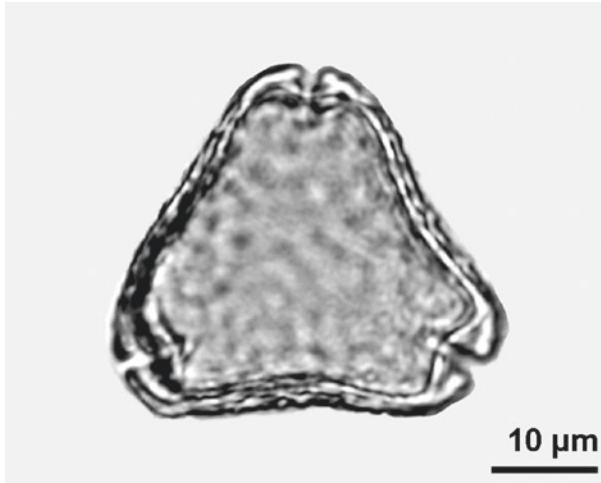


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angulaperturate

pollen grain with an angular outline where the apertures are located at the angles



■ *Symplocos* sp., Symplocaceae
fossil, middle Miocene, Austria, polar view

■ *Tropaeolum majus*, Tropaeolaceae
dry pollen

■ *Cardiospermum halicacabum*, Sapindaceae
polar view

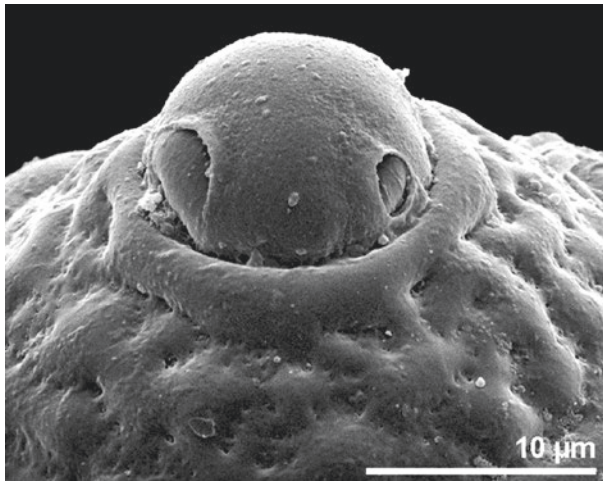
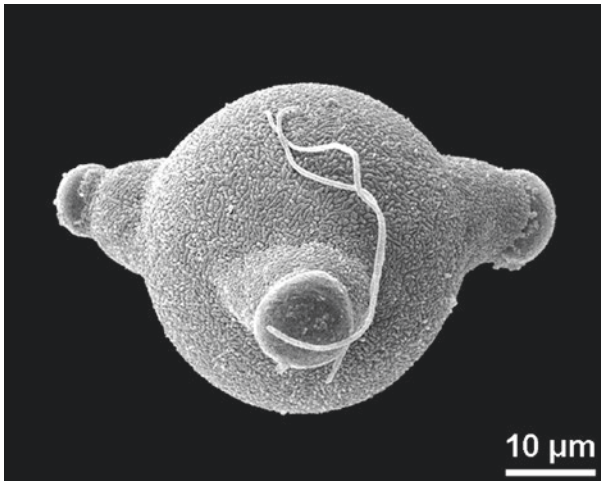
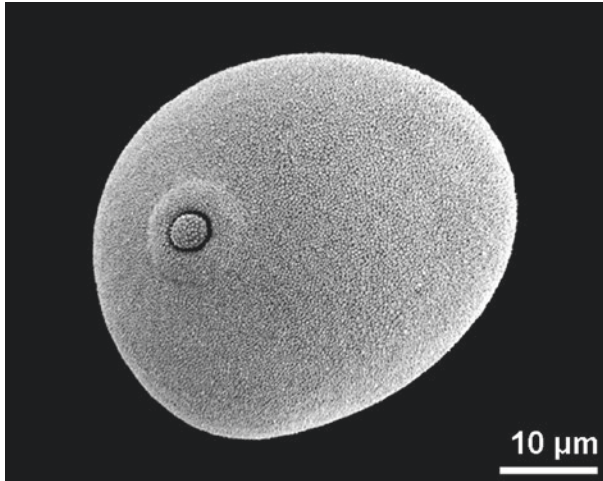
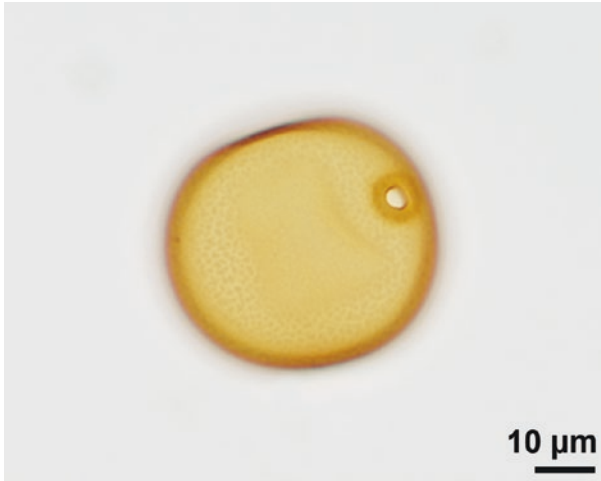
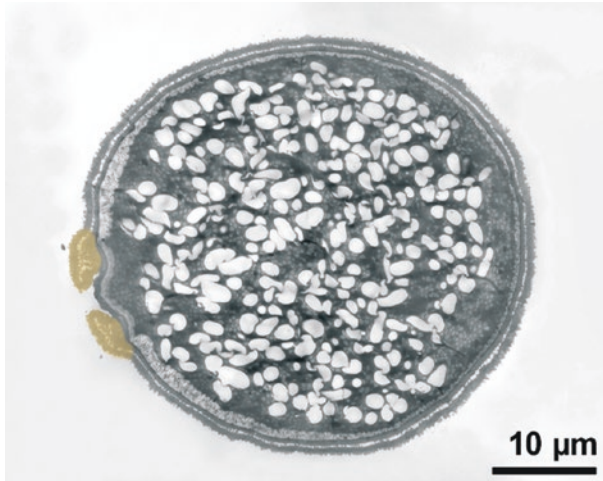
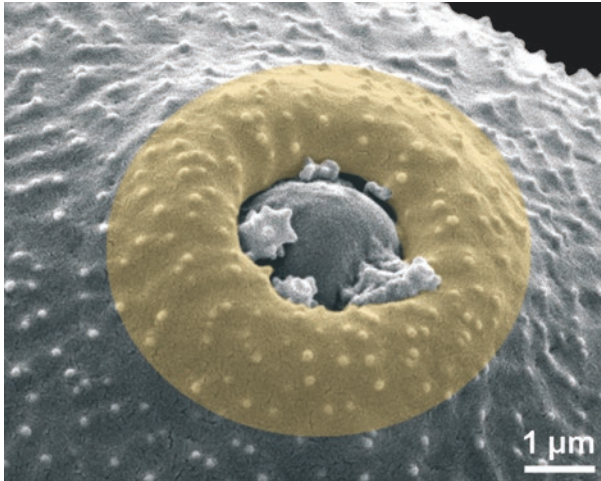
■ *Acalypha macrostachya*, Euphorbiaceae
polar view

■ *Anthyllis vulneraria*, Fabaceae
polar view

■ *Oenothera biennis*, Onagraceae
polar view, viscin threads

annulus/annulate

ring like wall thickening surrounding a porus or ulcus



■ ■ *Betula humilis*, Betulaceae
annulus colored

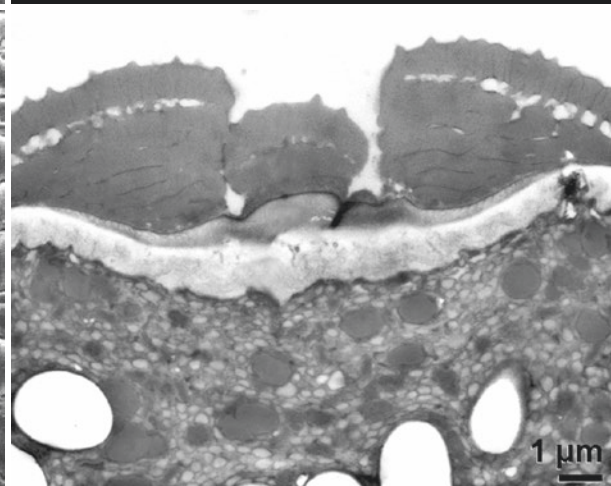
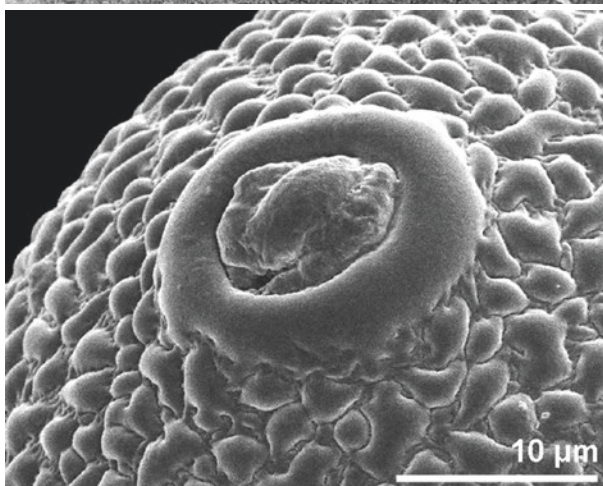
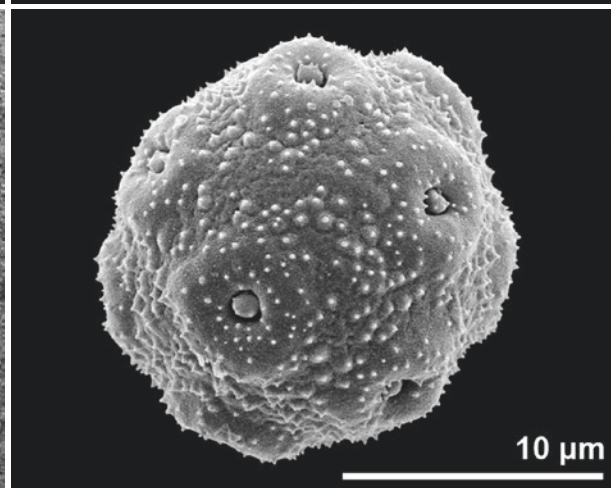
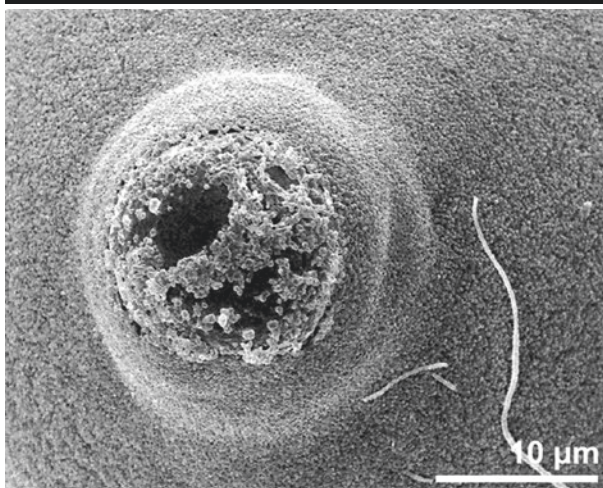
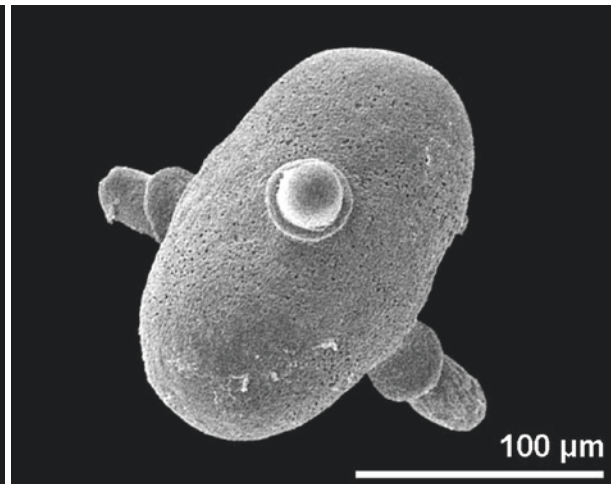
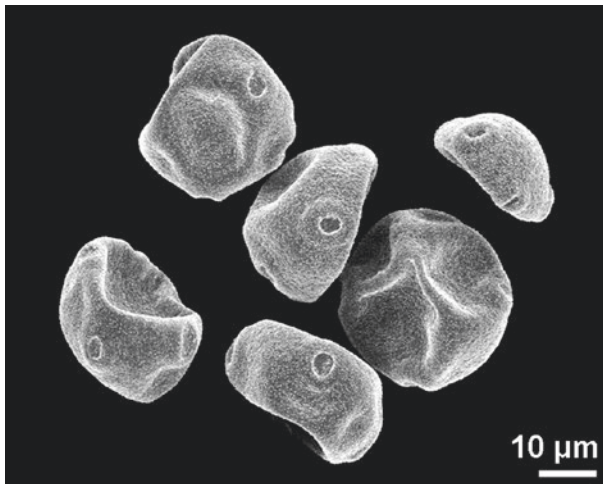
■ ■ Poaceae
oblique view

■ ■ *Circaea lutetiana*, Onagraceae
equatorial view, viscin threads

■ ■ *Triticum aestivum*, Poaceae
cross section, annulus colored

■ ■ *Secale cereale*, Poaceae
oblique distal polar view

■ ■ *Fumaria officinalis*, Papaveraceae



■ ■ *Myriophyllum spicatum*, Haloragaceae
dry pollen

■ ■ *Epilobium angustifolium*, Onagraceae

■ ■ *Trichosanthes cucumerina*, Cucurbitaceae

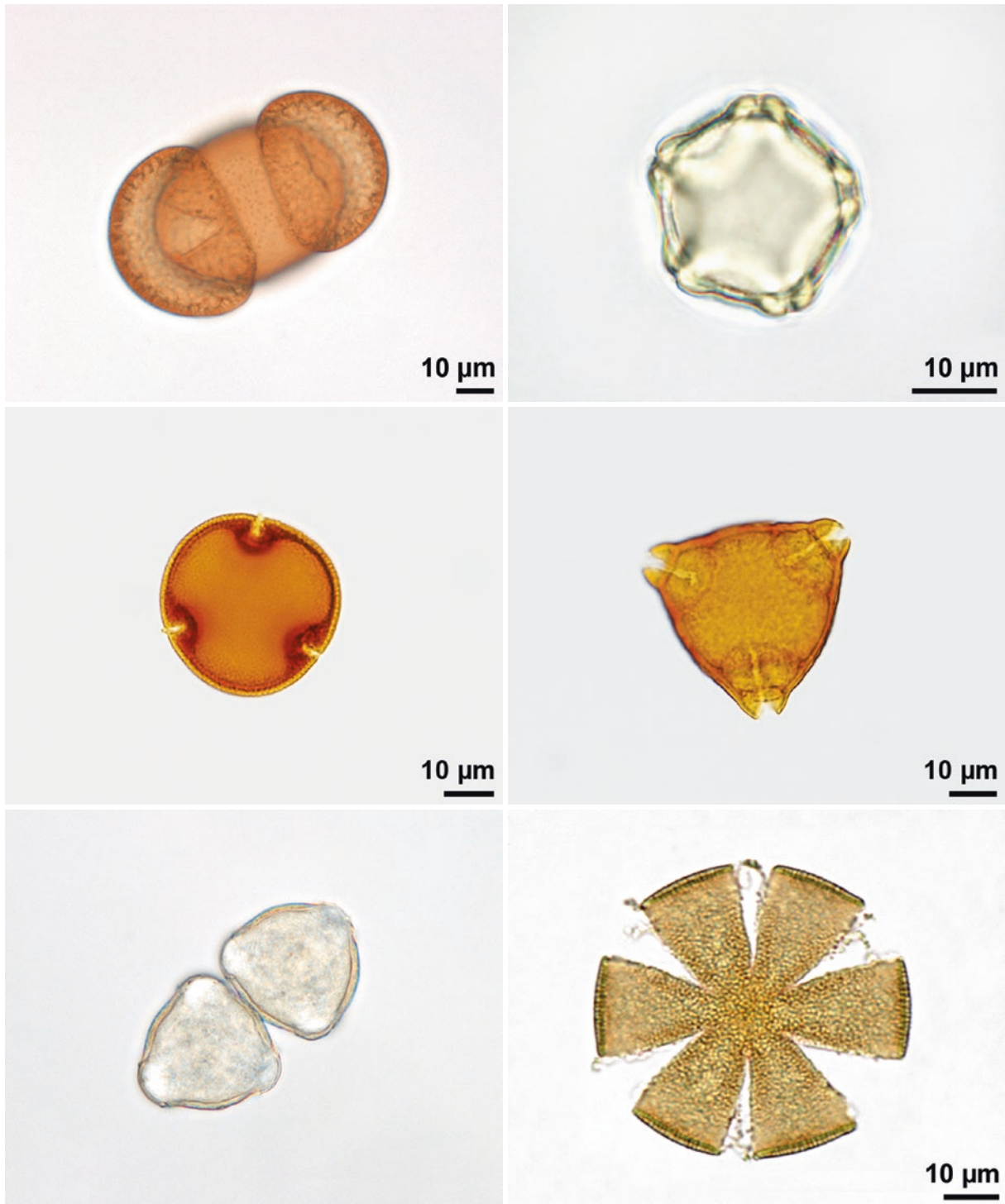
■ ■ *Morina longifolia*, Caprifoliaceae
equatorial view

■ ■ *Dorstenia contrajerva*, Moraceae

■ ■ *Zea mays*, Poaceae
cross section of aperture

aperture/aperturate

region of the pollen wall that differs morphologically and/or anatomically significantly from the rest of the pollen wall



■ ■ *Pinus strobus*, Pinaceae
leptoma, distal polar view

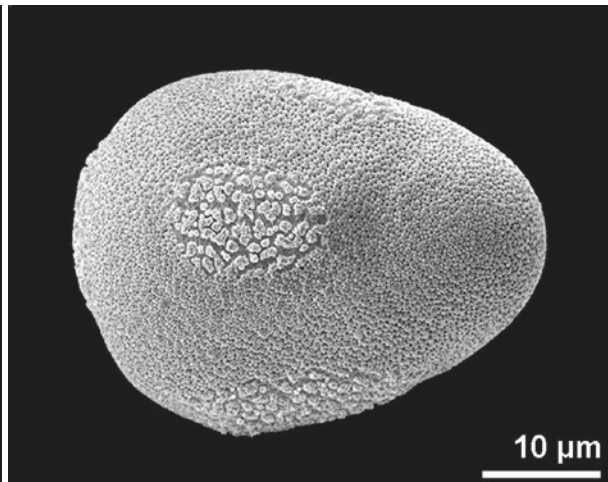
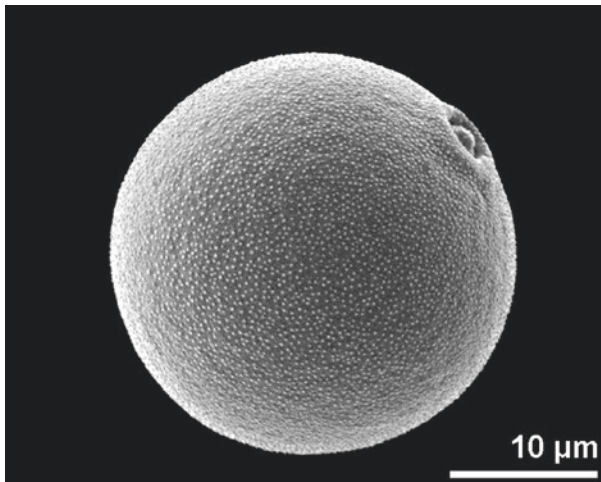
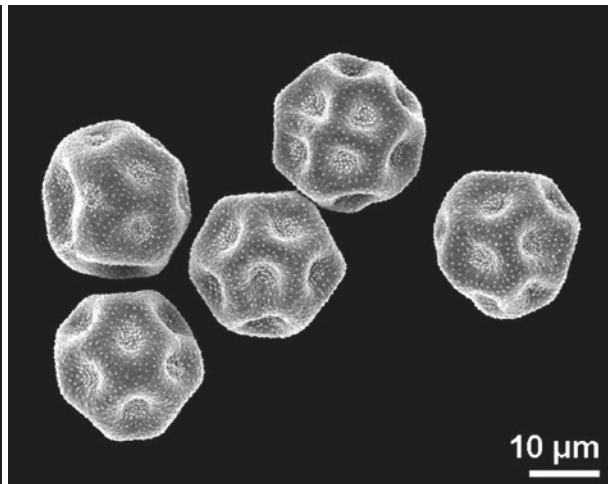
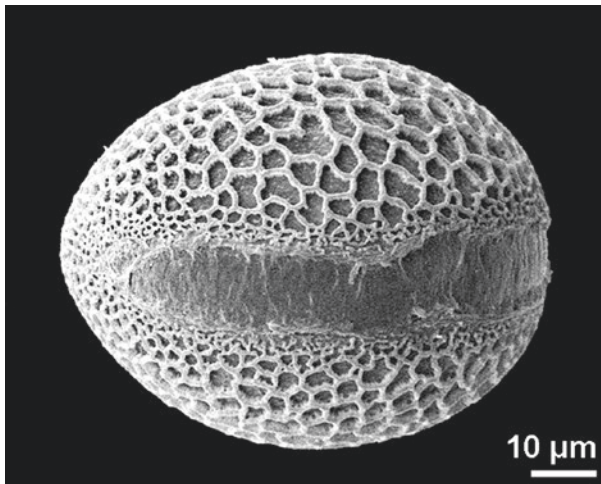
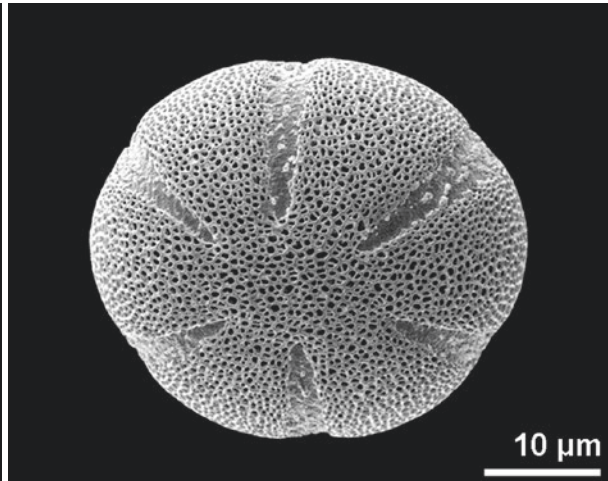
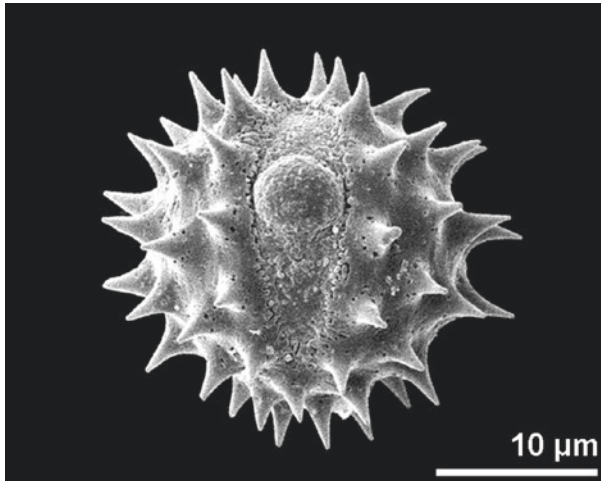
■ ■ *Tilia* sp., Malvaceae
tricolporate, polar view

■ ■ *Rubus caesius*, Rosaceae
tricolporate, polar view

■ ■ *Alnus glutinosa*, Betulaceae
pentaporate, polar view

■ ■ *Elaeagnus angustifolia*, Elaeagnaceae
tricolporate, polar view

■ ■ *Acinos alpinus*, Lamiaceae
hexacolporate, polar view



■ ■ *Eupatorium cannabinum*, Asteraceae
 ■ ■ tricolporate, equatorial view

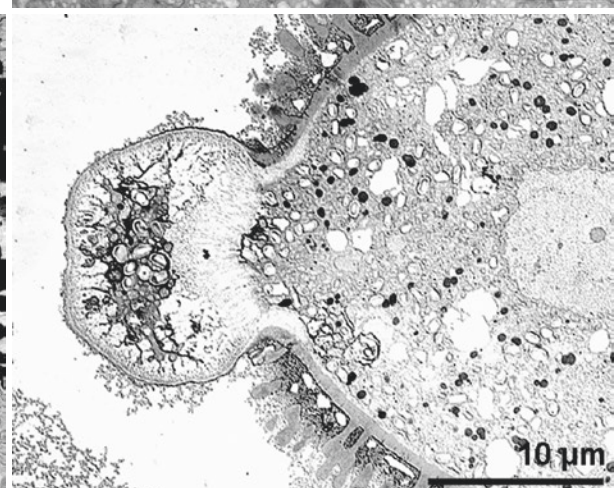
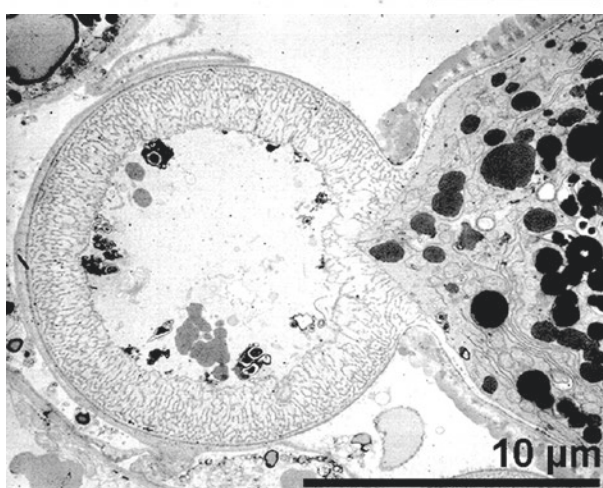
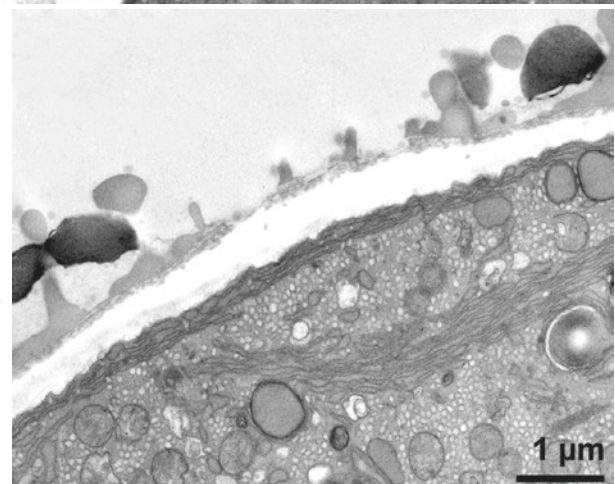
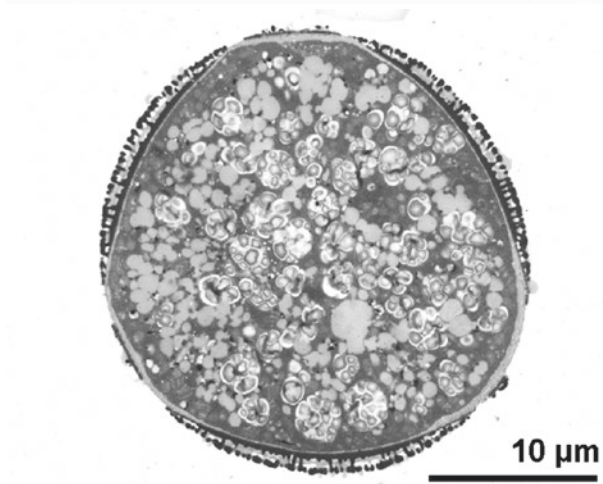
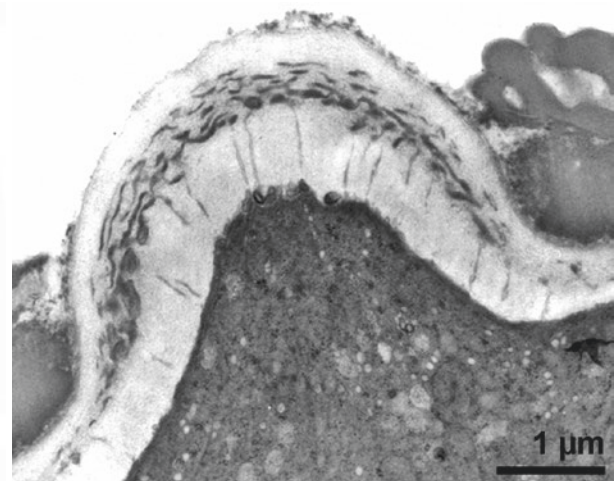
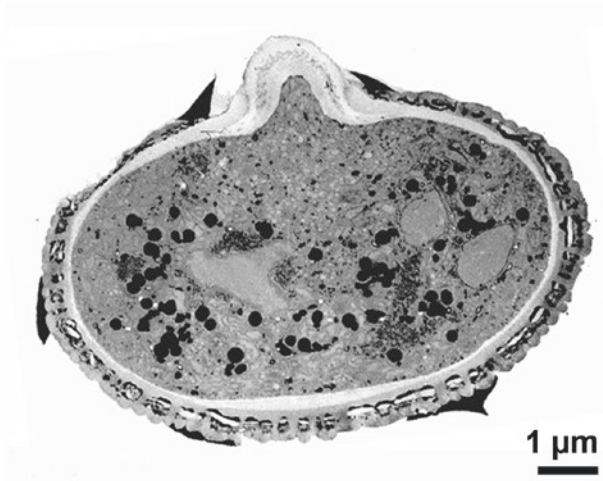
■ ■ *Clinopodium vulgare*, Lamiaceae
 ■ ■ hexacolpate, polar view

■ ■ *Eucharis grandiflora*, Amaryllidaceae
 ■ ■ sulcate, distal polar view

■ ■ *Alisma plantago-aquatica*, Alismataceae
 ■ ■ pantoporate, dry pollen

■ ■ *Sesleria sadleriana*, Poaceae
 ■ ■ ulcerate, equatorial view

■ ■ *Carex alba*, Cyperaceae
 ■ ■ poroidate, pseudomonad



■ *Apium nodiflorum*, Apiaceae
cross section

■ *Apium nodiflorum*, Apiaceae
cross section of aperture

■ *Veronica spicata*, Plantaginaceae
cross section

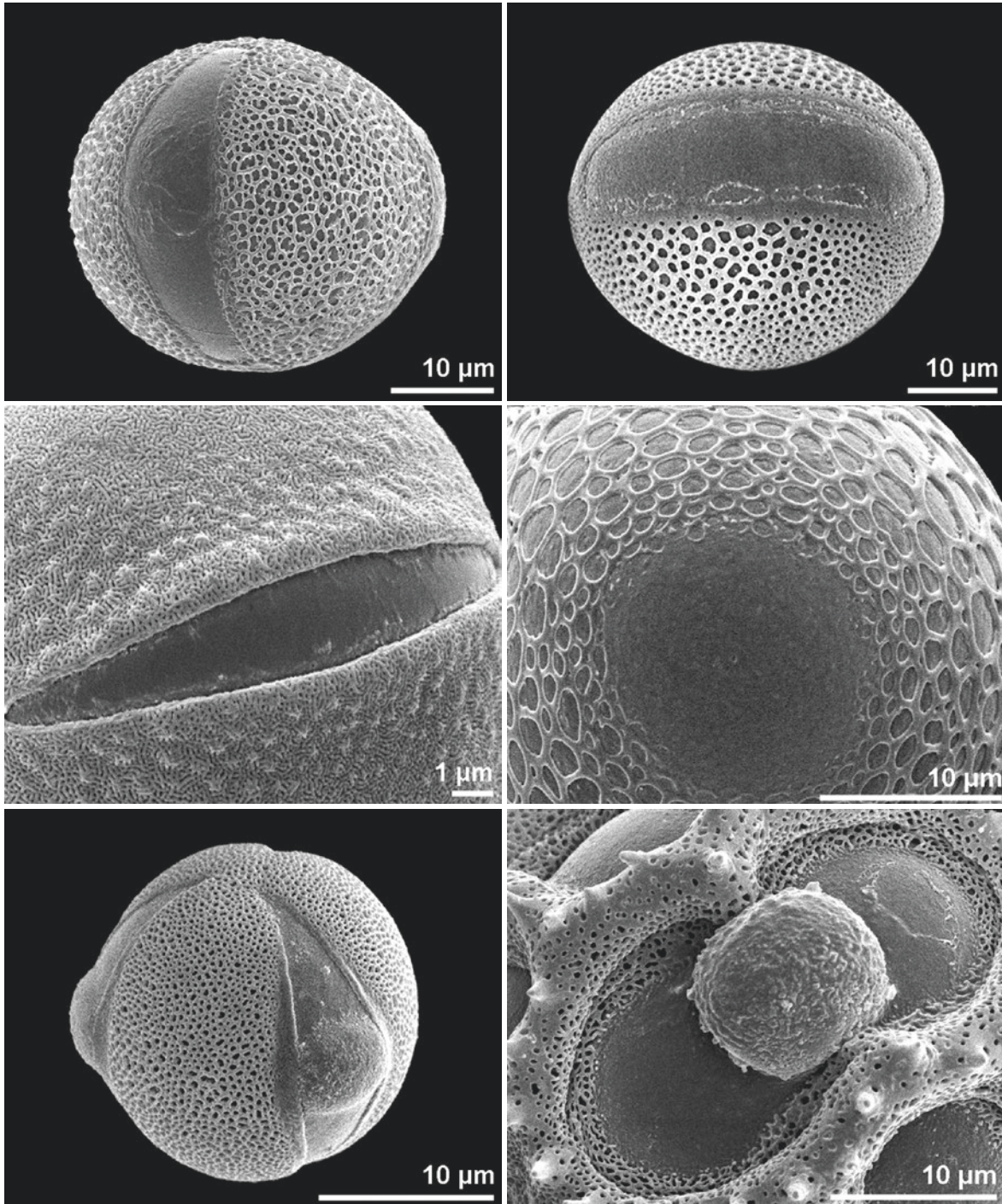
■ *Mentha aquatica*, Lamiaceae
cross section of aperture

■ *Ophiorrhiza* sp., Rubiaceae
cross section of aperture, apertural intine protrusion

■ *Geranium robertianum*, Geraniaceae
cross section of aperture, apertural intine protrusion

aperture membrane

exine layer covering an aperture
 aperture membrane psilate



■ *Scrophularia vernalis*, Scrophulariaceae
 ■ tricolporate

■ *Melampyrum subalpinum*, Orobanchaceae
 ■ colpus

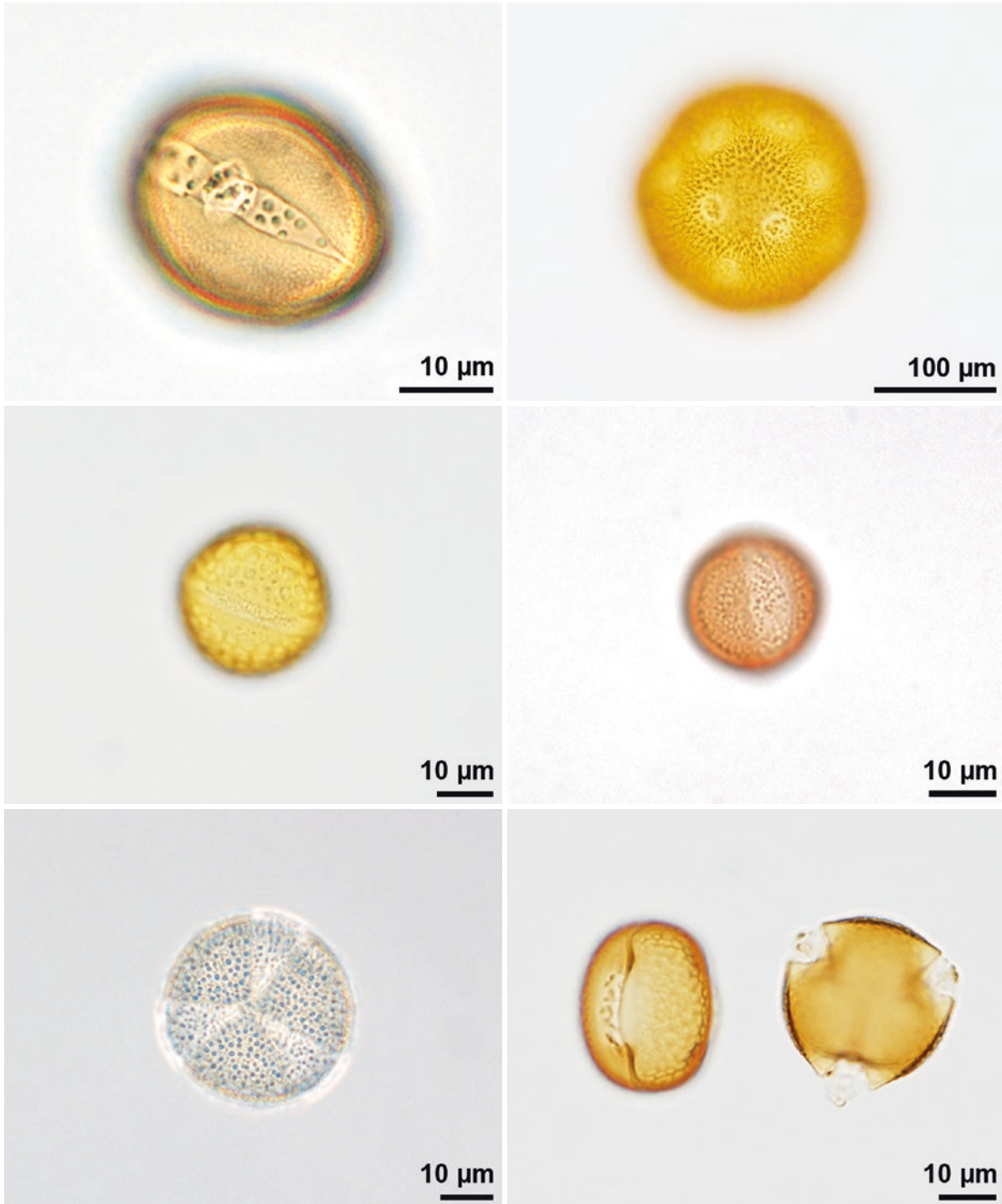
■ *Kickxia spuria*, Plantaginaceae
 ■ tricolporate

■ *Doryanthes palmeri*, Doryanthaceae
 ■ sulcate

■ *Aechmea caesia*, Bromeliaceae
 ■ porus

■ *Tragopogon dubius*, Asteraceae
 ■ colporus

aperture membrane ornamented



■ *Aesculus x carnea*, Sapindaceae
 ■ tricolporate

■ *Lamprocapnos spectabilis*, Papaveraceae
 ■ tricolpate

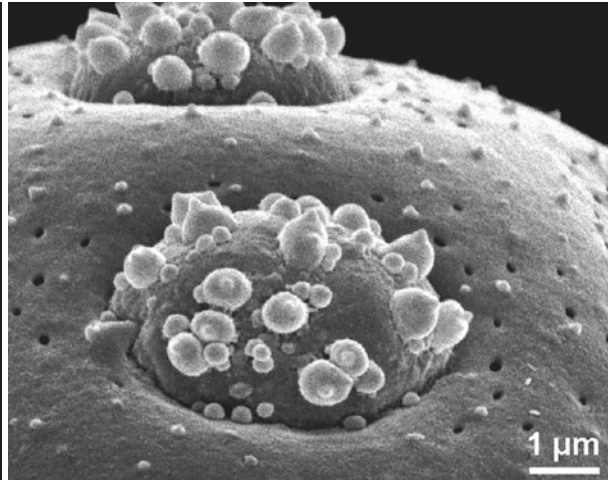
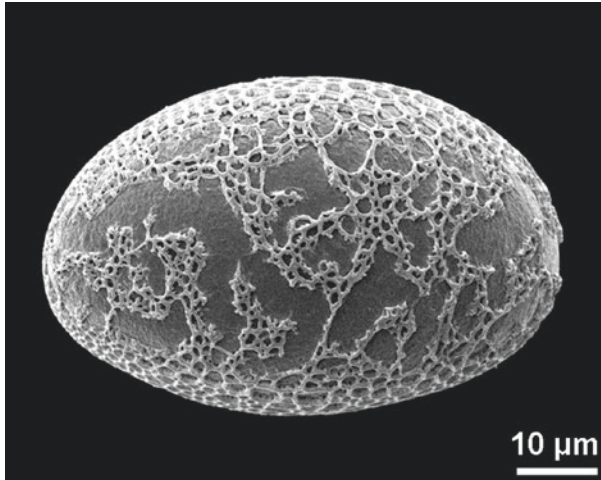
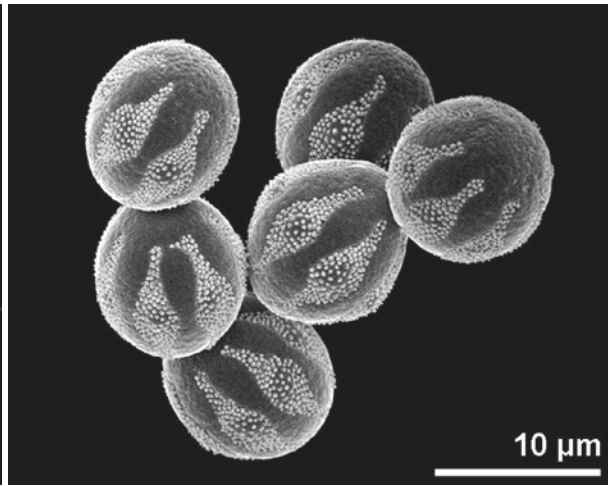
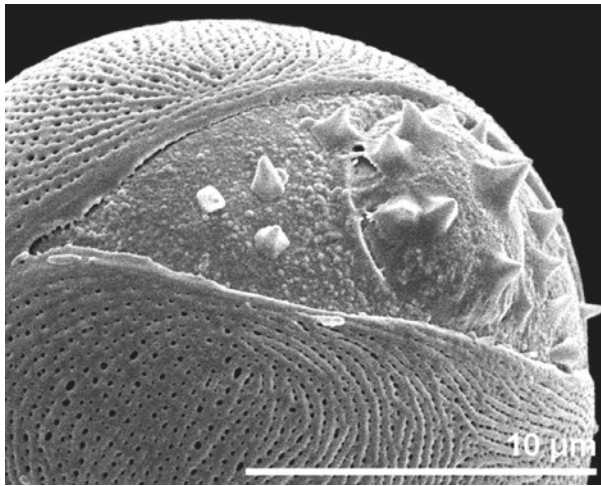
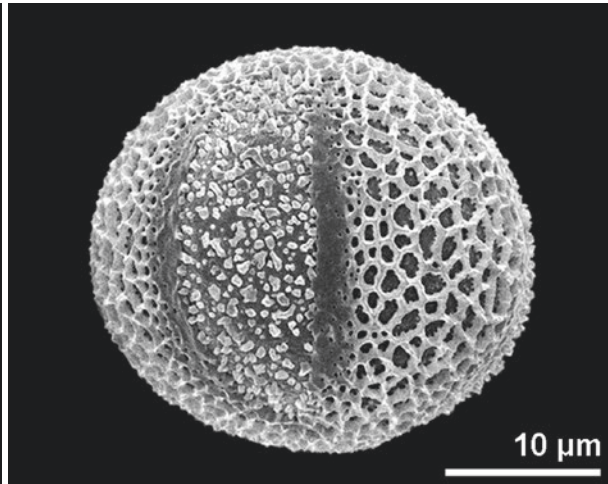
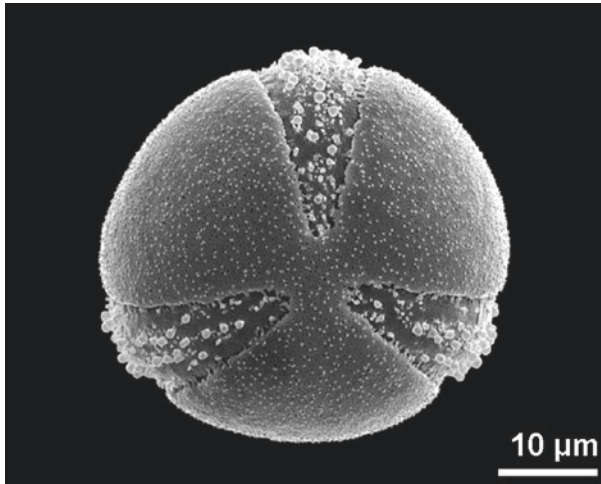
■ *Ficaria verna*, Ranunculaceae
 ■ tricolpate

■ *Calystegia sepium*, Convolvulaceae
 ■ pantoporate

■ *Papaver rhoeas*, Papaveraceae
 ■ tricolpate

■ *Lupinus* sp., Fabaceae
 ■ tricolporate

aperture membrane ornamented



■ ■ *Convolvulus tricolor*, Convolvulaceae
tricolpate

■ ■ *Salix alba*, Salicaceae
tricolpate

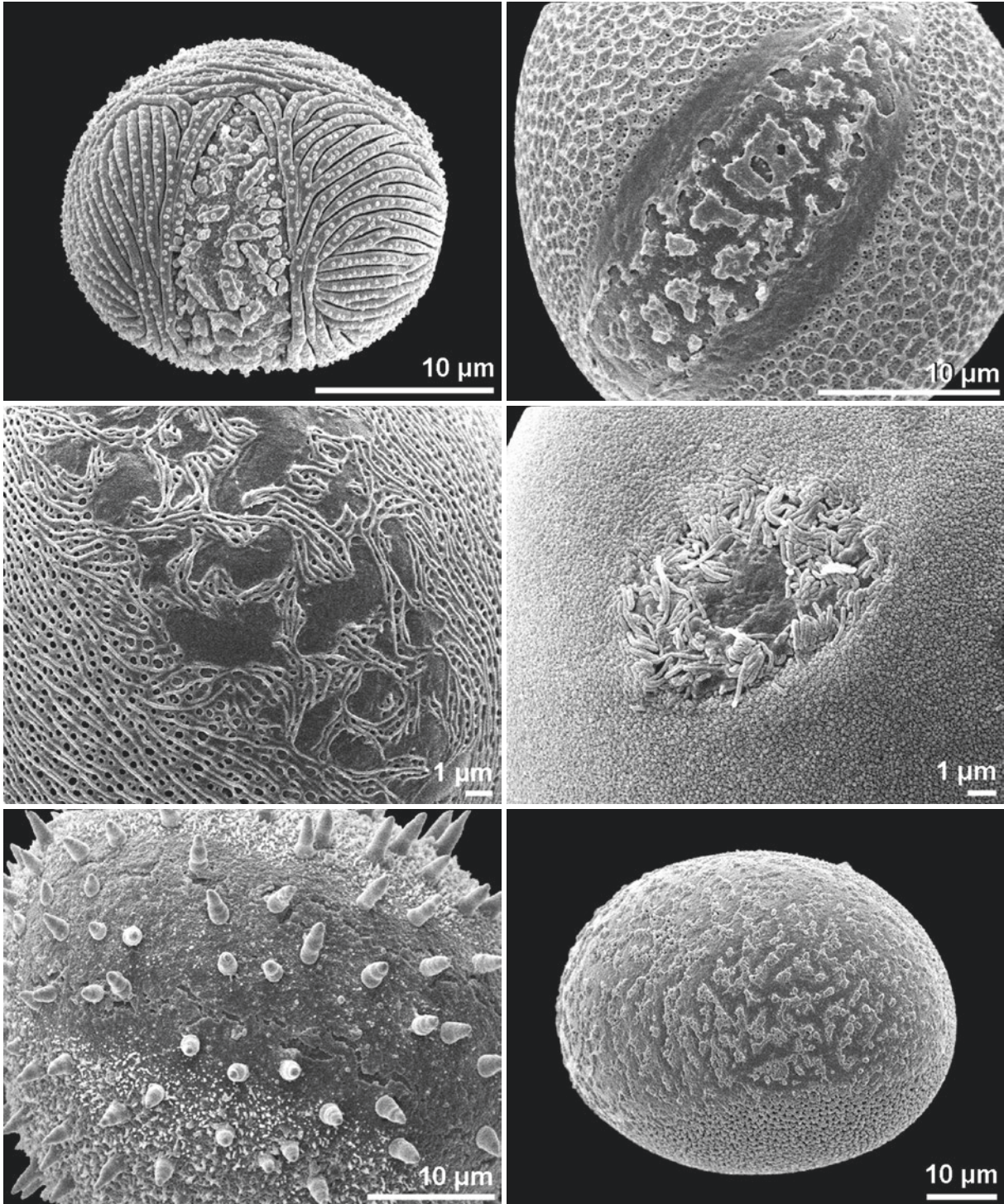
■ ■ *Aesculus hippocastanum*, Sapindaceae
tricolporate

■ ■ *Moltkia petraea*, Boraginaceae
stephanocolporate

■ ■ *Billbergia macrocalyx*, Bromeliaceae
sulcate

■ ■ *Arenaria serpyllifolia*, Caryophyllaceae
pantoporate

aperture membrane ornamented



■ *Saxifraga vandellii*, Saxifragaceae
 ■ tricolpate

■ *Veronica wyomingensis*, Plantaginaceae
 ■ tricolpate

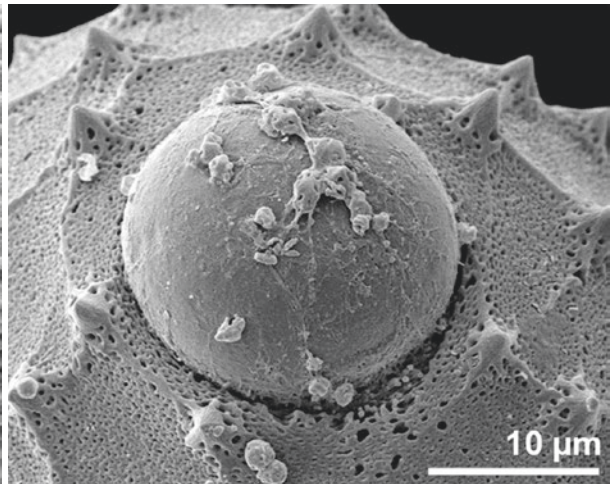
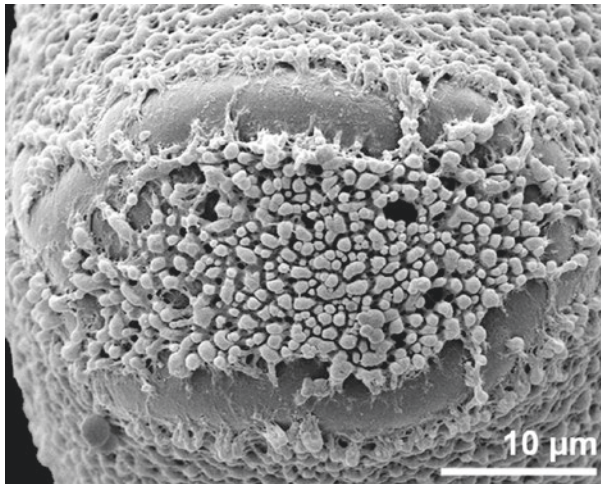
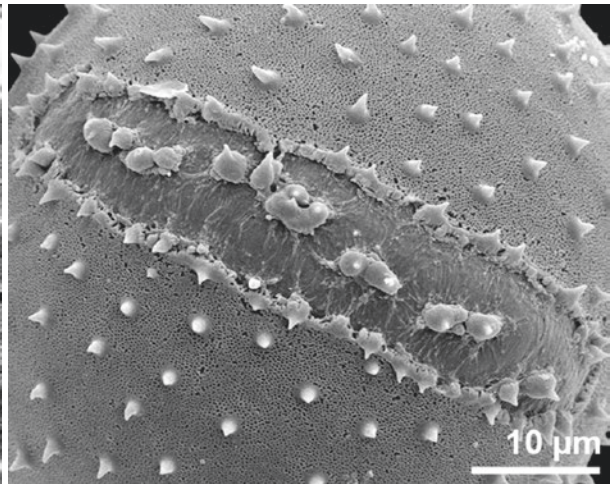
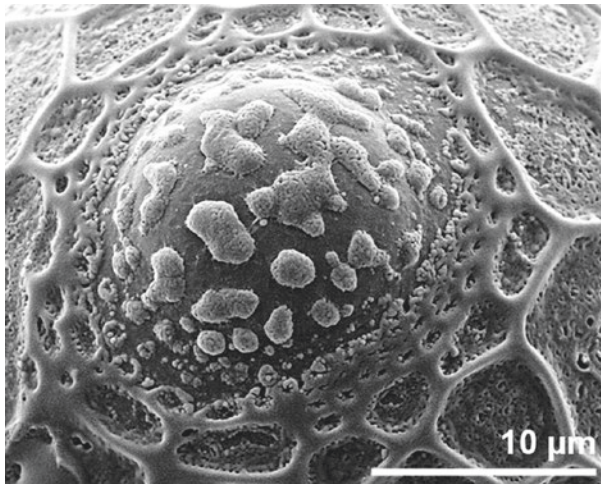
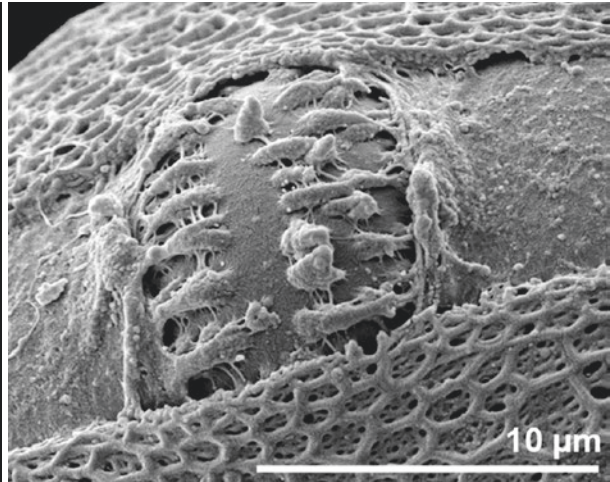
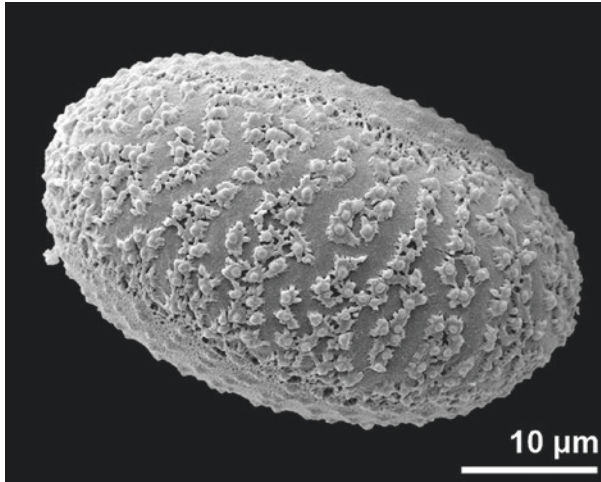
■ *Nuphar lutea*, Nymphaeaceae
 ■ sulcate

■ *Galeopsis tetrahit*, Lamiaceae
 ■ tricolpate

■ *Clarkia pulchella*, Onagraceae
 ■ triporate

■ *Gagea villosa*, Liliaceae
 ■ sulcate

aperture membrane ornamented



■ ■ *Commelina erecta*, Commelinaceae
sulcate

■ ■ *Sparmannia africana*, Malvaceae
tricolporate

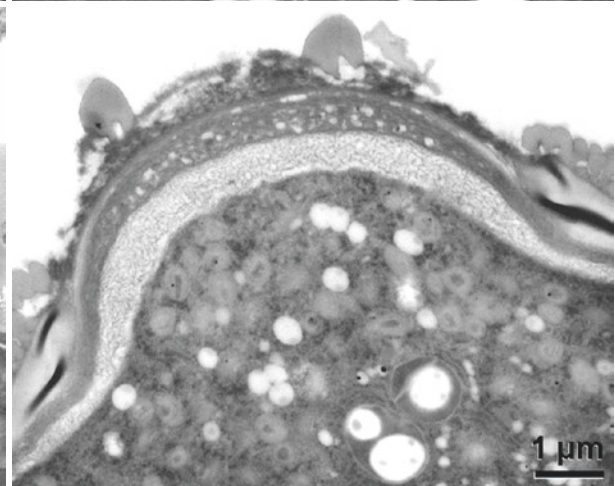
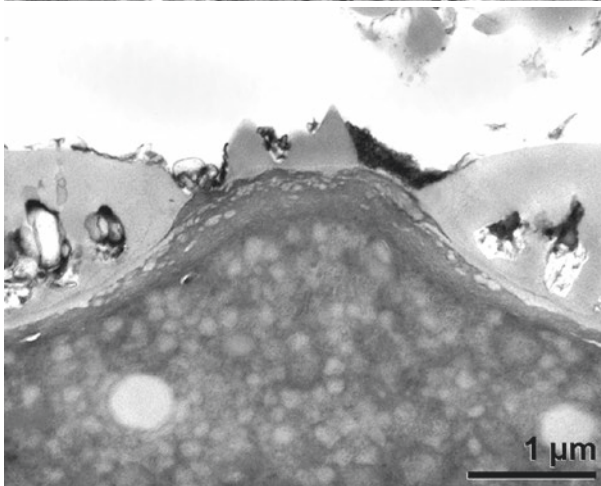
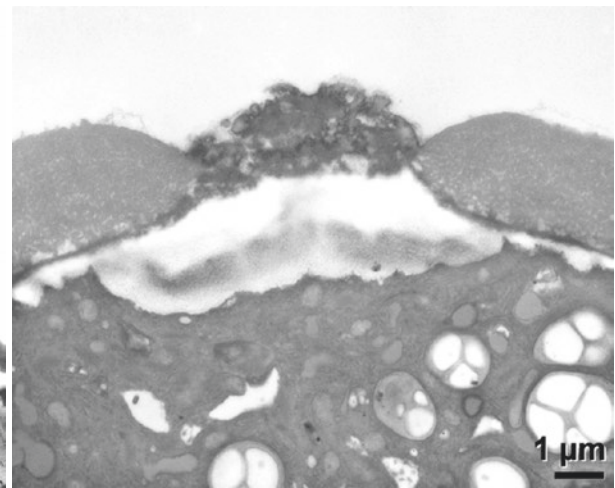
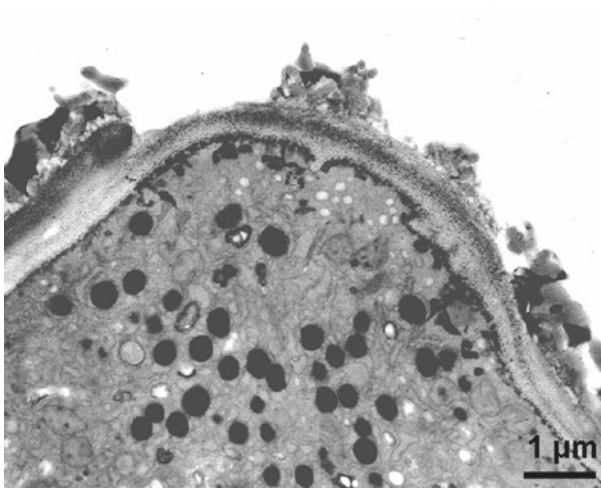
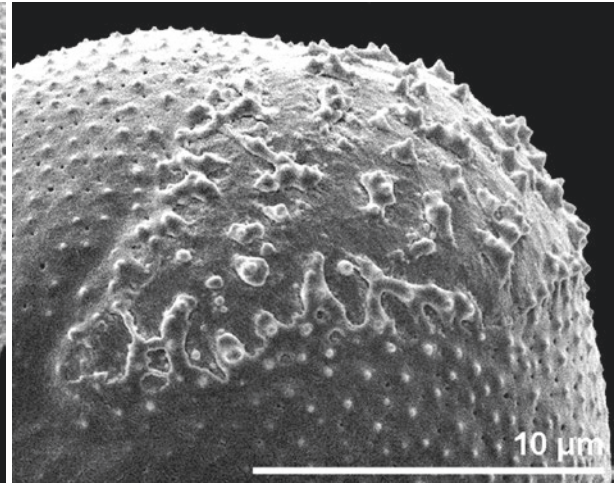
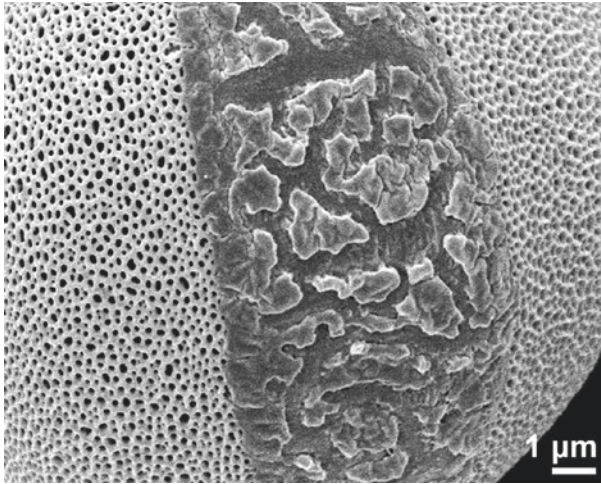
■ ■ *Vigna speciosa*, Fabaceae
breviscolporate

■ ■ *Clerodendrum thomsoniae*, Lamiaceae
tricolporate

■ ■ *Floridula gorgonias*, Roridulaceae
tricolporate

■ ■ *Carthamus lanatus*, Asteraceae
breviscolporate

aperture membrane ornamented



■ ■ *Lamiastrum galeobdolon*, Lamiaceae
tricolpate

■ ■ *Aconitum lycoctonum*, Ranunculaceae
tricolpate

■ ■ *Mercurialis perennis*, Euphorbiaceae
cross section of aperture

■ ■ *Ulmus minor*, Ulmaceae
cross section of aperture

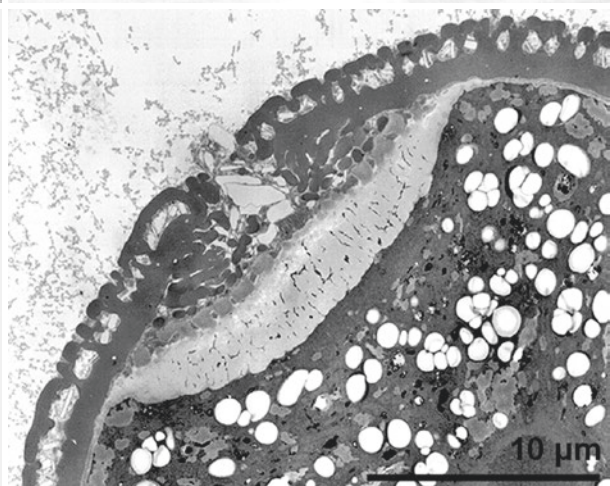
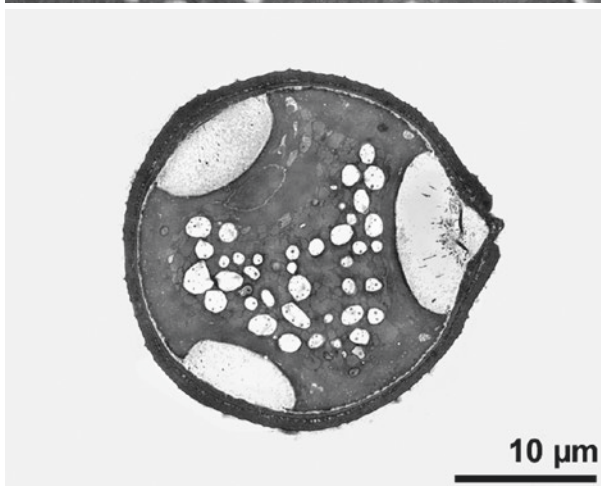
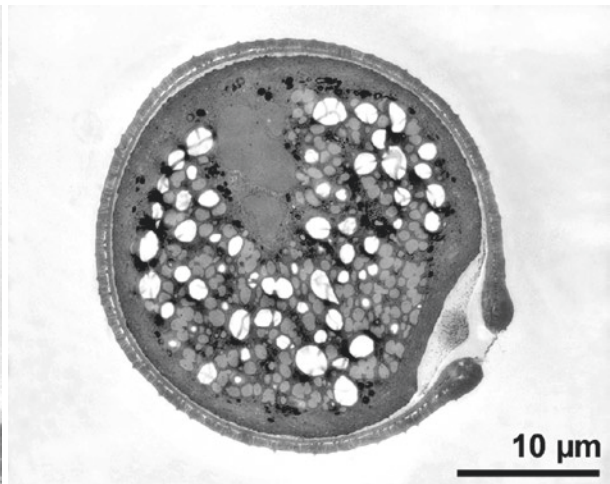
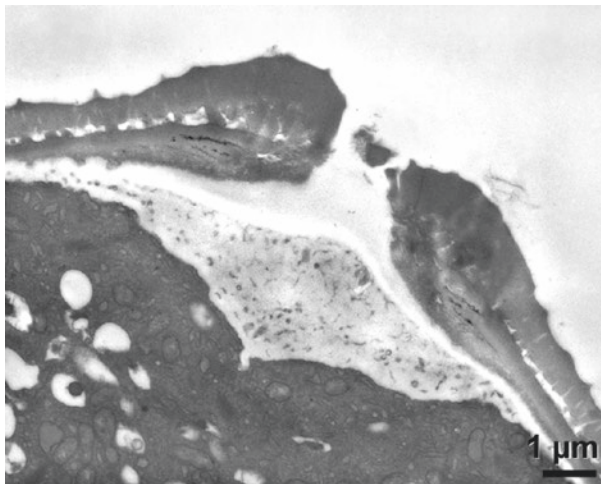
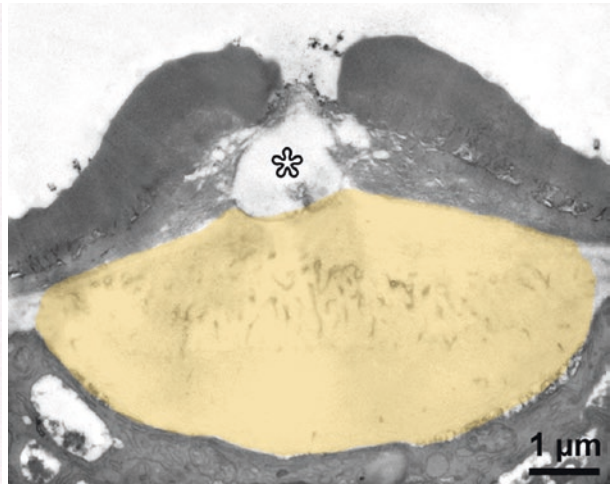
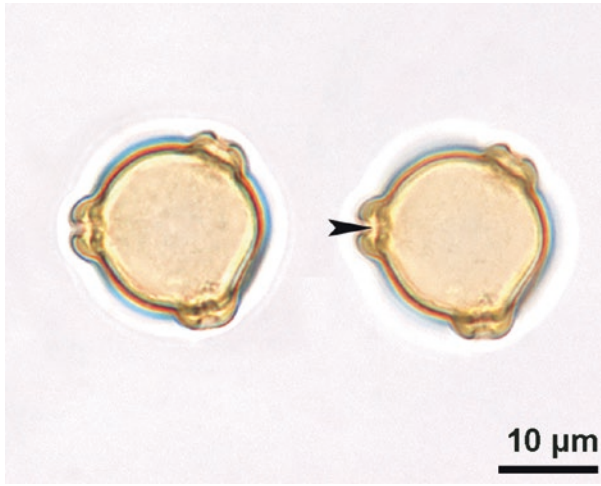
■ ■ *Chenopodium hybridum*, Amaranthaceae
cross section of aperture

■ ■ *Aesculus carnea*, Sapindaceae
cross section of aperture

atrium, oncus

atrium: space between diverging exine layers within the aperture

oncus: lens-shaped body located beneath the aperture, not resistant to acetolysis



■ *Betula* sp., Betulaceae
atrium (arrowhead)

■ *Betula humilis*, Betulaceae
oncus, cross section of aperture

■ *Corylus avellana*, Betulaceae
oncus, cross section

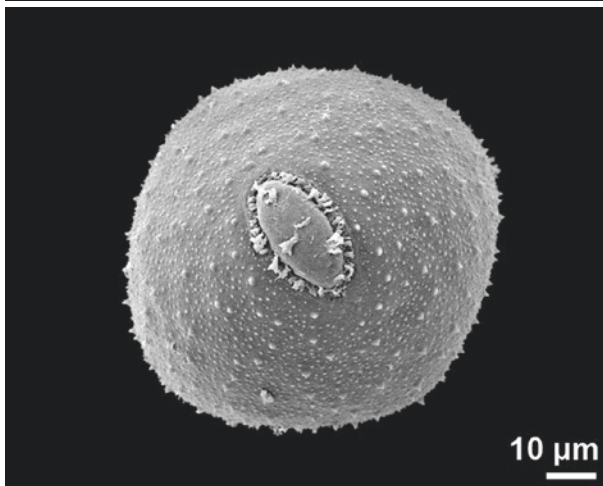
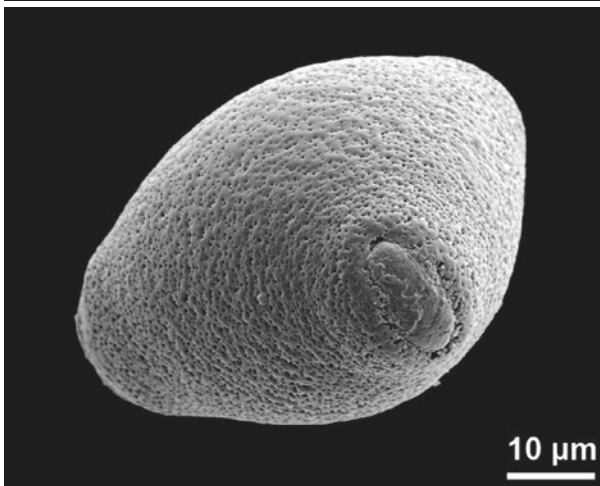
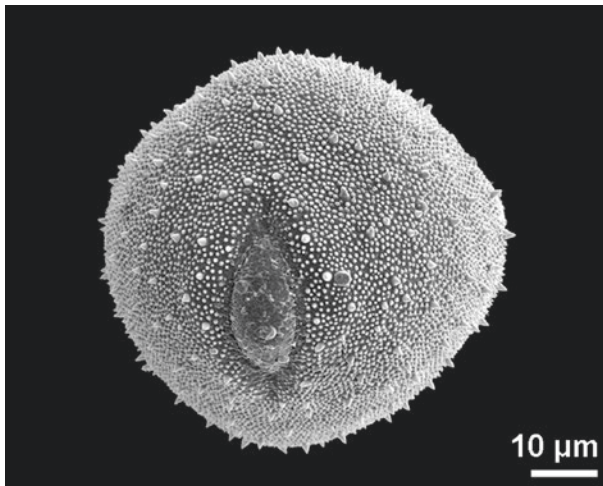
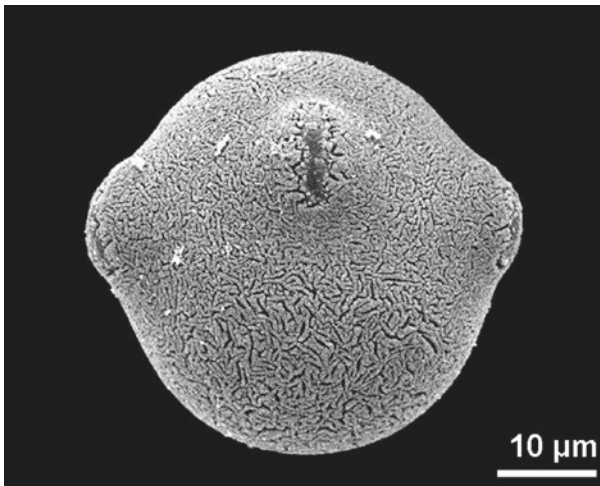
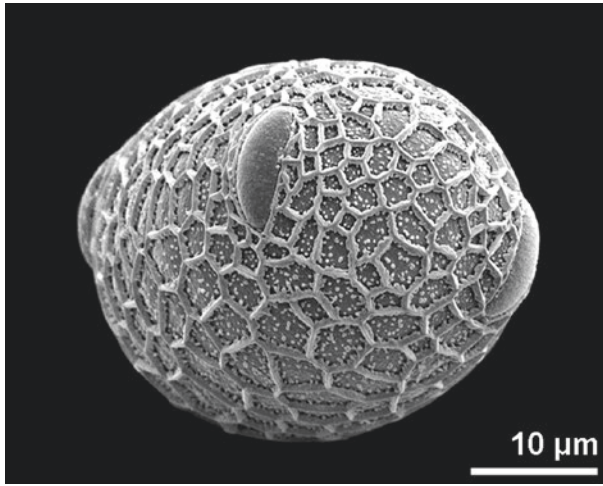
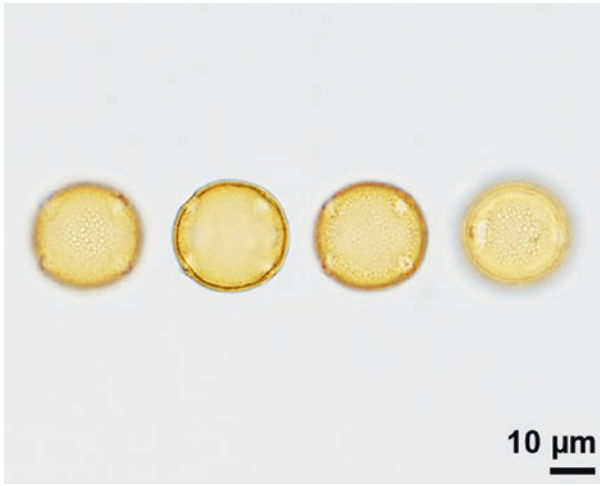
■ *Betula pendula*, Betulaceae
atrium (asterisk) and oncus (colored)

■ *Betula humilis*, Betulaceae
oncus, cross section

■ *Tilia platyphyllos*, Malvaceae
oncus, cross section of aperture

brevicolpus/brevicolpate

short colpus situated equatorially



■ ■ *Pistacia* sp., Anacardiaceae
tetracolpate

■ ■ *Impatiens columbaria*, Balsaminaceae
tetracolpate, equatorial view

■ ■ *Mendoncia albida*, Acanthaceae
pentacolpate, oblique equatorial view

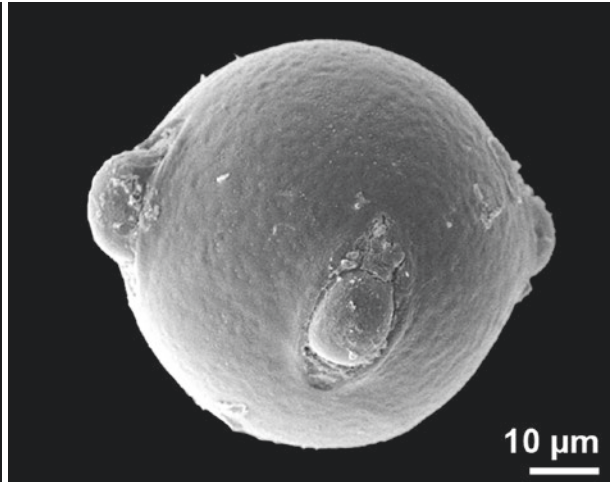
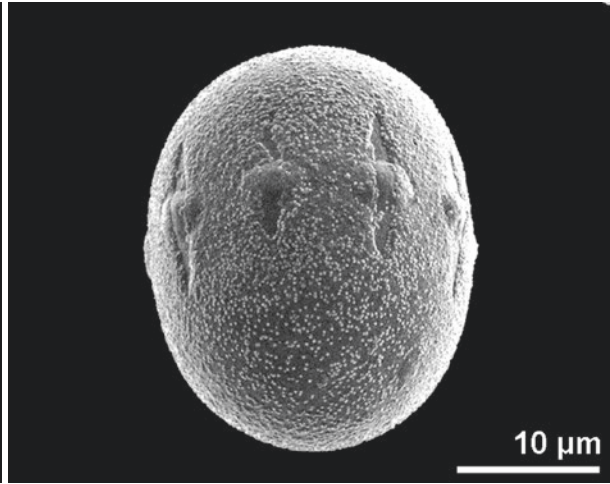
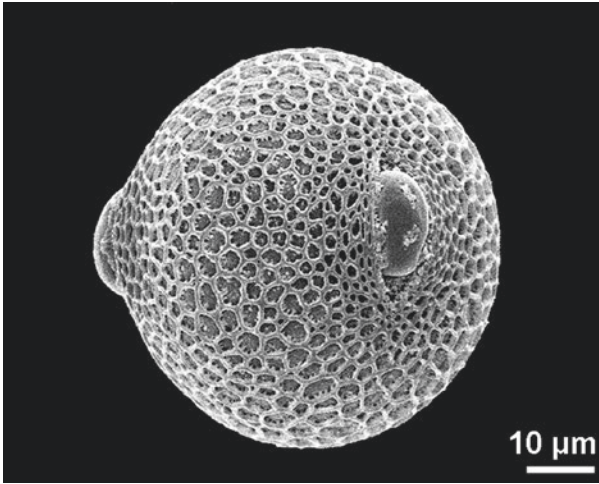
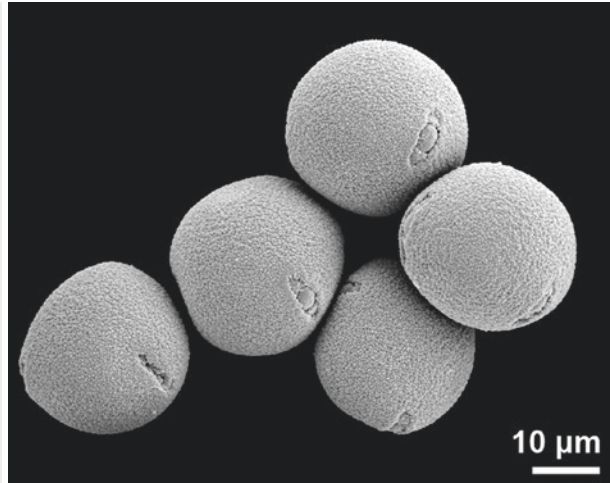
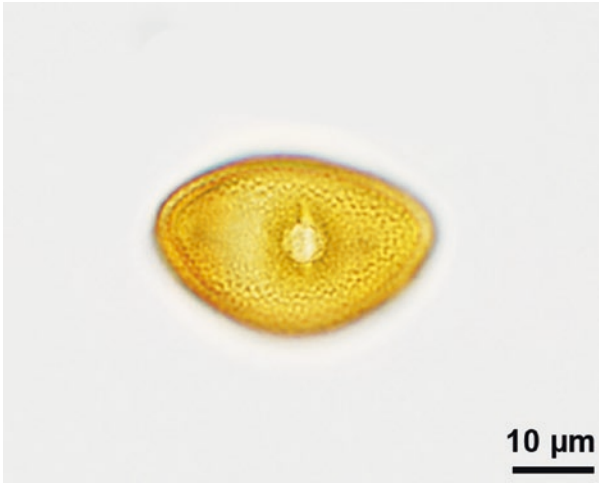
■ ■ *Scabiosa ochroleuca*, Caprifoliaceae
tricolpate, equatorial view

■ ■ *Petrea volubilis*, Verbenaceae
tricolpate, oblique equatorial view

■ ■ *Succisa pratensis*, Caprifoliaceae
tricolpate, equatorial view

brevicolporus/brevicolporate

short colpus in a compound aperture situated equatorially



■ *Tilia platyphyllos*, Malvaceae
 ■ tricolporate, equatorial view

■ *Coriaria myrtifolia*, Coriariaceae
 ■ tricolporate

■ *Dalechampia spathulata*, Euphorbiaceae
 ■ tricolporate, equatorial view

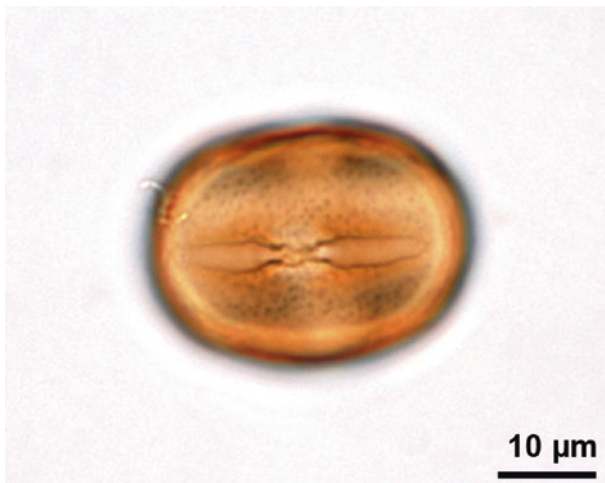
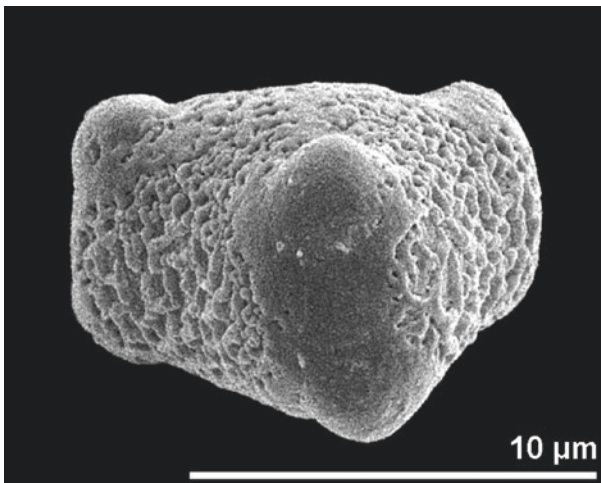
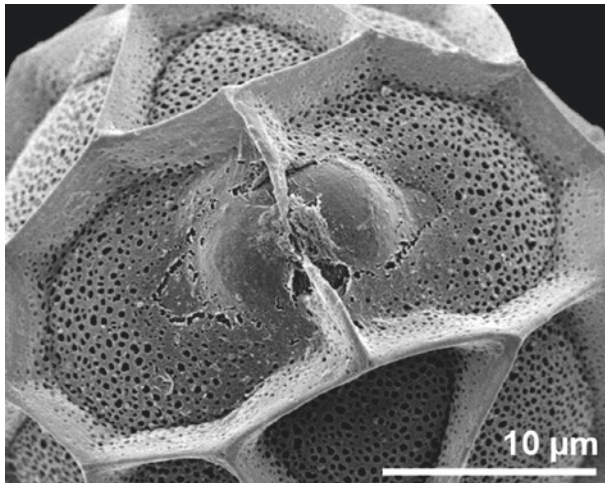
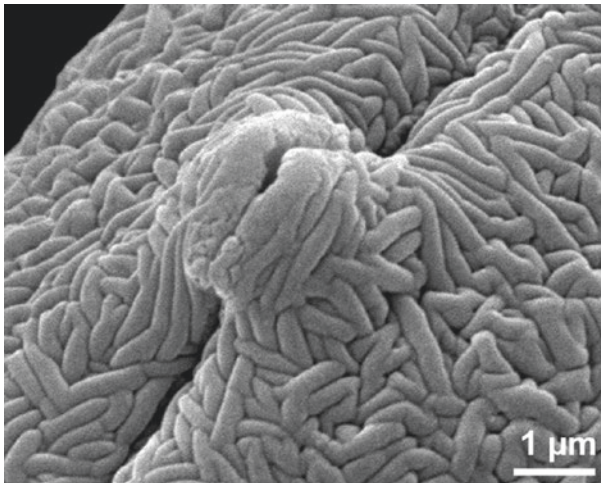
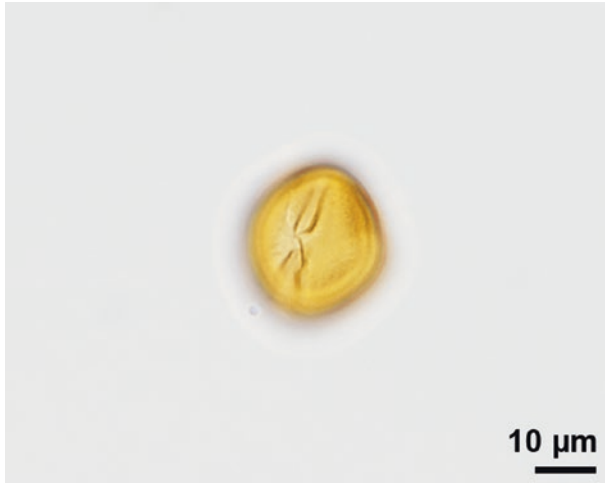
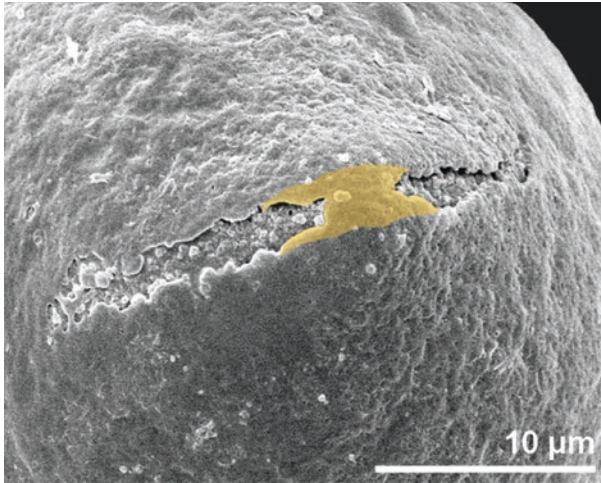
■ *Symphytum orientale*, Boraginaceae
 ■ stephanocolporate, equatorial view

■ *Borago pygmaea*, Boraginaceae
 ■ stephanocolporate, equatorial view

■ *Tabernaemontana simulans*, Apocynaceae
 ■ tetracolporate, equatorial view

bridge

exine connection(s) between the margins of an aperture



■ ■ *Elaeagnus angustifolia*, Elaeagnaceae
tricolporate, bridge colored

■ ■ *Bifora radians*, Apiaceae
tricolporate

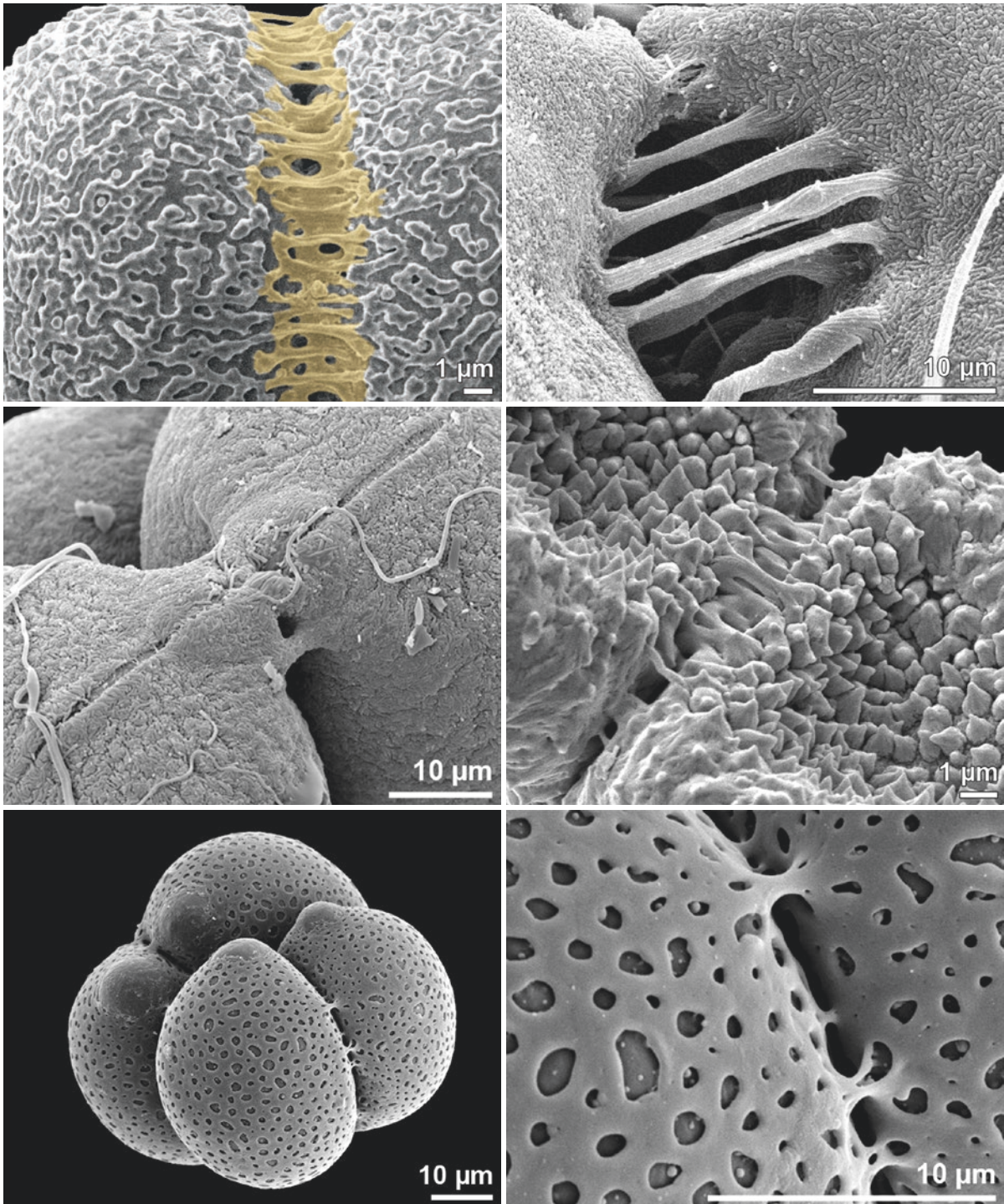
■ ■ *Cunonia capensis*, Cunoniaceae
hexaporate with bridge, equatorial view

■ ■ *Malus baccata*, Rosaceae
tricolporate, equatorial view

■ ■ *Gazania rigens*, Asteraceae
tricolporate

■ ■ *Colutea arborescens*, Fabaceae
tricolporate, equatorial view

the term bridge is used in a more general context, e.g., for exine connections within tetrads



■ *Typha latifolia*, Typhaceae
tetrad, bridge (colored) between monads

■ *Ludwigia octovalvis*, Onagraceae
tetrad, monads also adnate in aperture region

■ *Aechmea subintegerrima*, Bromeliaceae
tetrad, bridge between monads

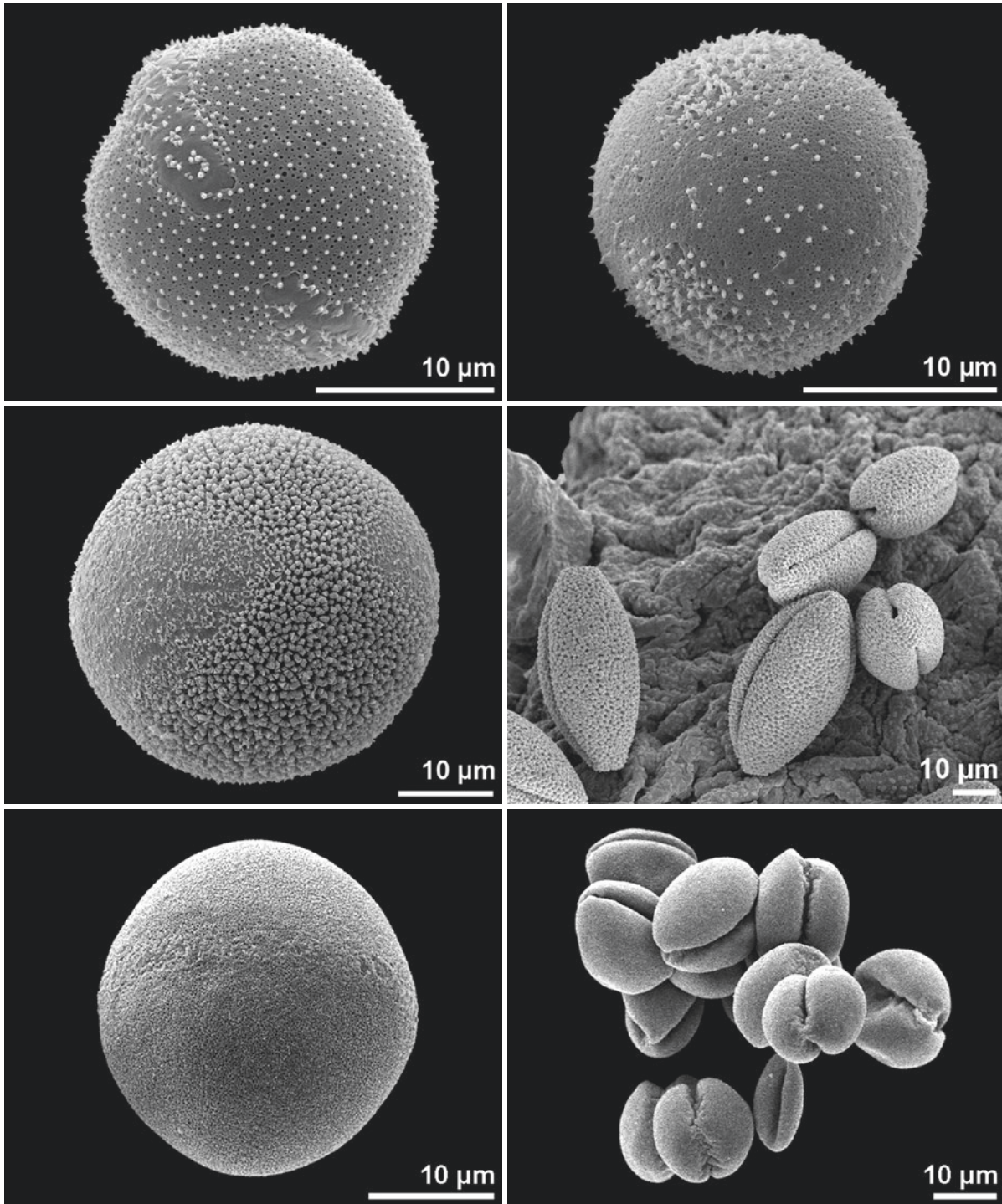
■ *Epilobium hirsutum*, Onagraceae
tetrad, bridge between monads

■ *Thelethylax minutiflora*, Podostemaceae
dyad, bridge between monads

■ *Aechmea subintegerrima*, Bromeliaceae

colpus/colpate, dicolpate

colpus: elongated aperture (length/width ratio >2) situated at the equator or globally distributed
 dicolpate: pollen grain with two colpi



Hypecoum imberbe, Papaveraceae
 polar view

Mayna odorata, Achariaceae
 oblique polar view

Pedicularis elongata, Orobanchaceae
 oblique polar view

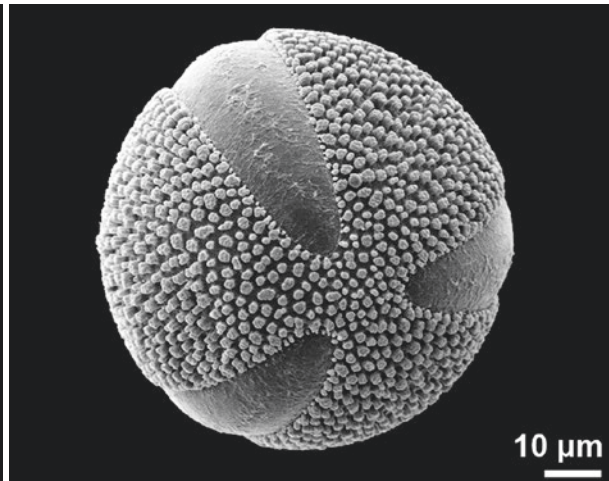
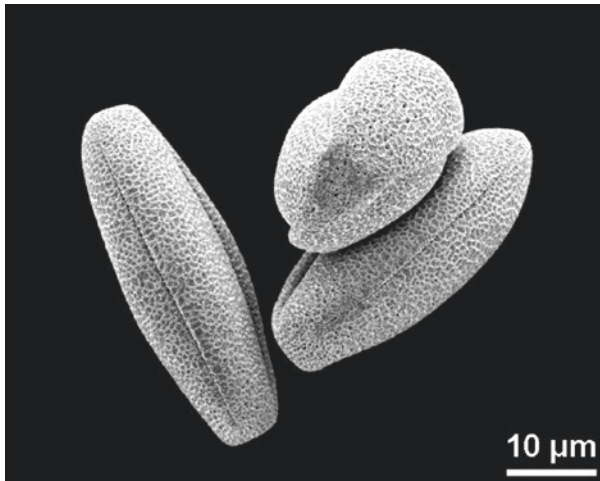
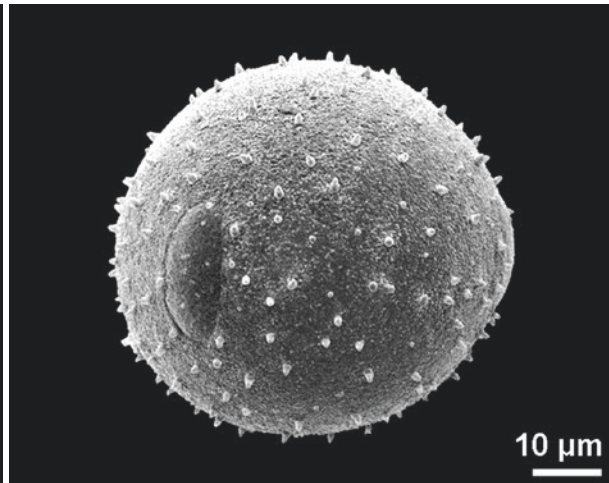
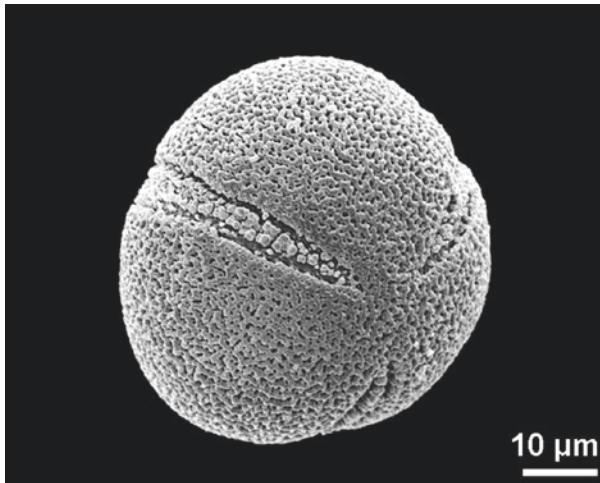
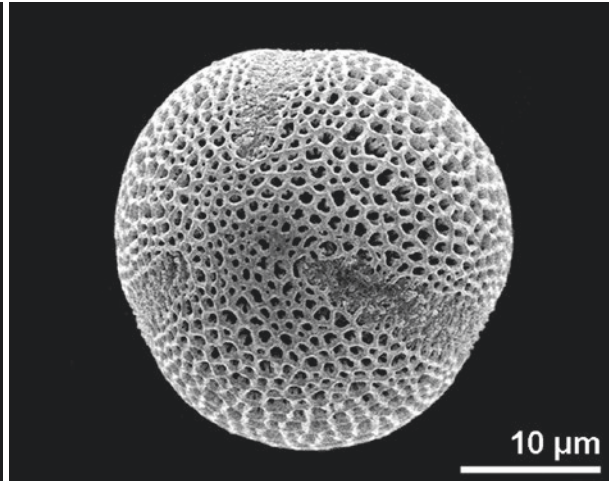
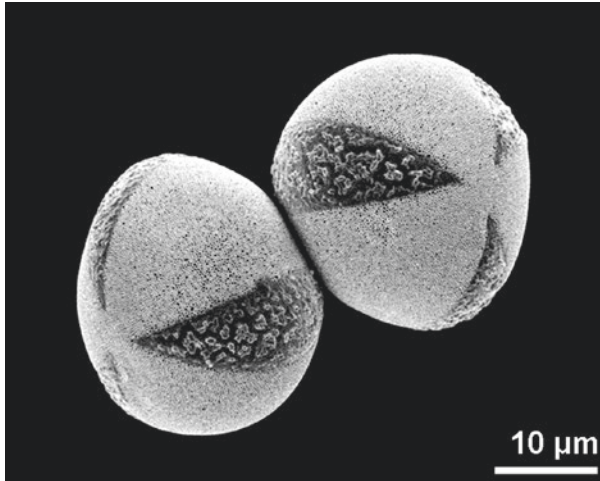
Hypecoum procumbens, Papaveraceae
 oblique polar view

Mayna odorata, Achariaceae
 dry pollen

Pedicularis elongata, Orobanchaceae
 dry pollen

colpus/colpate, tricolpate

tricolpate: pollen grain with three colpi



■ ■ *Lamium maculatum*, Lamiaceae

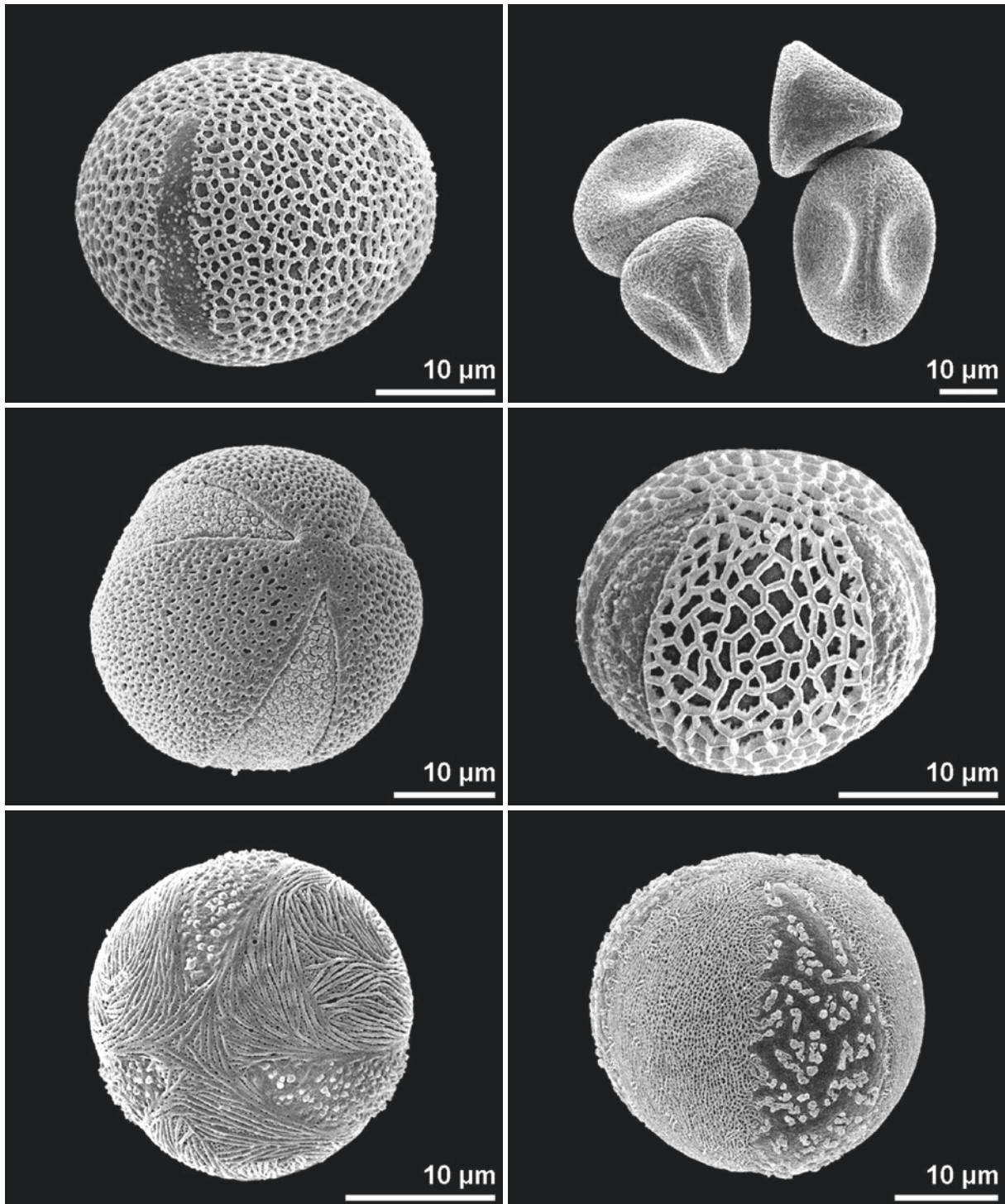
■ ■ *Erysimum odoratum*, Brassicaceae
polar view

■ ■ *Nelumbo nucifera*, Nelumbonaceae
oblique polar view

■ ■ *Lonicera fragrantissima*, Caprifoliaceae
equatorial view

■ ■ *Stachys palustris*, Lamiaceae
dry pollen

■ ■ *Ceratostigma plumbaginoides*, Plumbaginaceae
polar view



■ ■ ■ *Fraxinus excelsior*, Oleaceae
equatorial view

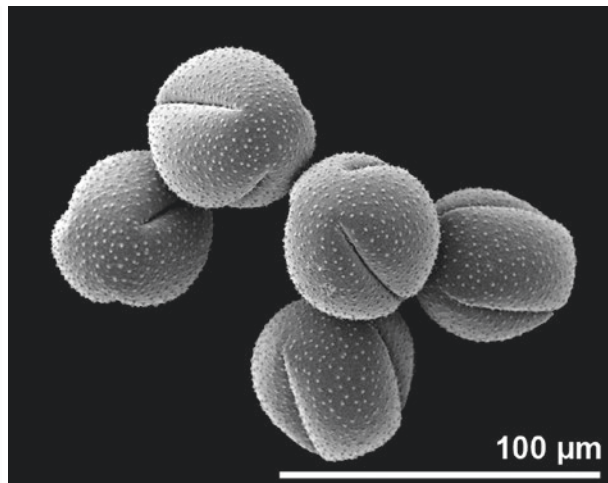
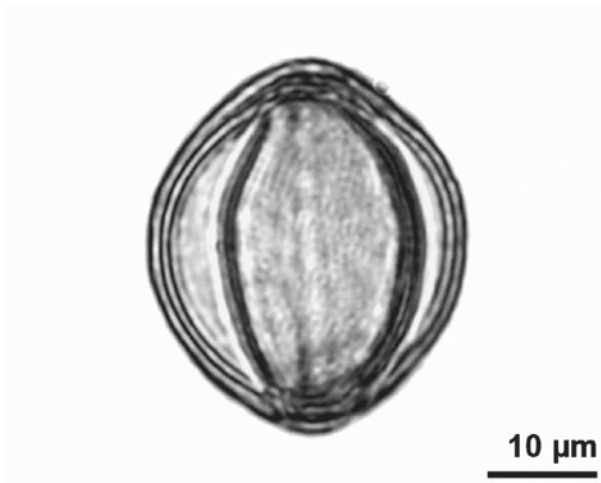
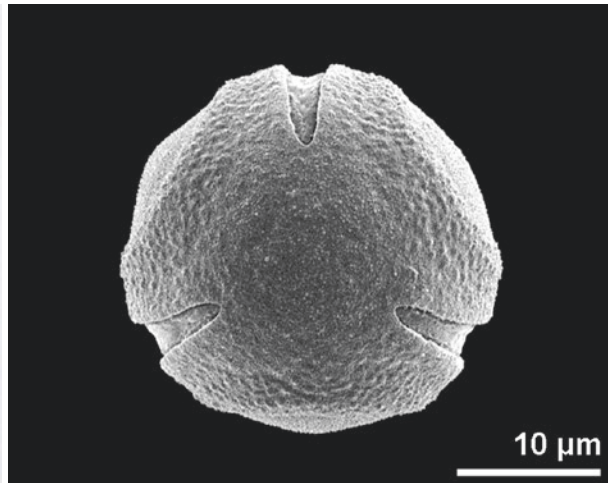
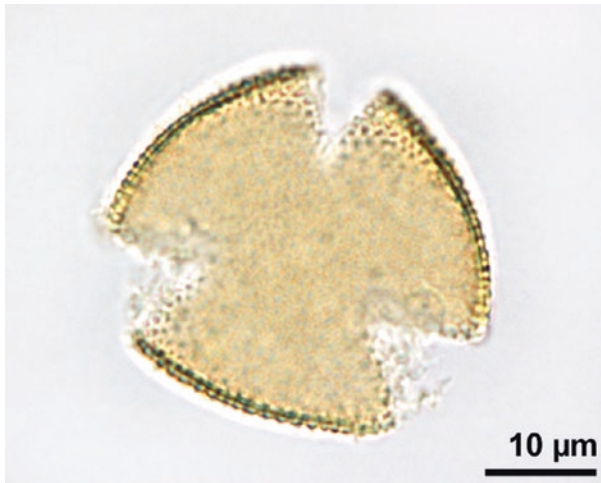
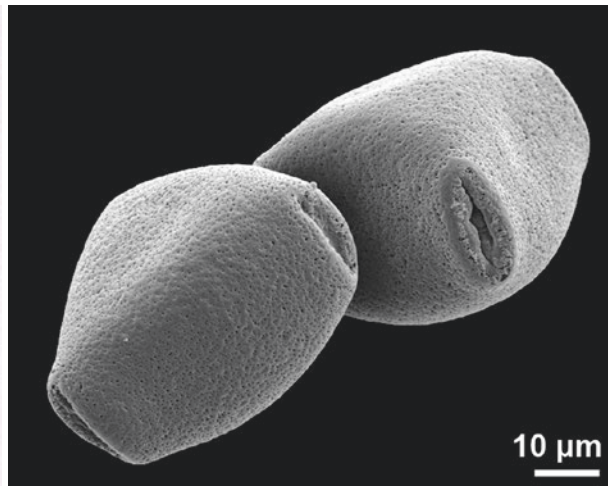
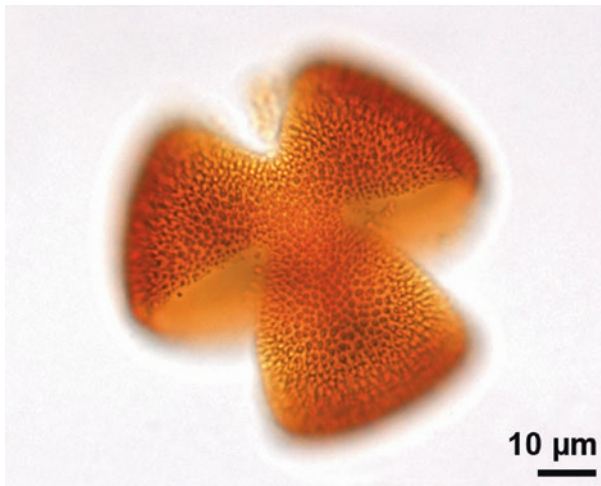
■ ■ ■ *Nandina domestica*, Berberidaceae
polar view

■ ■ ■ *Trollius europaeus*, Ranunculaceae
polar view

■ ■ ■ *Odontites luteus*, Orobanchaceae
dry pollen

■ ■ ■ *Corylopsis platypetala*, Hamamelidaceae
equatorial view

■ ■ ■ *Veronica serpyllifolia*, Plantaginaceae
equatorial view



■ *Convolvulus arvensis*, Convolvulaceae
polar view

■ *Petrea volubilis*, Verbenaceae
dry pollen

■ *Fraxinus excelsior*, Oleaceae
polar view

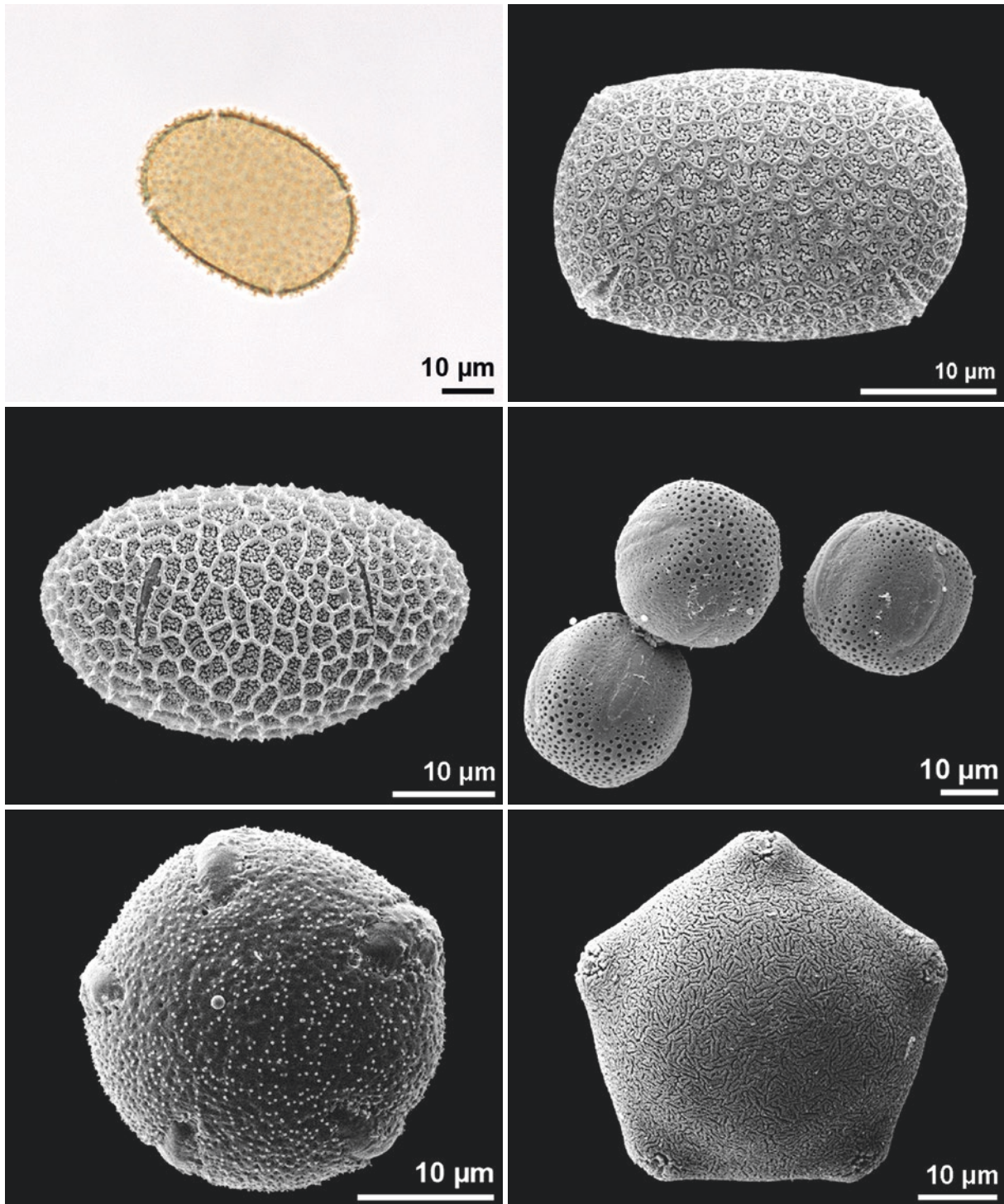
■ *Melampyrum arvense*, Orobanchaceae
polar view

■ *Acer* sp., Sapindaceae
fossil, middle Miocene, Austria, equatorial view

■ *Cleistocactus straussii*, Cactaceae
dry pollen

colpus/colpate, tetracolpate, pentacolpate

tetra- and pentacolpate: pollen grain with four or five colpi



■ ■ *Impatiens parviflora*, Balsaminaceae
tetracolpate, polar view

■ ■ *Impatiens parviflora*, Balsaminaceae
tetracolpate, equatorial view

■ ■ *Didymaea mexicana*, Rubiaceae
pentacolpate, polar view

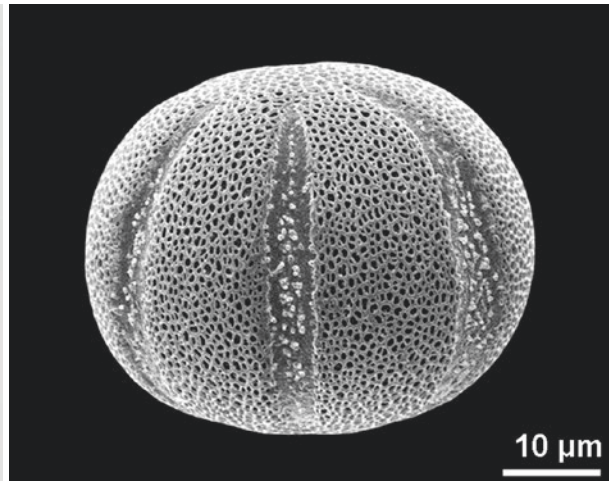
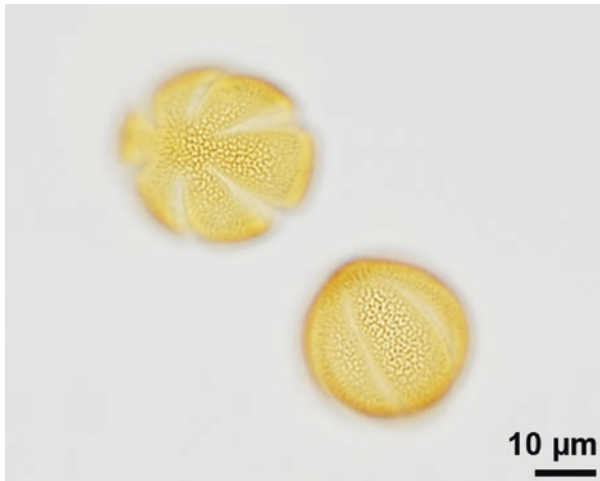
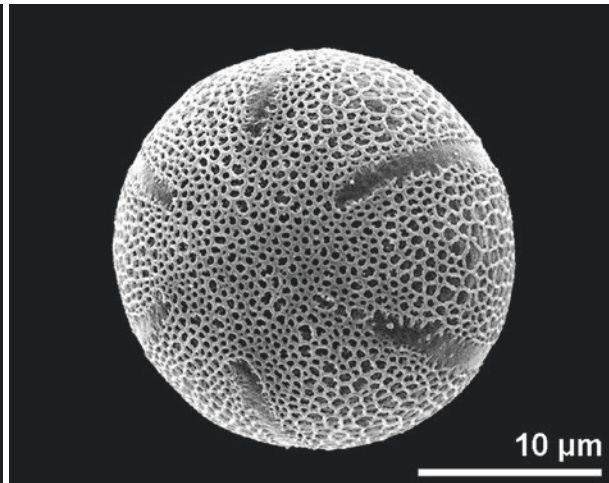
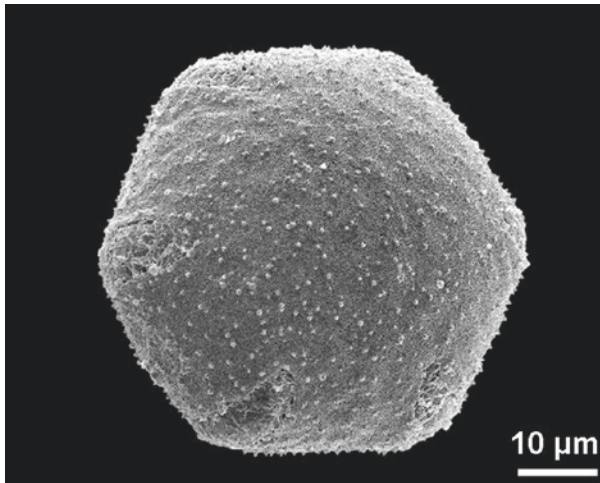
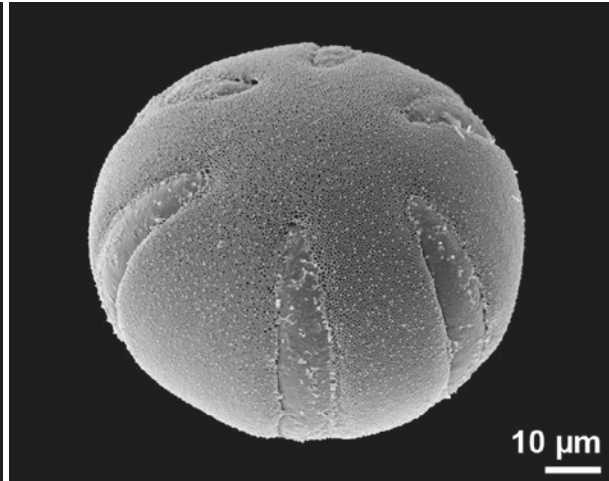
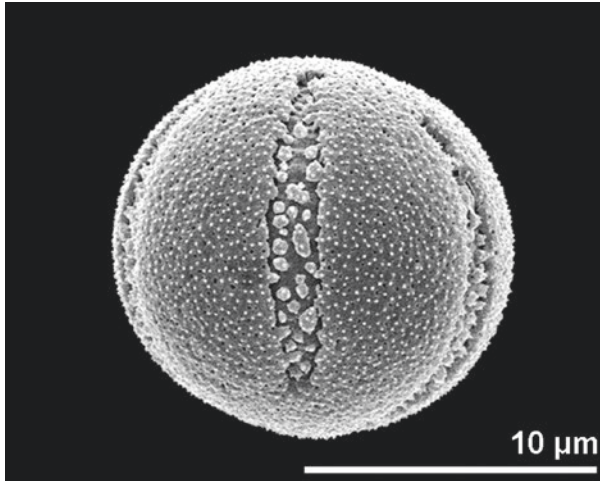
■ ■ *Impatiens glandulifera*, Balsaminaceae
tetracolpate, polar view

■ ■ *Sideritis romana*, Lamiaceae
tetracolpate

■ ■ *Mendoncia albida*, Acanthaceae
pentacolpate, polar view

colpus/colpate, hexacolpate

hexacolpate: pollen grain with six colpi



■ *Cruciata laevipes*, Rubiaceae
stephanocolpate, equatorial view

■ *Platycodon grandiflorus*, Campanulaceae
stephanocolpate, polar view

■ *Origanum vulgare*, Lamiaceae
stephanocolpate

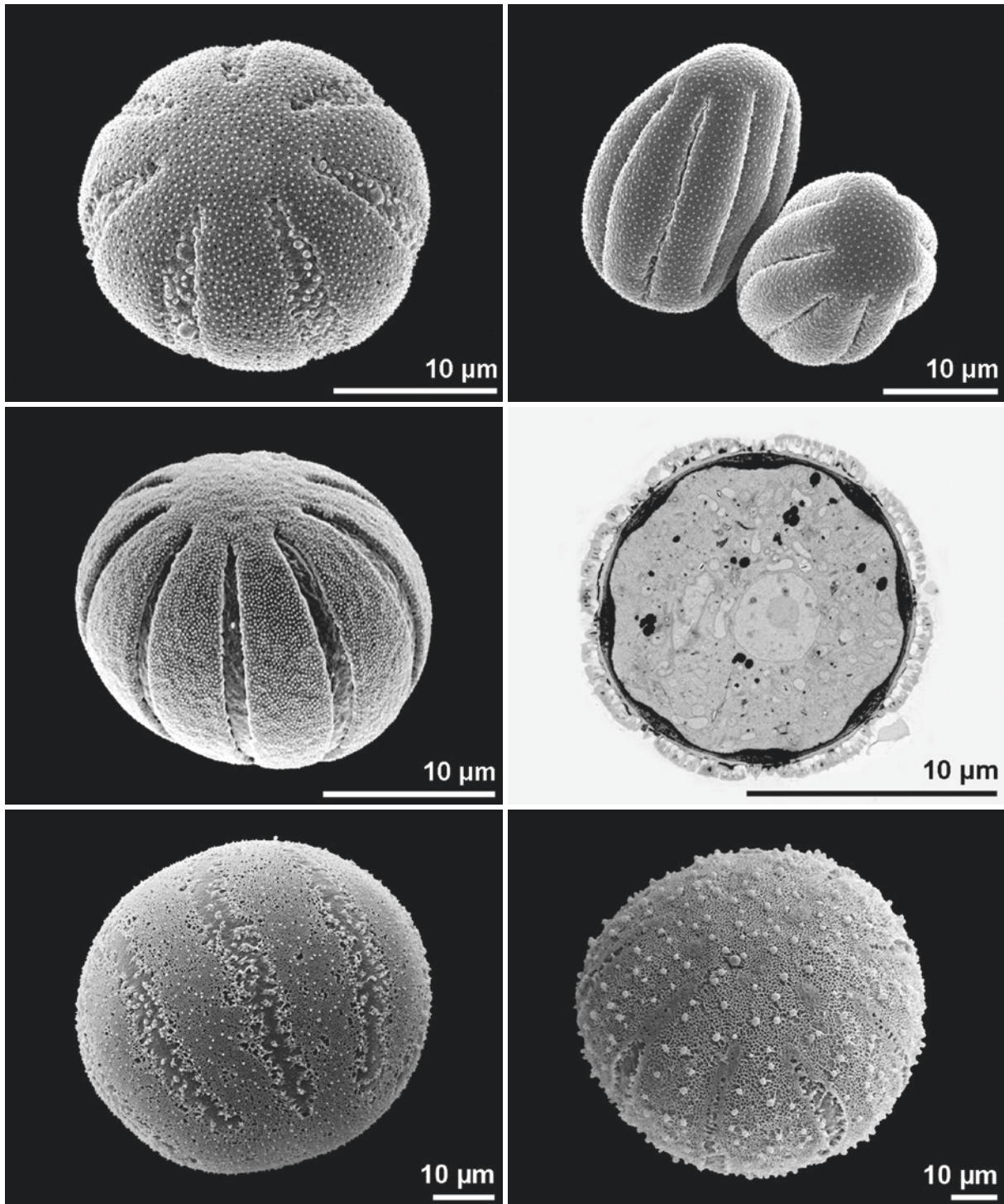
■ *Merremia umbellata*, Convolvulaceae
stephanocolpate, oblique polar view

■ *Primula veris*, Primulaceae
stephanocolpate, polar view

■ *Clinopodium vulgare*, Lamiaceae
stephanocolpate, equatorial view

colpus/colpate, stephanocolpate

stephanocolpate: colpi situated at the equator (term usually used for six or more apertures)



■ ■ *Galium glaucum*, Rubiaceae
■ ■ oblique polar view

■ ■ *Sherardia arvensis*, Rubiaceae
■ ■ oblique equatorial view

■ ■ *Codonopsis pilosula*, Campanulaceae
■ ■ equatorial view

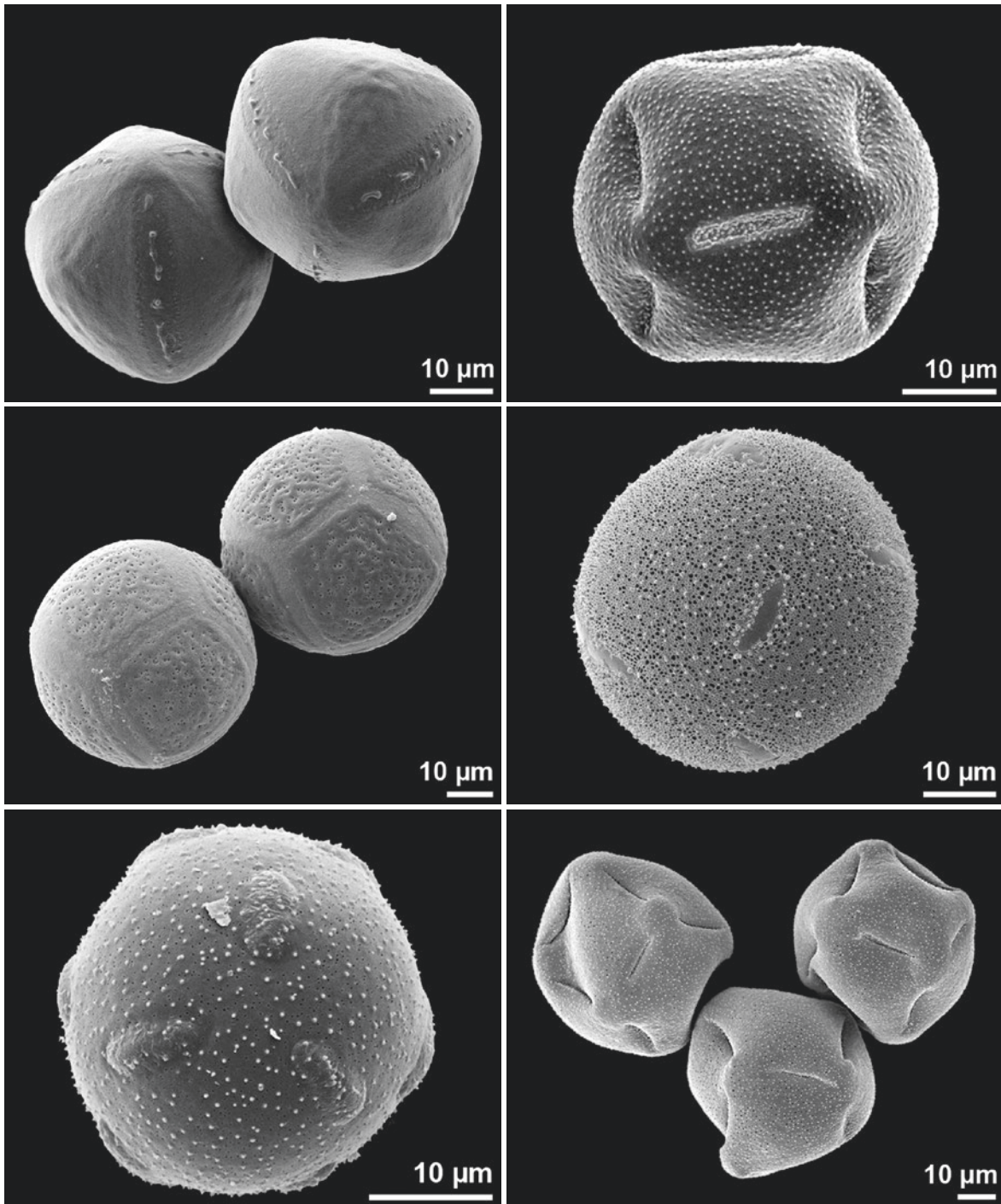
■ ■ *Galium lucidum*, Rubiaceae
■ ■ dry pollen

■ ■ *Galium odoratum*, Rubiaceae
■ ■ cross section

■ ■ *Sechium edule*, Cucurbitaceae
■ ■ oblique polar view

colpus/colpate, pantocolpate

pantocolpate: pollen grain with colpi distributed more or less regularly over the surface



■ *Sarcocapnos enneaphylla*, Papaveraceae
panto(6)colpate

■ *Pseudofumaria lutea*, Papaveraceae
panto(syn)colpate

■ *Mollugo verticillata*, Molluginaceae

■ *Talinum paniculatum*, Talinaceae
dry pollen

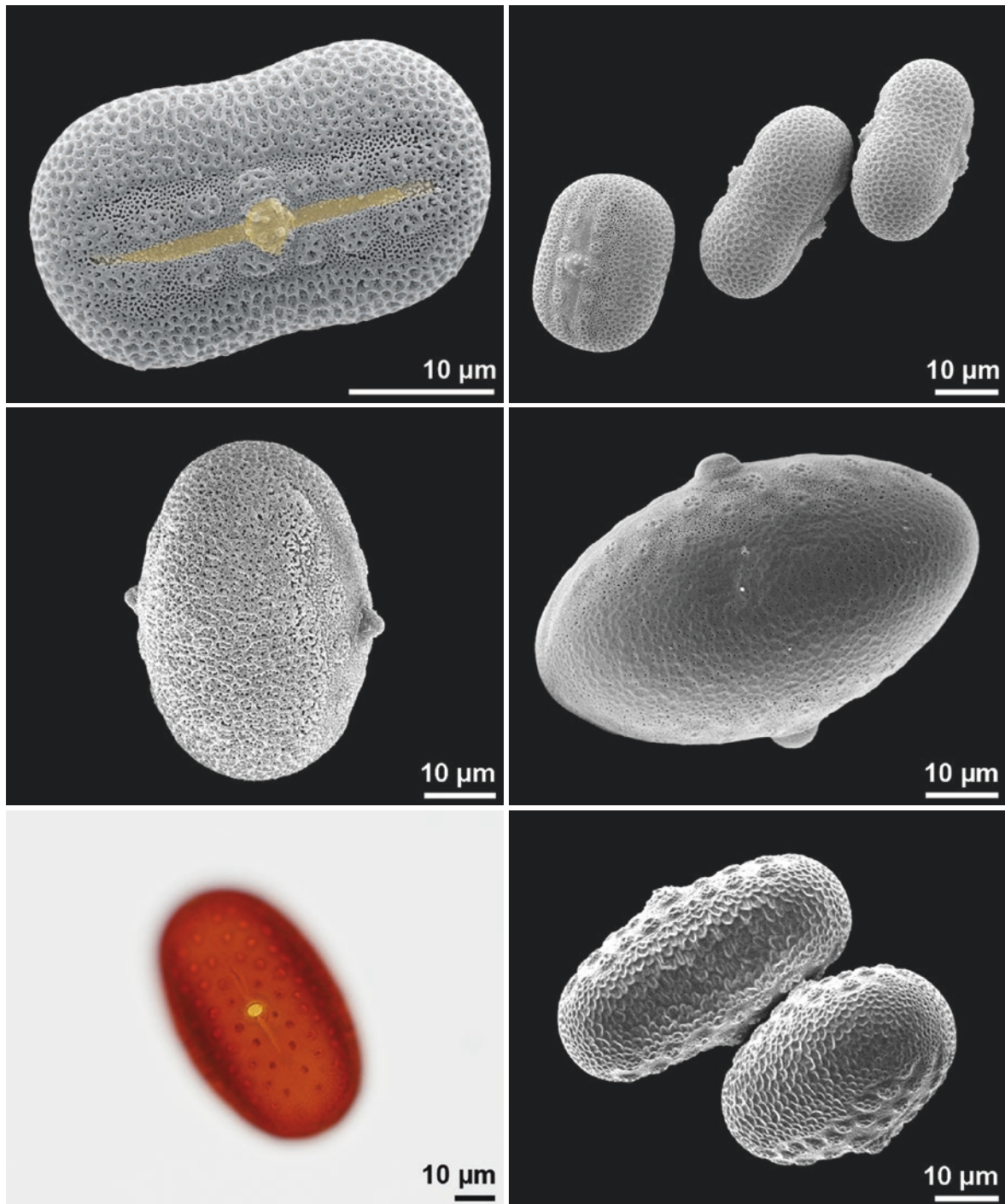
■ *Maripa nicaraguensis*, Convolvulaceae

■ *Turbincarpus pseudomacrochele*, Cactaceae
dry pollen

colporus/colporate, dicolporate

colporus: compound aperture composed of a colpus (ektoaperture) combined with an endoaperture of variable size and shape

dicolporate: pollen grain with two colpi



■ *Justicia procumbens*, Acanthaceae
colporus colored, equatorial view

■ *Adhatoda schimperiana*, Acanthaceae
equatorial view

■ *Justicia carnea*, Acanthaceae
equatorial view

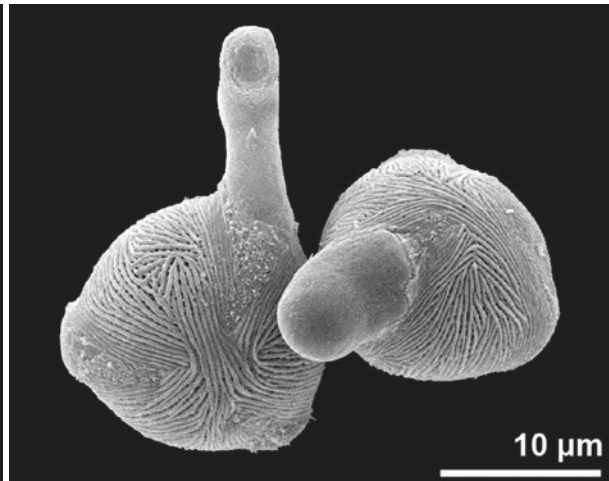
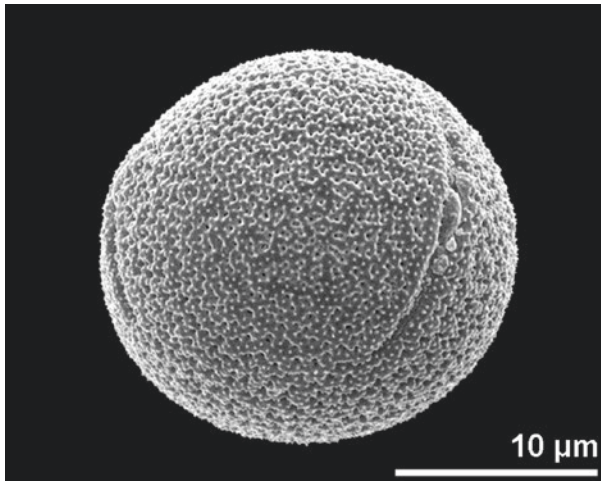
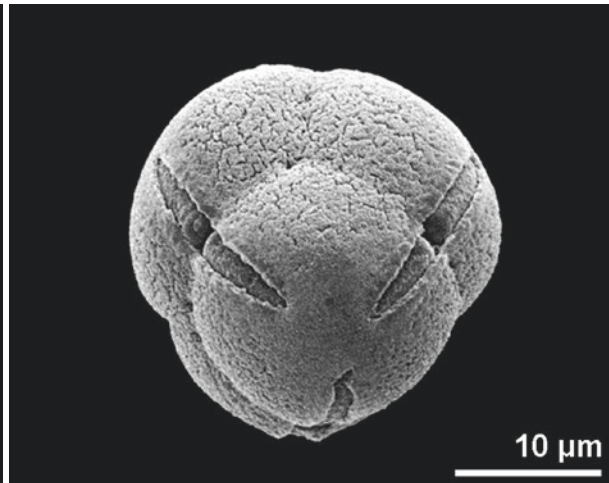
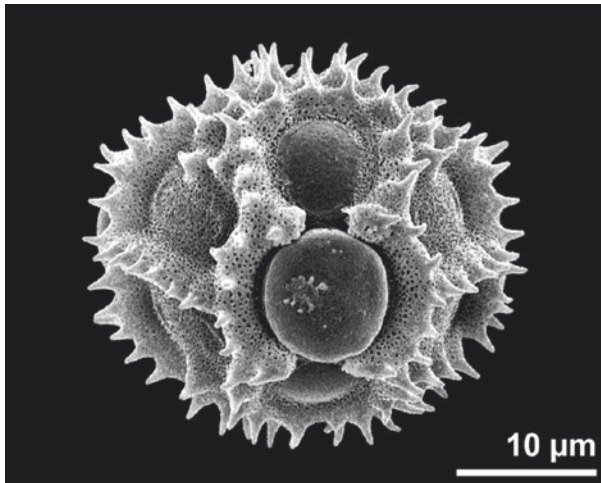
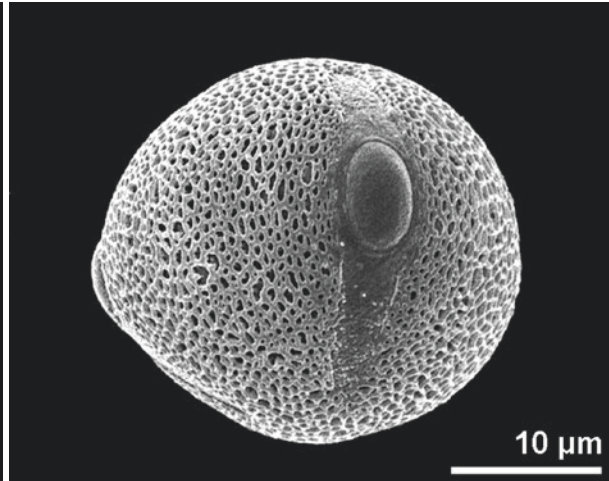
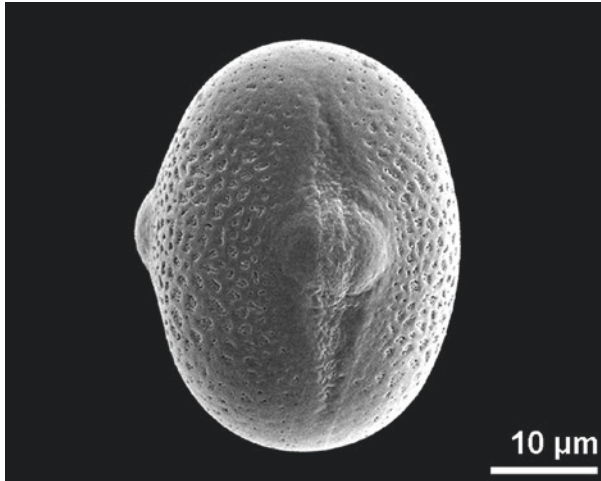
■ *Justicia procumbens*, Acanthaceae
equatorial view

■ *Justicia macrantha*, Acanthaceae
equatorial view

■ *Justicia xylosteoides*, Acanthaceae

colporus/colporate, tricolporate

tricolporate: pollen grain with three colpi



■ *Lathyrus vernus*, Fabaceae
equatorial view

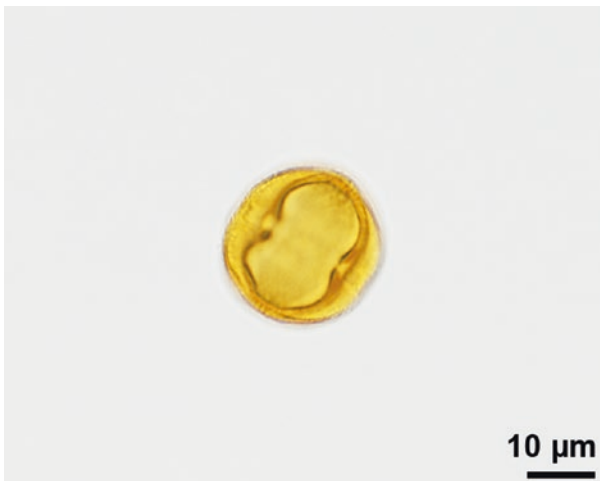
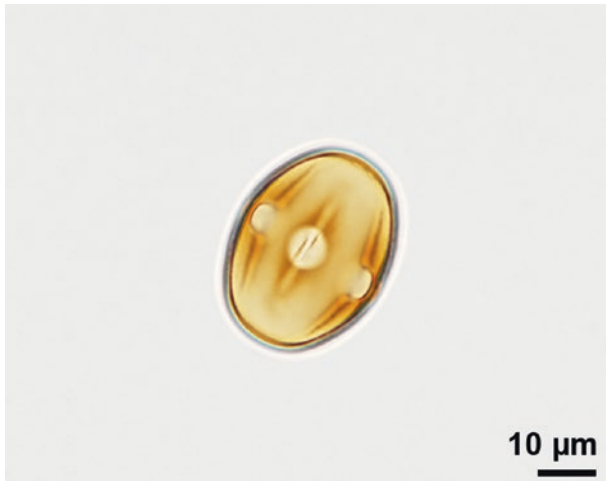
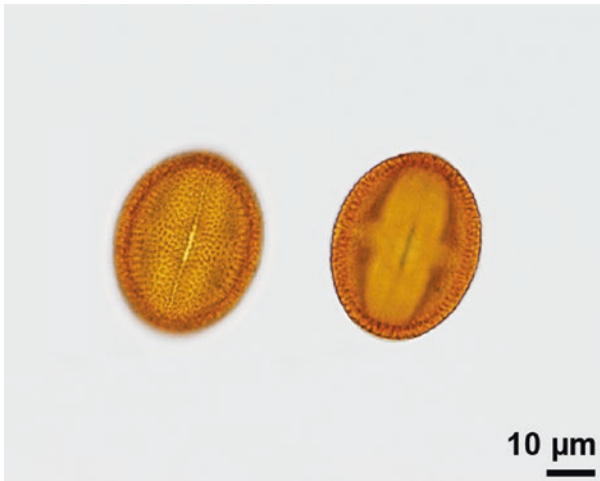
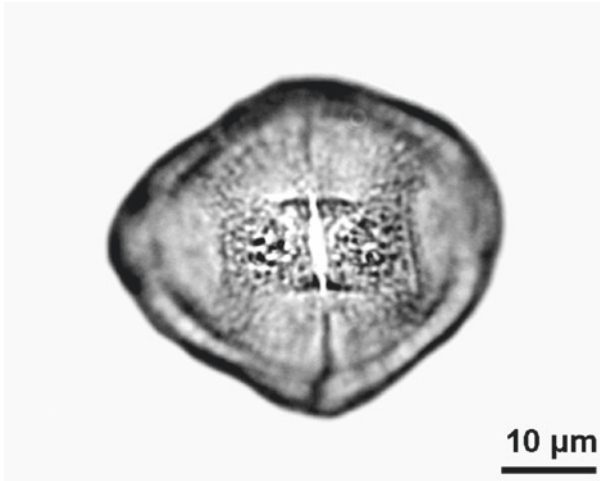
■ *Hieracium hoppeanum*, Asteraceae
equatorial view

■ *Rumex acetosa*, Polygonaceae
equatorial view

■ *Kraussia floribunda*, Rubiaceae
equatorial view

■ *Erica herbacea*, Ericaceae
tetrad

■ *Aruncus dioicus*, Rosaceae
germinating pollen



■ *Tricolporopollenites wackersdorfensis*, Fabaceae
 ■ fossil, middle Miocene, Austria, equatorial view

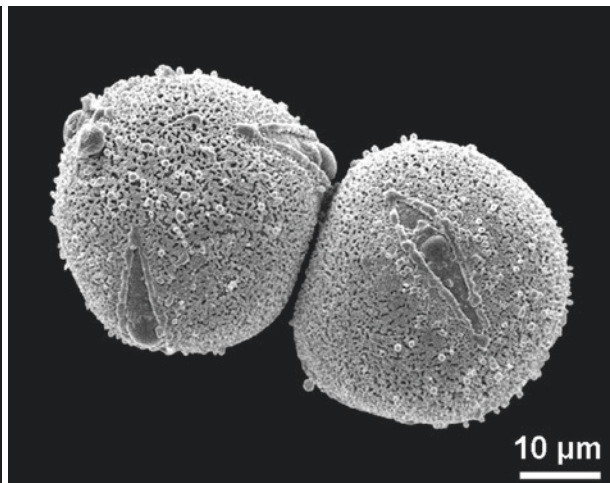
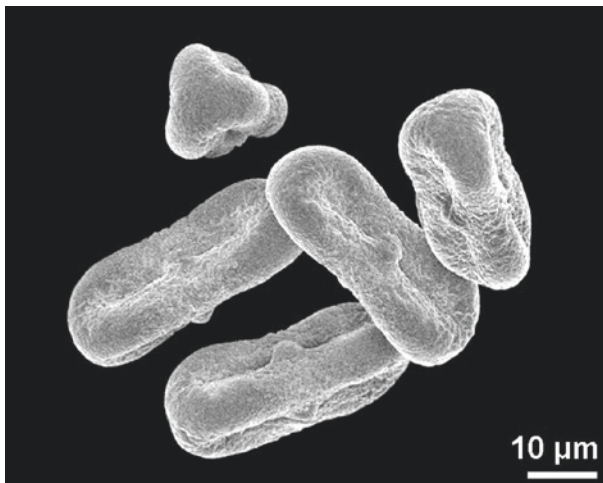
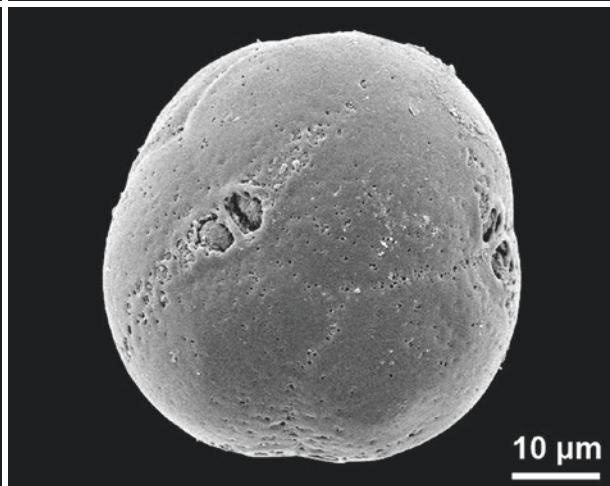
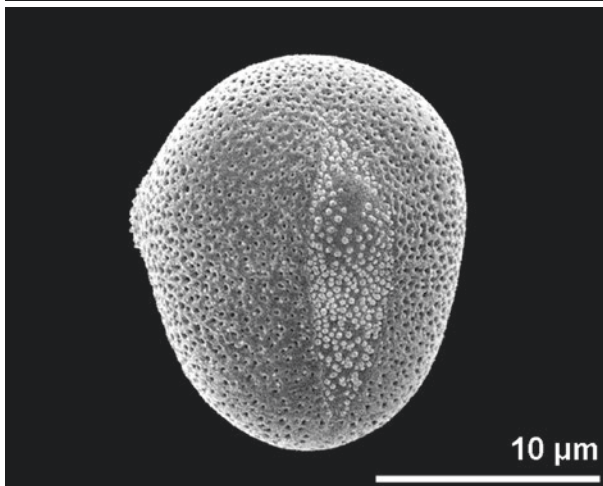
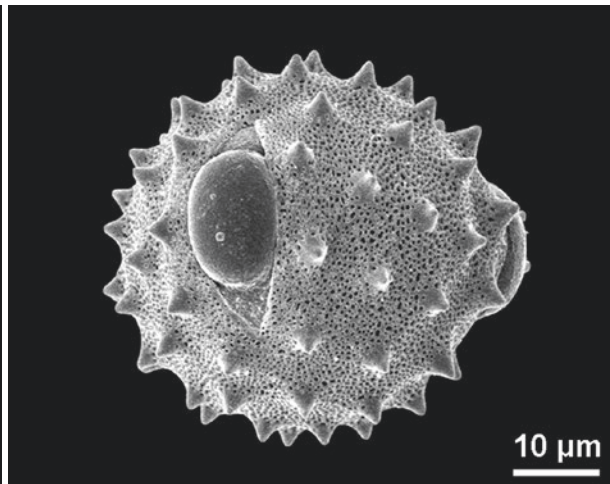
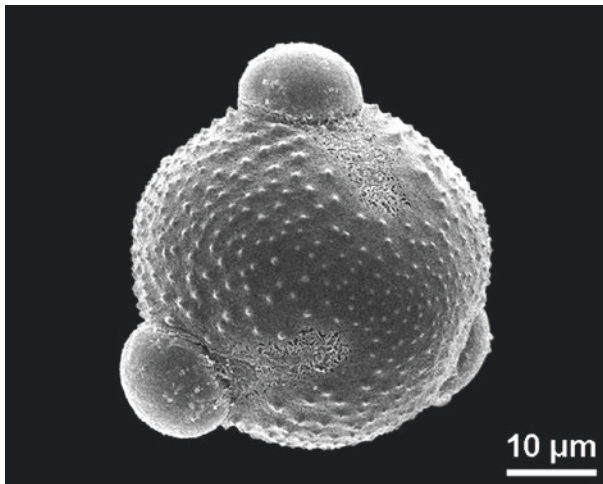
■ *Fagopyrum* sp., Polygonaceae
 ■ equatorial view

■ *Rhus* sp., Anacardiaceae
 ■ equatorial view

■ Fabaceae
 ■ equatorial view

■ *Lathyrus sylvestris*, Fabaceae
 ■ equatorial view

■ *Euphorbia peplus*, Euphorbiaceae
 ■ polar view



■ *Centaurea scabiosa*, Asteraceae
■ polar view

■ *Echium vulgare*, Boraginaceae
■ equatorial view

■ *Myrrhis odorata*, Apiaceae
■ dry pollen

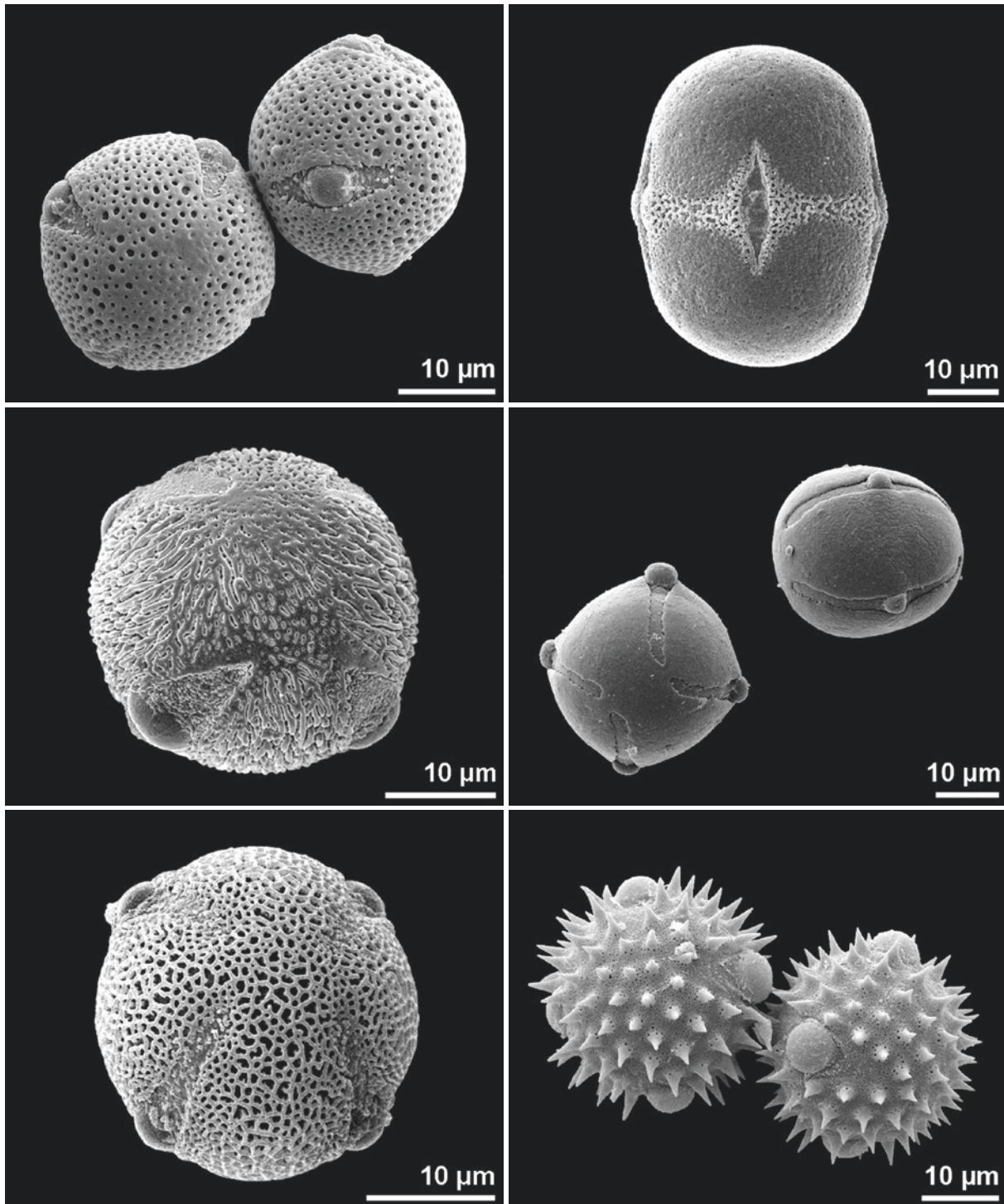
■ *Cirsium oleraceum*, Asteraceae
■ equatorial view

■ *Gardenia thunbergia*, Rubiaceae
■ tetrad

■ *Fatsia japonica*, Araliaceae

colporus/colporate, tetracolporate

tetracolporate: pollen grain with 4 colpi



■ ■ *Citrus swinglei*, Rutaceae

■ ■ *Nicotiana tabacum*, Solanaceae
oblique polar view

■ ■ *Poncirus trifoliata*, Rutaceae
oblique polar view

■ ■ *Pulmonaria mollis*, Boraginaceae
equatorial view

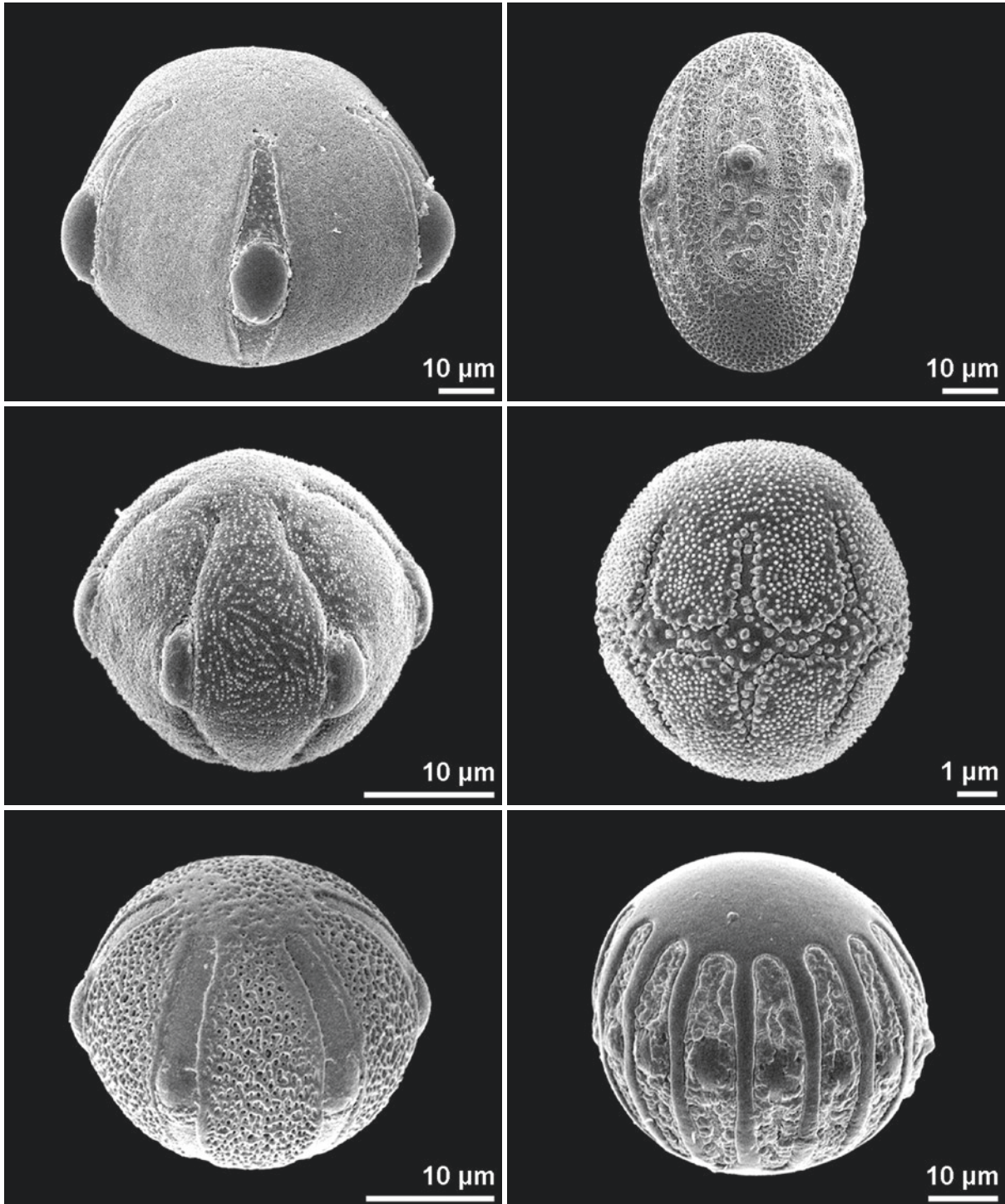
■ ■ *Genlisea violacea*, Lentibulariaceae

■ ■ *Tridax procumbens*, Asteraceae

colporus/colporate, pentacolporate, stephanocolporate

pentacolporate: pollen grain with five colpi

stephanocolporate: colpi situated at the equator (term usually used for 6 or more apertures)



■ *Viola arvensis*, Violaceae
pentacolporate, equatorial view

■ *Sanguisorba officinalis*, Rosaceae
stephanocolporate, equatorial view

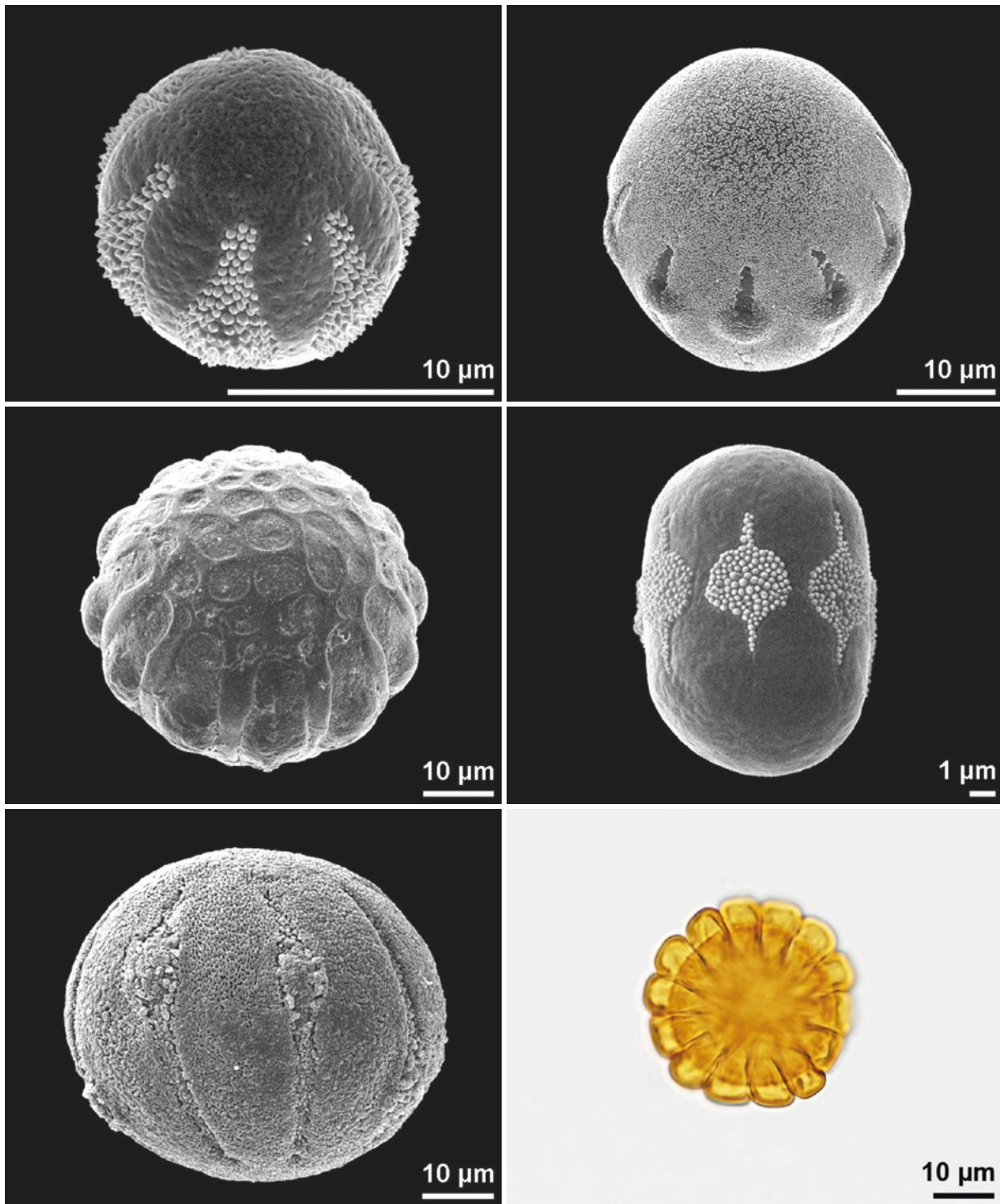
■ *Pinguicula ehlersiae*, Lentibulariaceae
stephanocolporate, equatorial view

■ *Justicia menesii*, Acanthaceae
hexacolporate, oblique equatorial view

■ *Cerinthe minor*, Boraginaceae
stephanocolporate, equatorial view

■ *Polygala chamaebuxus*, Polygalaceae
stephanocolporate, equatorial view

colporus/colporate, stephanocolporate



■ ■ *Moltkia petraea*, Boraginaceae
oblique polar view

■ ■ *Polygala major*, Polygalaceae
oblique polar view

■ ■ *Echinopepon wrightii*, Cucurbitaceae
equatorial view

■ ■ *Symphytum caucasicum*, Boraginaceae
oblique polar view

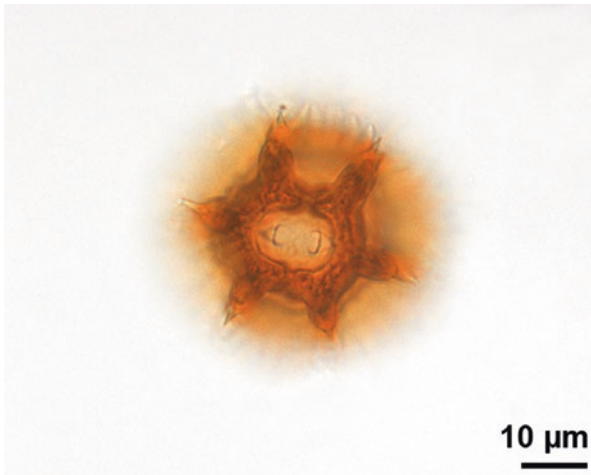
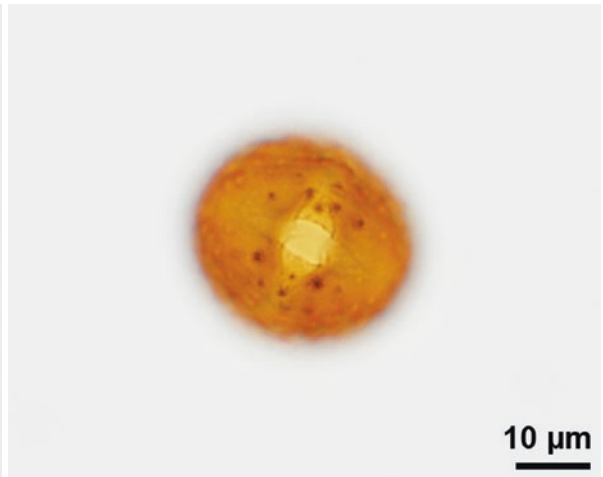
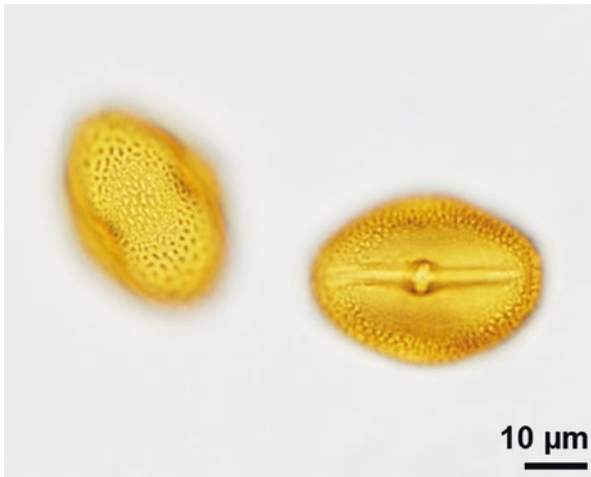
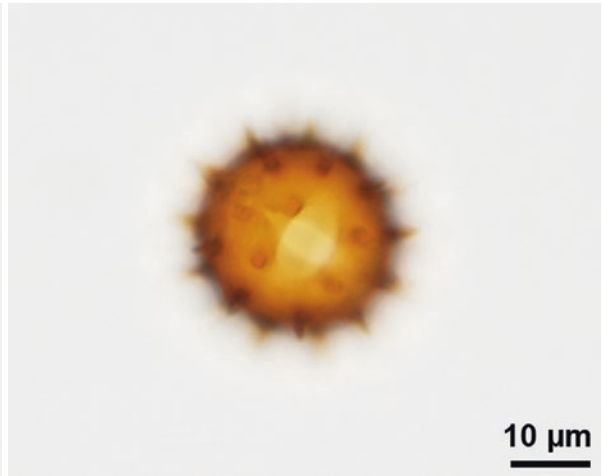
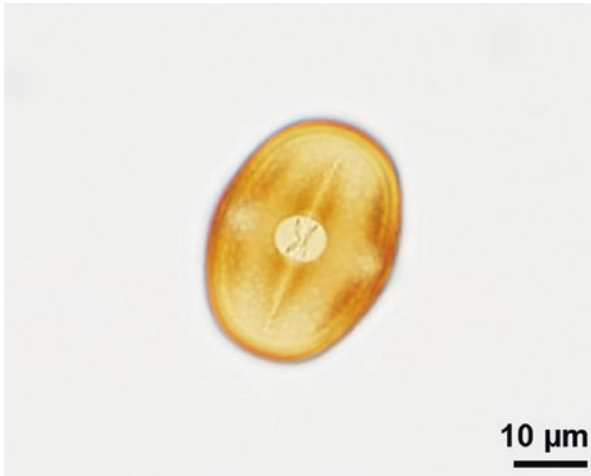
■ ■ *Buglossoides arvensis*, Boraginaceae
equatorial view

■ ■ *Utricularia vulgaris*, Lentibulariaceae
polar view

ektoaperture, endoaperture, lalongate, lolongate

ektoaperture: outer part of a compound aperture

endoaperture: inner part of a compound aperture



■ ■ *Lathyrus sylvestris*, Fabaceae
 ■ ■ ektoaperture: colpus, endoaperture: porus

■ ■ *Tussilago farfara*, Asteraceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus

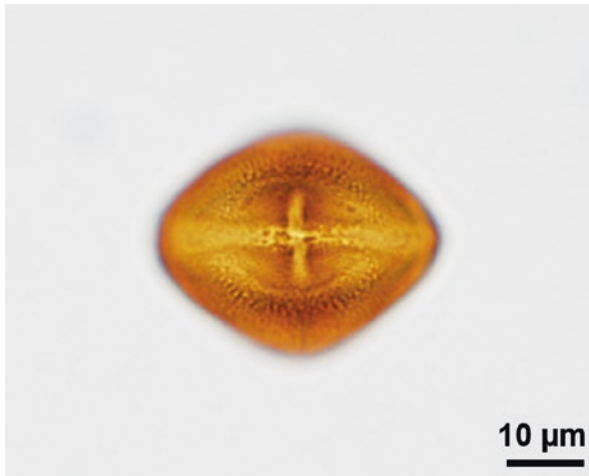
■ ■ *Parthenocissus* sp., Vitaceae
 ■ ■ ektoaperture: colpus, endoaperture: porus

■ ■ *Centaurea jacea*, Asteraceae
 ■ ■ ektoaperture: colpus, endoaperture: porus

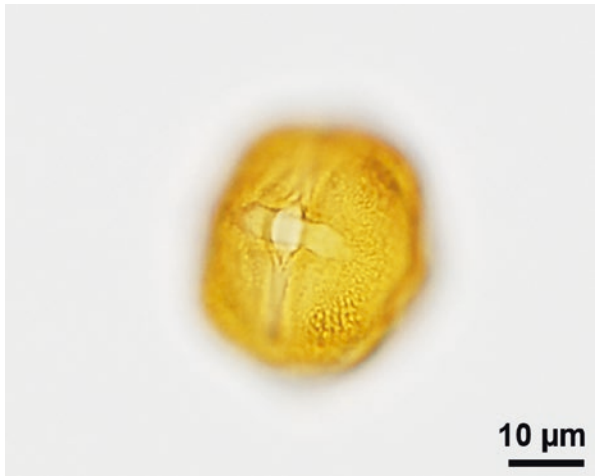
■ ■ *Cichorium intybus*, Asteraceae
 ■ ■ ektoaperture: colpus, endoaperture: porus

■ ■ *Lysimachia punctata*, Primulaceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus

lalongate: ectoaperture elongated equatorially
 lolongate: ectoaperture elongated meridionally



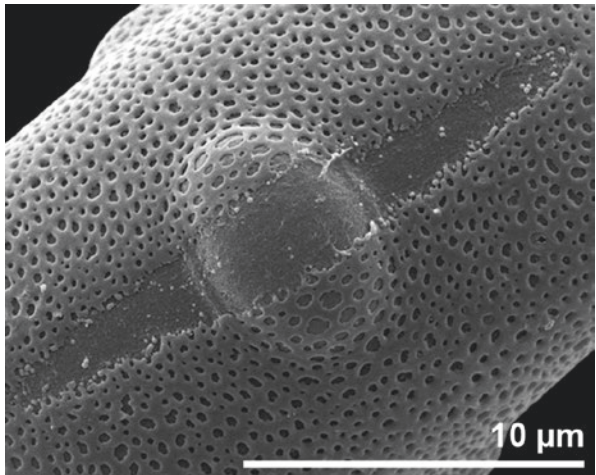
10 µm



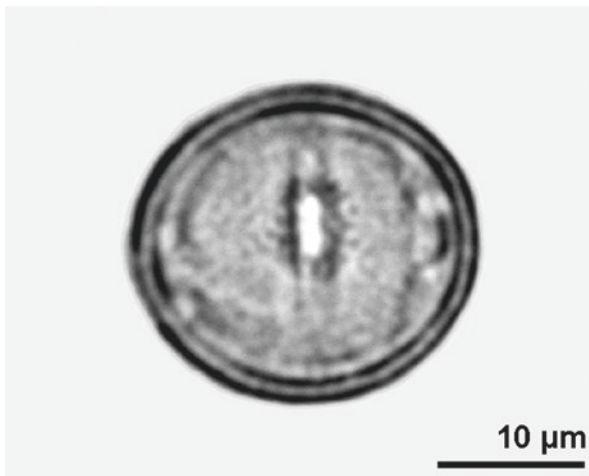
10 µm



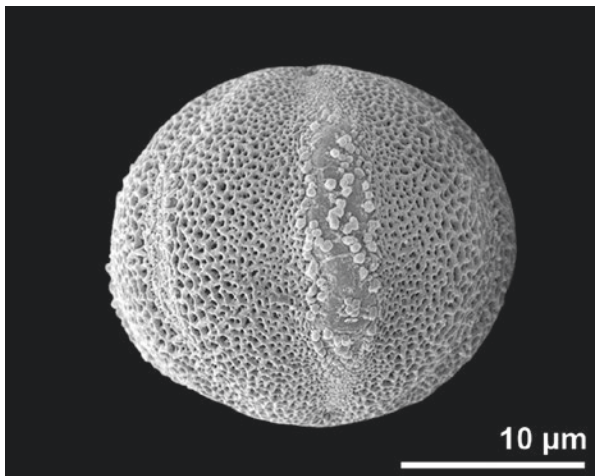
10 µm



10 µm



10 µm



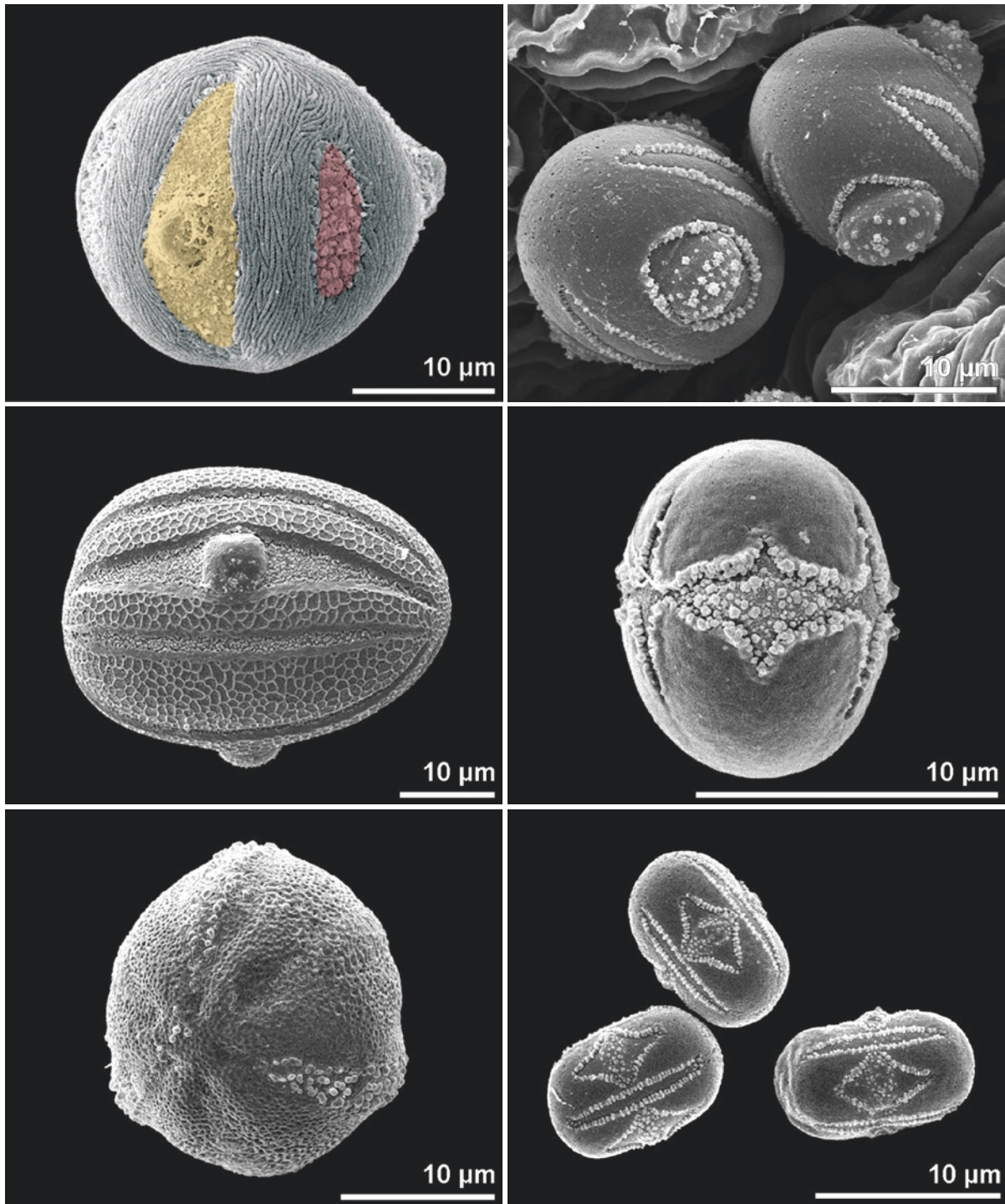
10 µm

- ■ *Dictamnus albus*, Rutaceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus
- ■ *Vicia faba*, Fabaceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus
- ■ *Rumex* sp., Polygonaceae
 ■ ■ fossil, Quaternary Austria, ektoaperture: colpus, endoaperture: lolongate porus

- ■ *Scaevola aemula*, Goodeniaceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus
- ■ *Vitaliana primuliflora*, Primulaceae
 ■ ■ ektoaperture: colpus, endoaperture: lalongate porus
- ■ *Phacelia campanularia*, Boraginaceae
 ■ ■ heteroaperturate pollen, ektoaperture: colpus, endoaperture lolongate porus

heteroaperturate

pollen grain with different types of apertures; only one type presumed to function as germination site



■ *Lythrum hyssopifolia*, Lythraceae
 ■ colporus (yellow) and pseudocolpus (purple), equatorial view

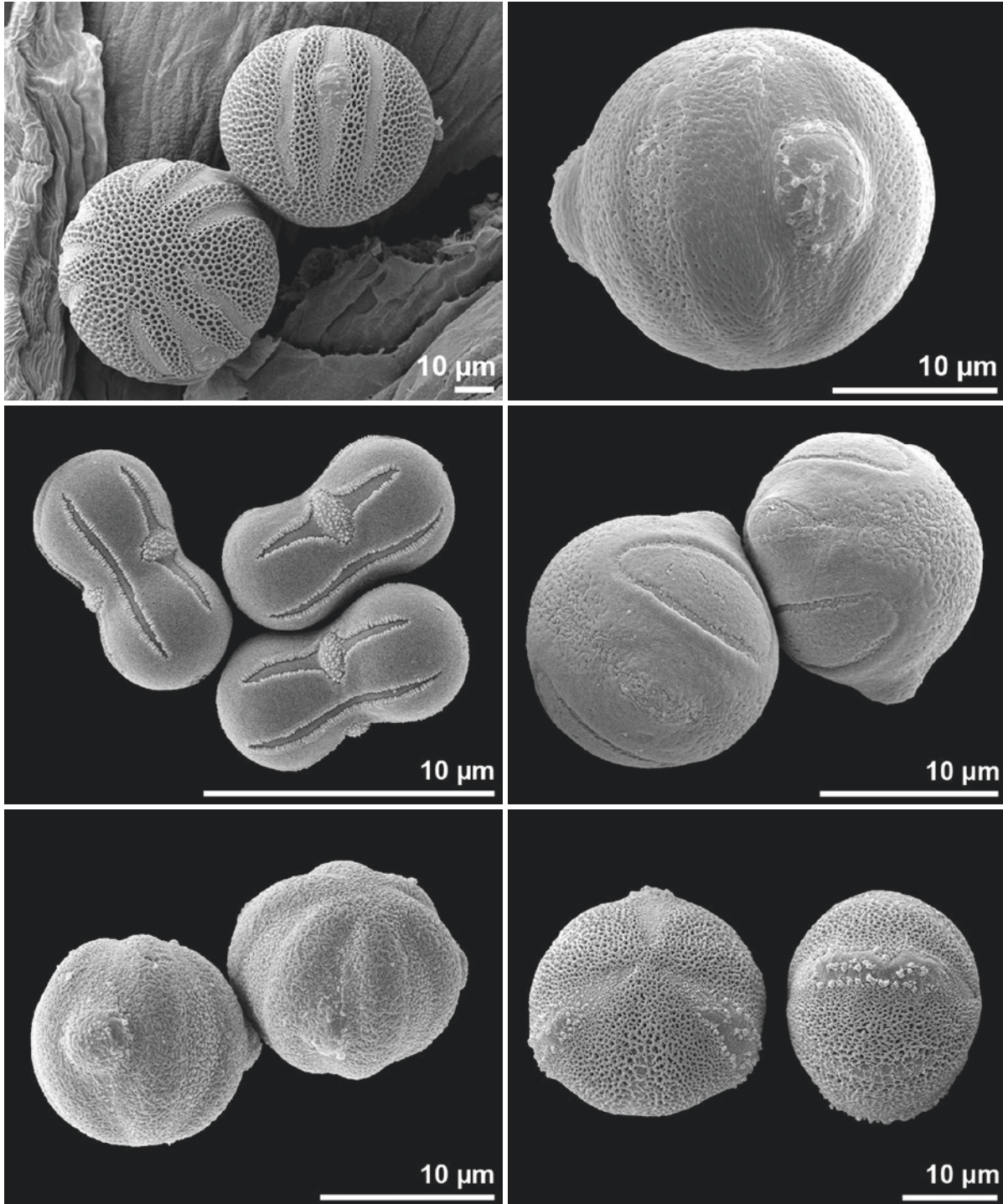
■ *Tetramerium nervosum*, Acanthaceae
 ■ equatorial view

■ *Phacelia tanacetifolia*, Boraginaceae
 ■ polar view

■ *Pardoglossum* sp., Boraginaceae

■ *Cynoglossum officinale*, Boraginaceae
 ■ equatorial view

■ *Myosotis ramosissima*, Boraginaceae



■ ■ ■ *Pseuderanthemum alatum*, Acanthaceae

■ ■ ■ *Omphalodes linifolia*, Boraginaceae

■ ■ ■ *Meriania selvaflourensii*, Melastomataceae

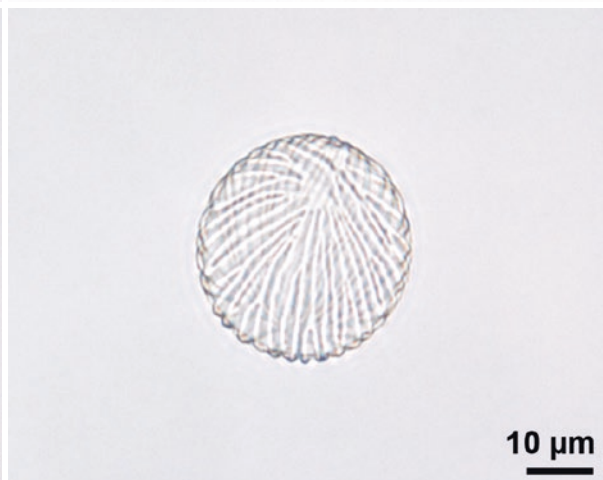
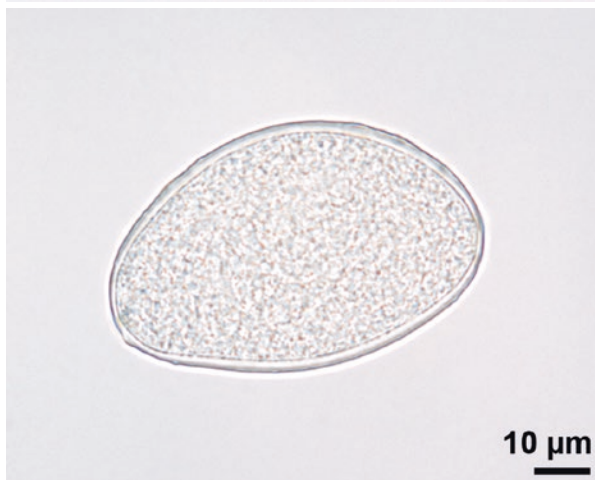
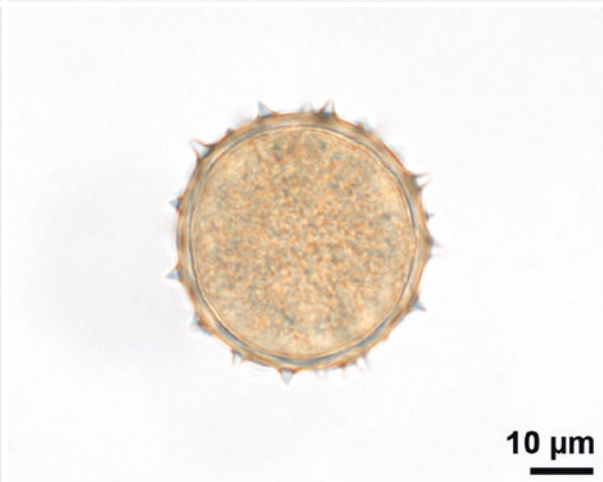
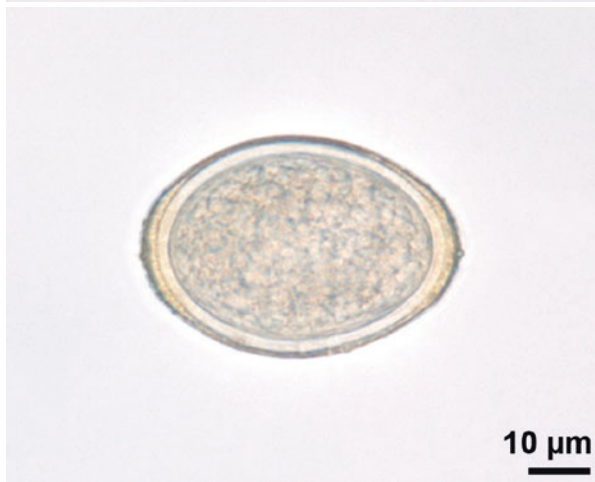
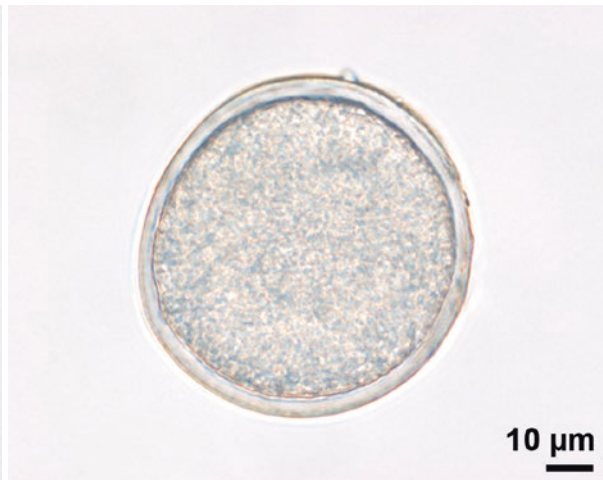
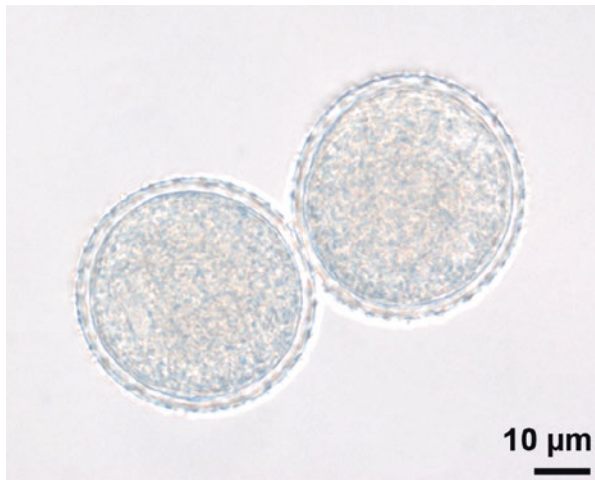
■ ■ ■ *Combretum fruticosum*, Combretaceae
equatorial view

■ ■ ■ *Medinilla scortechinii*, Melastomataceae

■ ■ ■ *Phacelia campanularia*, Boraginaceae

inaperturate

pollen grain without distinct apertures



■ *Alocasia odora*, Araceae
hydrated

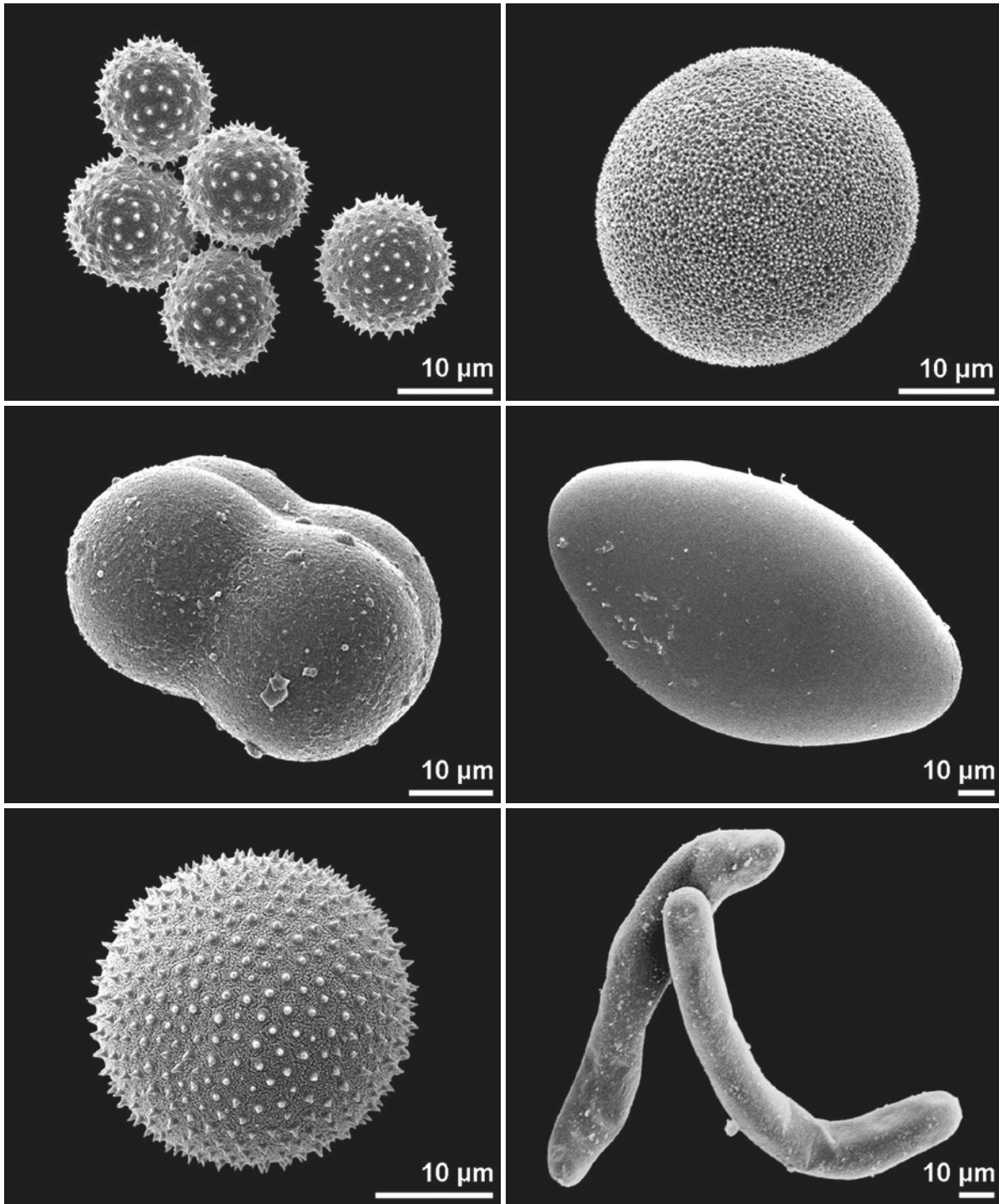
■ *Ambrosina bassii*, Araceae
hydrated


■ *Spathicarpa sagittifolia*, Araceae
hydrated


■ *Stylochaeton bogneri*, Araceae
hydrated


■ *Synandropadix vermitoxicus*, Araceae
hydrated


■ *Spathiphyllum* sp., Araceae
hydrated





 *Pinellia ternata*, Araceae

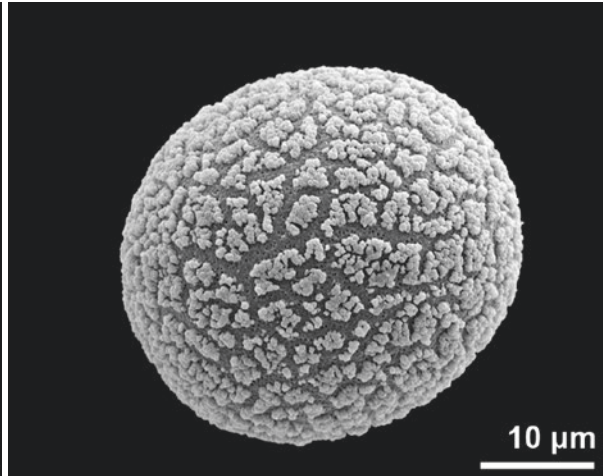
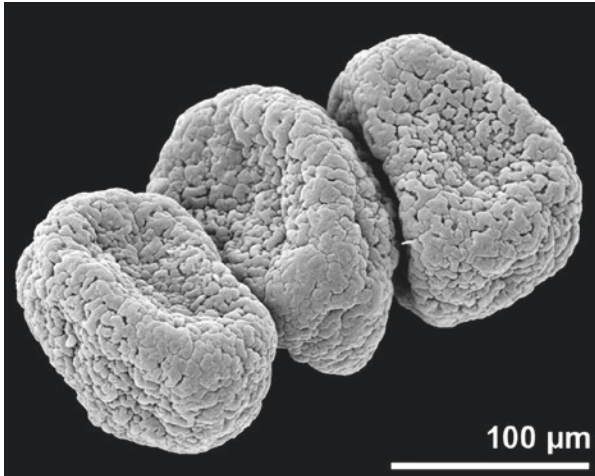
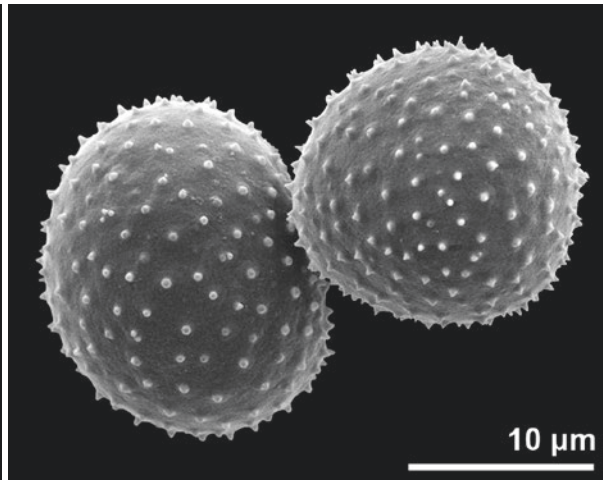
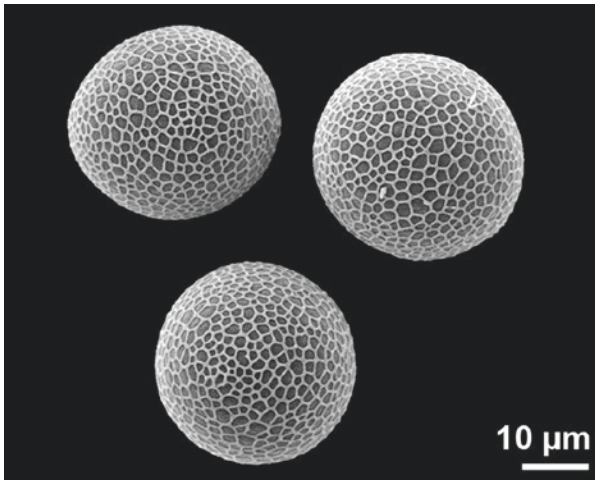
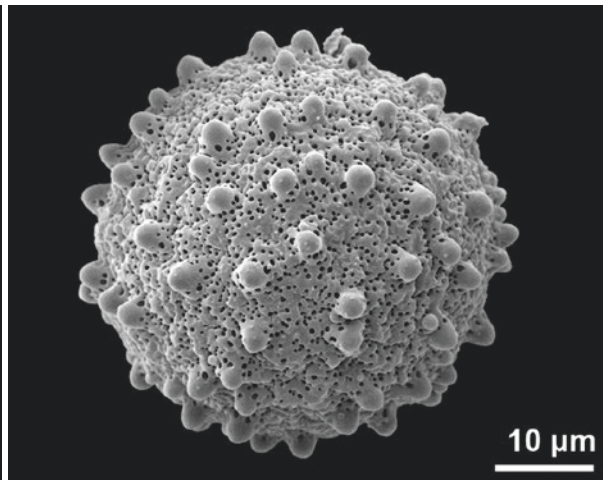
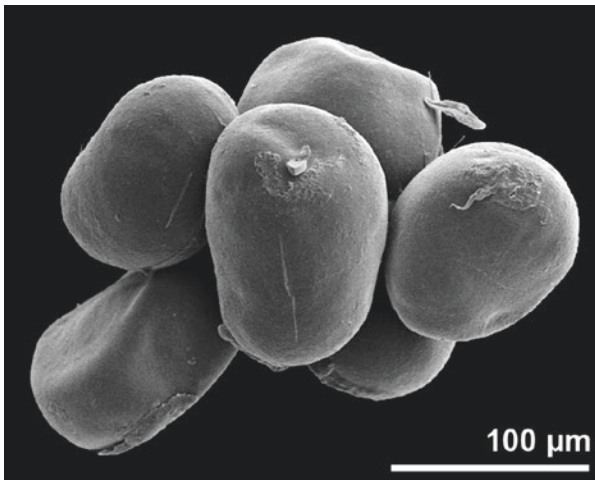
 *Chlorospatha dodsonii*, Araceae
tetrad

 *Phoebe sheareri*, Lauraceae

 *Populus alba*, Salicaceae

 *Aglaodorum griffithii*, Araceae

 *Posidonia* sp., Posidoniaceae



■ ■ ■ *Orchidantha maxillarioides*, Lowiaceae
dry pollen

■ ■ ■ *Aristolochia arborea*, Aristolochiaceae

■ ■ ■ *Triglochin maritima*, Juncaginaceae

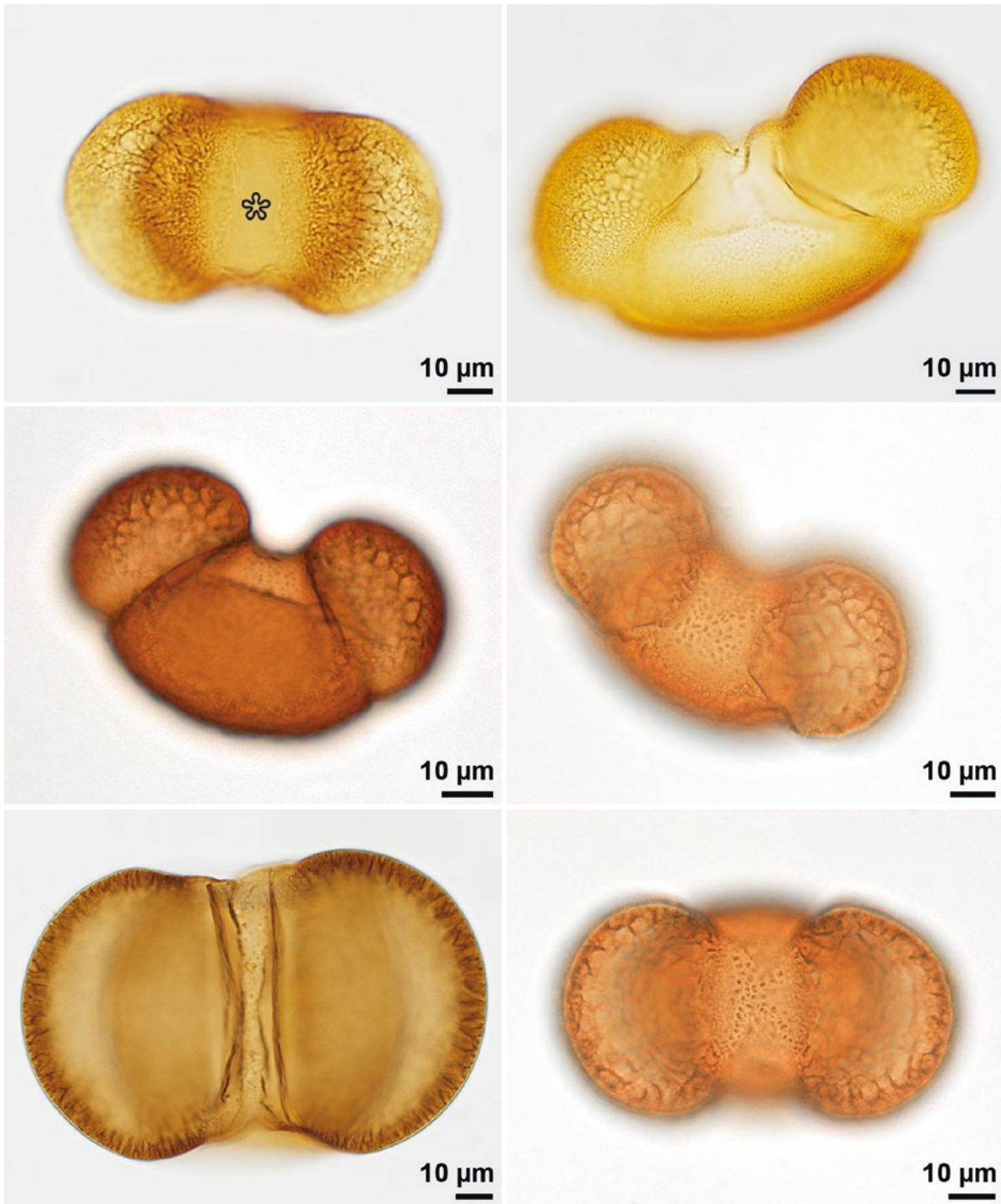
■ ■ ■ *Gnetum gnemon*, Gnetaceae

■ ■ ■ *Cytinus hypocistis*, Cytinaceae
dry pollen

■ ■ ■ *Trillium chloropetalum*, Melanthiaceae

leptoma

thinning of the pollen wall on the distal face in conifers, presumed to function as germination area



■ *Cedrus atlantica*, Pinaceae
 ■ leptoma (asterisk), distal polar view

■ *Pinus strobus*, Pinaceae
 ■ equatorial view

■ *Picea* sp., Pinaceae
 ■ distal polar view

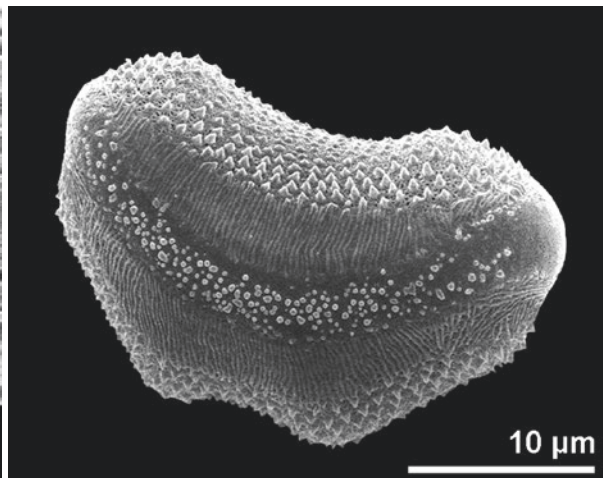
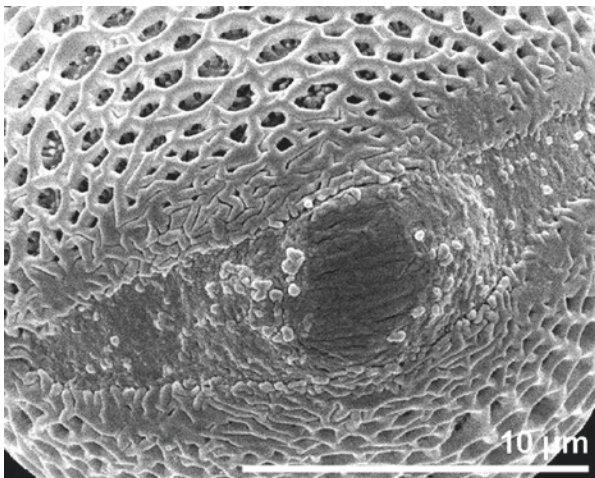
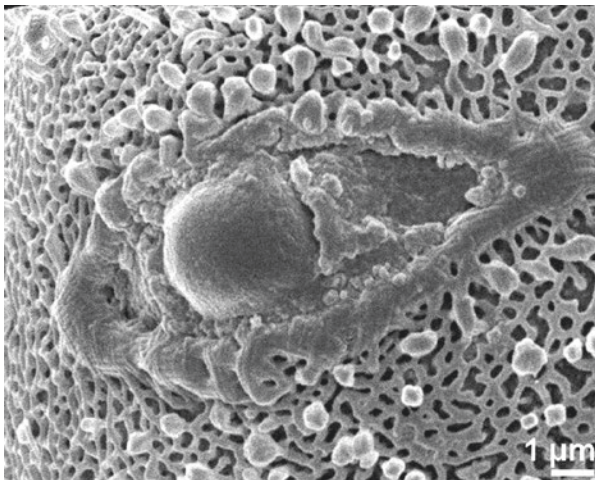
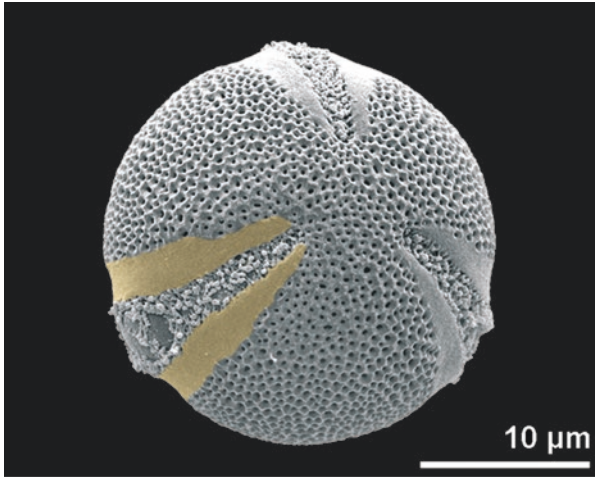
■ *Picea* sp., Pinaceae
 ■ equatorial view

■ *Pinus cembra*, Pinaceae
 ■ oblique equatorial view

■ *Pinus cembra*, Pinaceae
 ■ distal polar view

margo

exine area with different ornamentation bordering a colpus/colporus/sulcus



■ *Discocleidion rufescens*, Euphorbiaceae
margo (colored), tricolporate, polar view

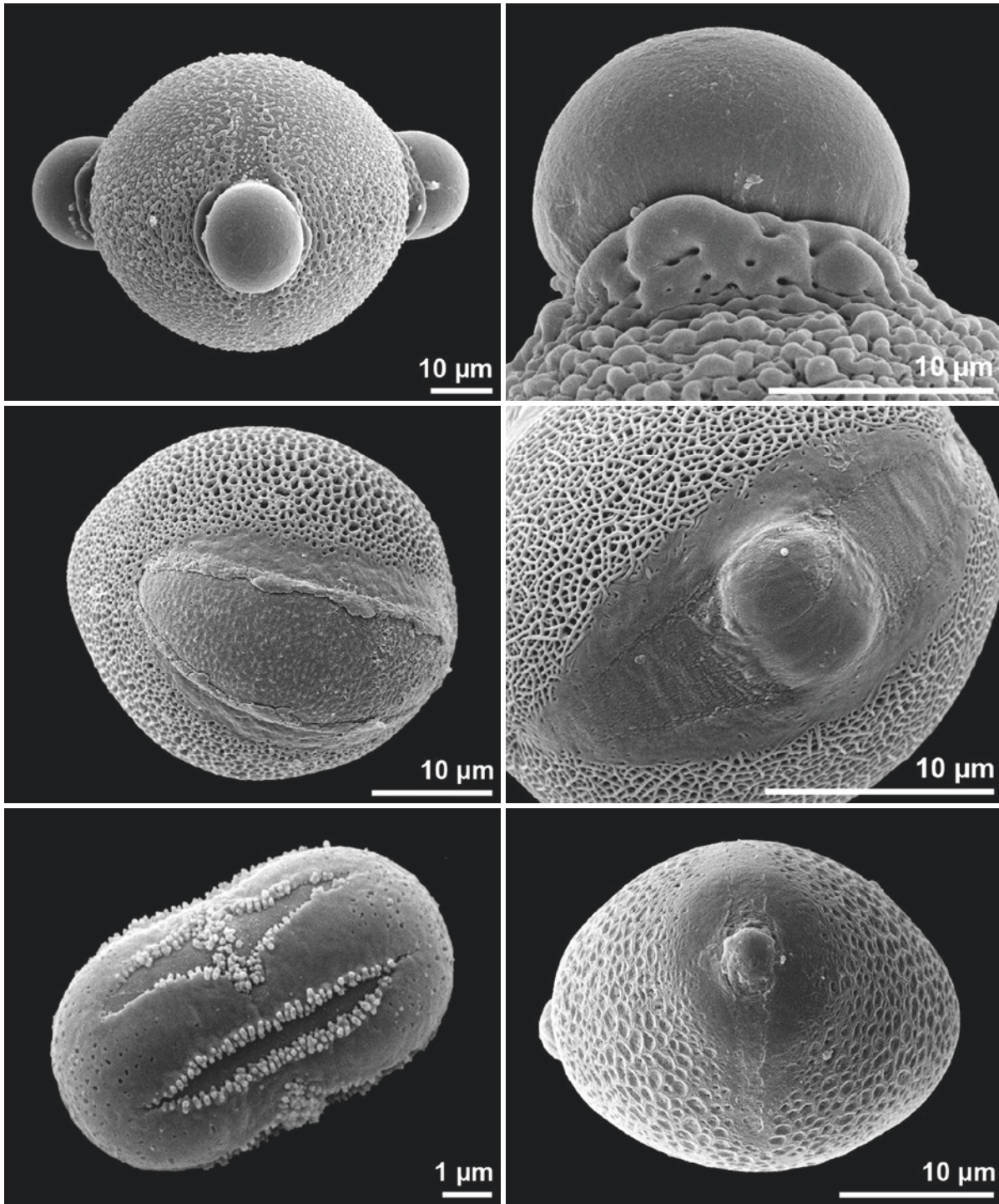
■ *Fatsia japonica*, Araliaceae
tricolporate

■ *Lysimachia vulgaris*, Primulaceae
tricolporate

■ *Euphorbia peplus*, Euphorbiaceae
tricolporate, polar view

■ *Begonia heracleifolia*, Begoniaceae
tricolporate, equatorial view

■ *Limnanthes douglasii*, Limnanthaceae
ring-like aperture, equatorial view



■ *Merinthopodium neuranthum*, Solanaceae
 ■ tricolporate, equatorial view

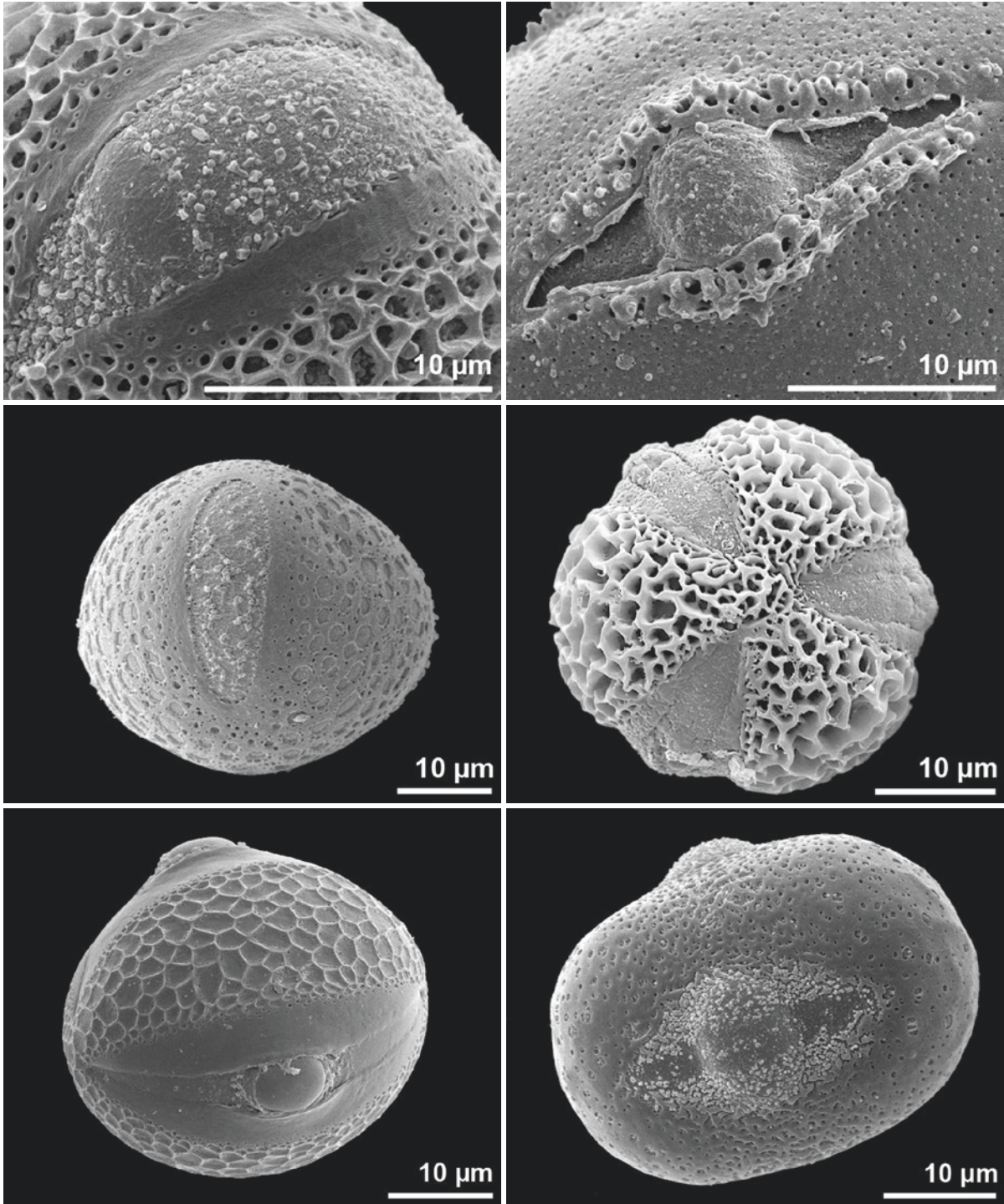
■ *Butomus umbellatus*, Butomaceae
 ■ sulcate, distal polar view

■ *Omphalodes verna*, Boraginaceae
 ■ heteroaperturate, equatorial view

■ *Merinthopodium neuranthum*, Solanaceae
 ■ close-up

■ *Blumenbachia hieronymi*, Loasaceae
 ■ tricolporate

■ *Rhamnus cathartica*, Rhamnaceae
 ■ tricolporate, equatorial view



■ *Salix retusa*, Salicaceae
tricolporate

■ *Nematanthus strigillosus*, Gesneriaceae
tricolporate, equatorial view

■ *Coris monspeliensis*, Primulaceae
tricolporate, equatorial view

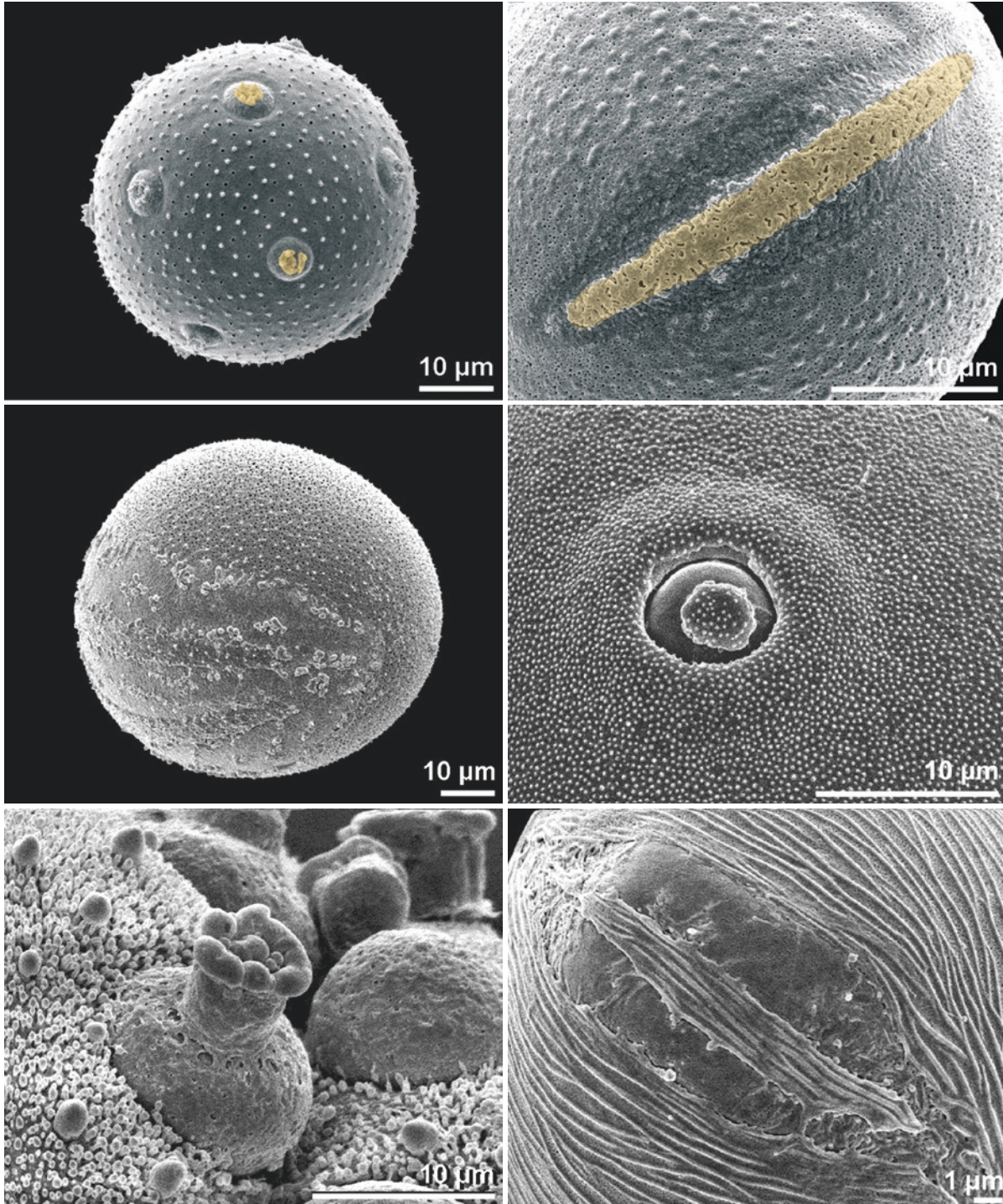
■ *Anchusa cretica*, Boraginaceae
tetraporate

■ *Fouquieria columnaris*, Fouquieriaceae
tricolporate, polar view

■ *Astragalus tragacantha*, Fabaceae
tricolporate, equatorial view

operculum/operculate

distinctly delimited exine structure covering an aperture



■ *Dianthus carthusianorum*, Caryophyllaceae
pantoporate, opercula (colored)

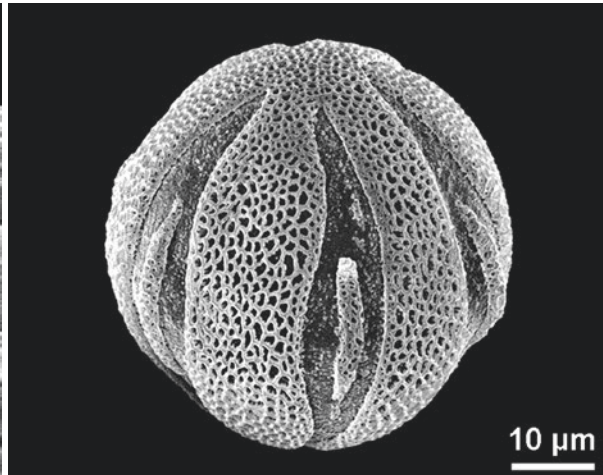
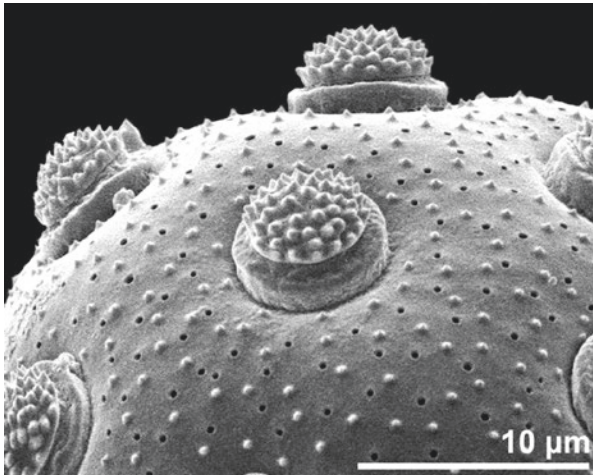
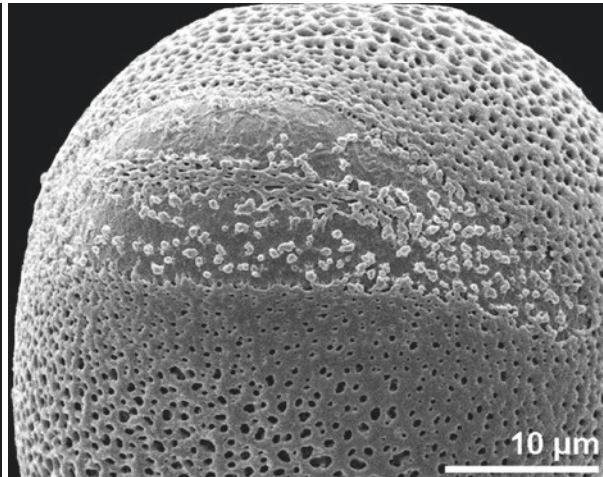
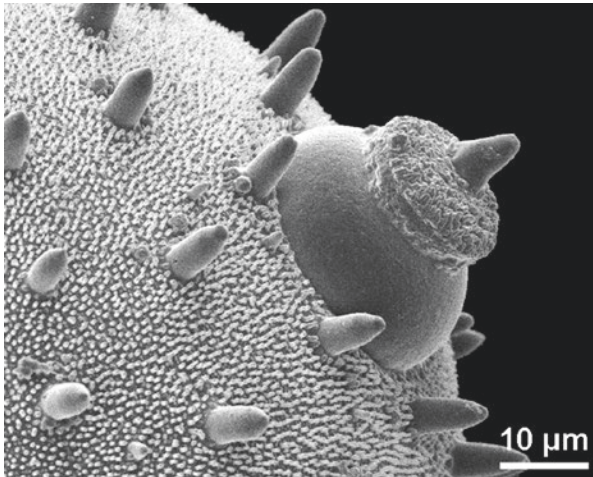
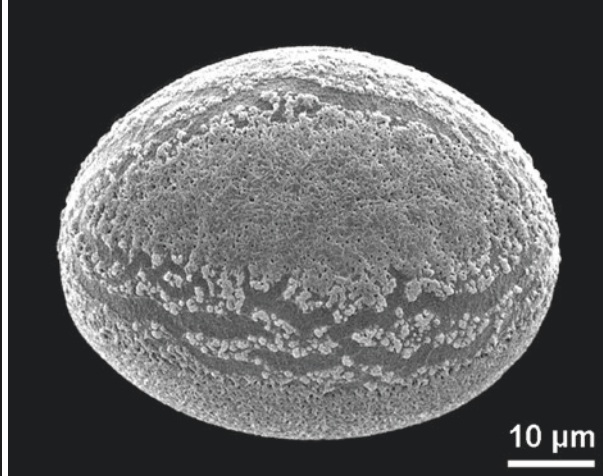
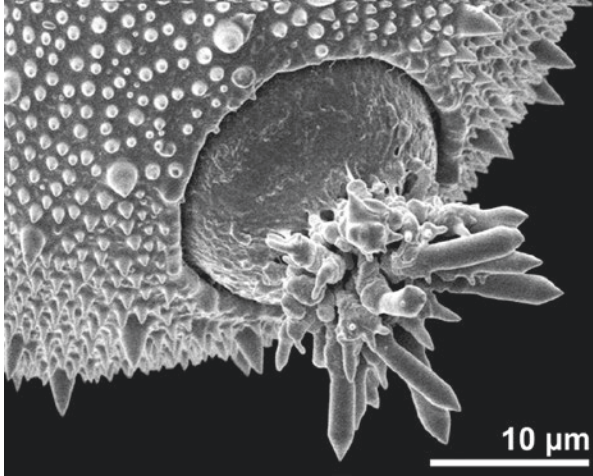
■ *Babiana ecklonii*, Iridaceae
sulcate, two opercula, oblique equatorial view

■ *Dionaea muscipula*, Droseraceae
tetrad, stephanoporate, operculum plug-like

■ *Teucrium pyrenaicum*, Lamiaceae
colpus, operculum (colored)

■ *Zea mays*, Poaceae
ulcerate

■ *Potentilla incana*, Rosaceae
colporus



■ *Knautia drymeia*, Caprifoliaceae
porus, operculum crystal-like

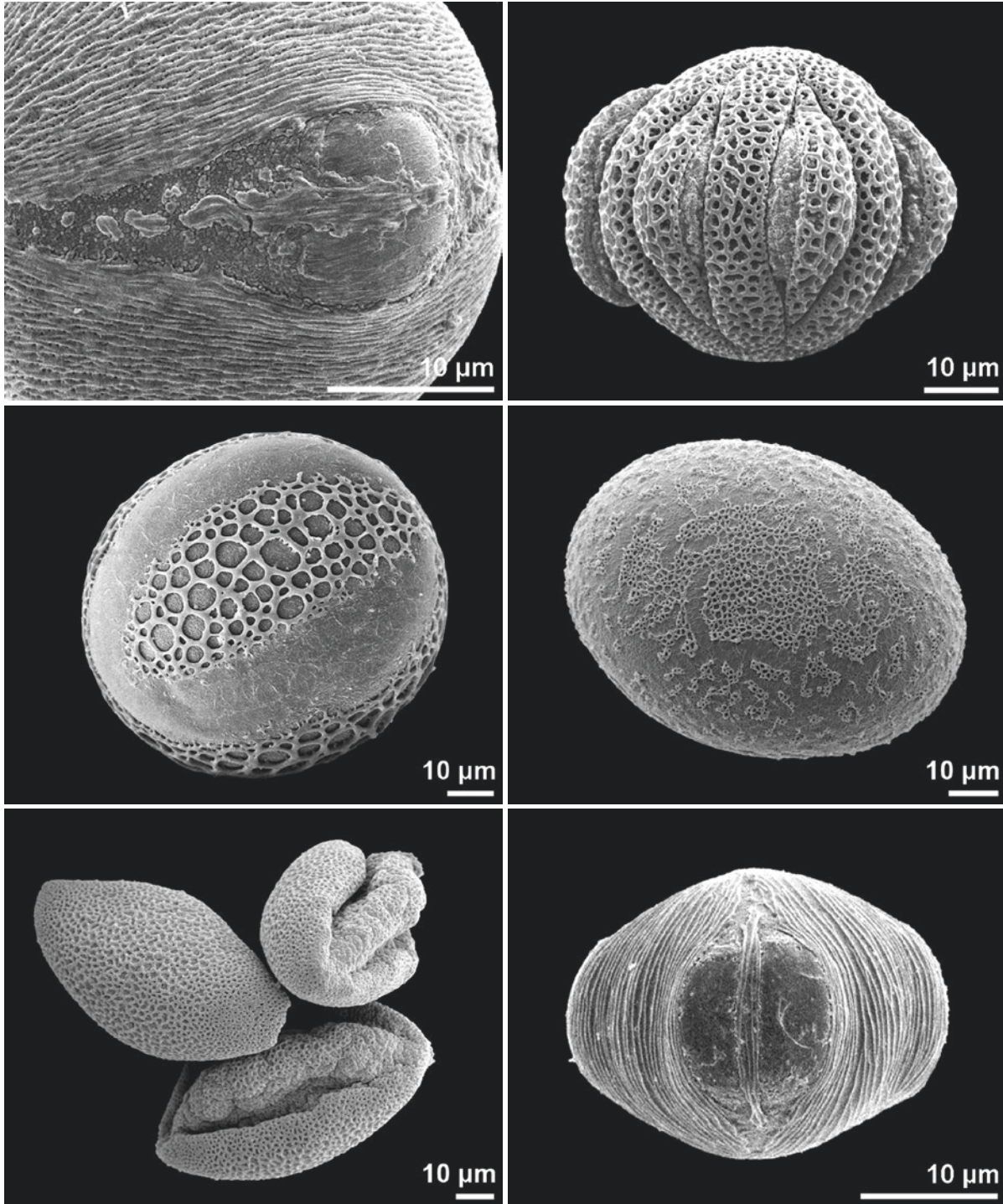
■ *Tulipa sylvestris*, Liliaceae
sulcate, distal polar view

■ *Cucurbita pepo*, Cucurbitaceae
porus

■ *Camellia japonica*, Theaceae
colporus

■ *Agrostemma githago*, Caryophyllaceae
pantoporate

■ *Passiflora citrina*, Passifloraceae
stephanocolpate, oblique equatorial view



■ *Rosa pendulina*, Rosaceae
colporus

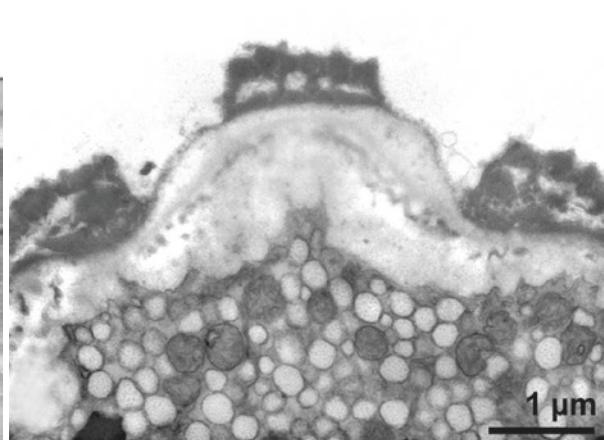
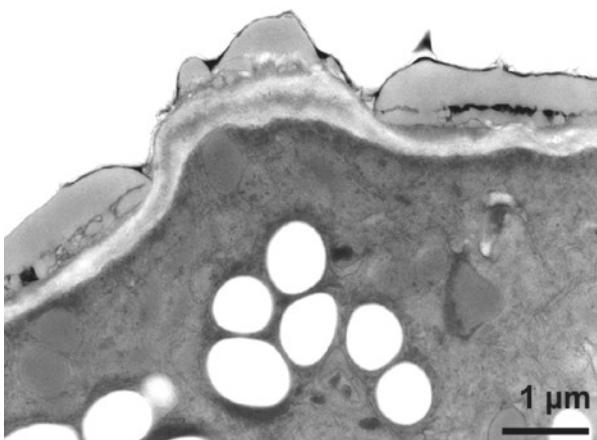
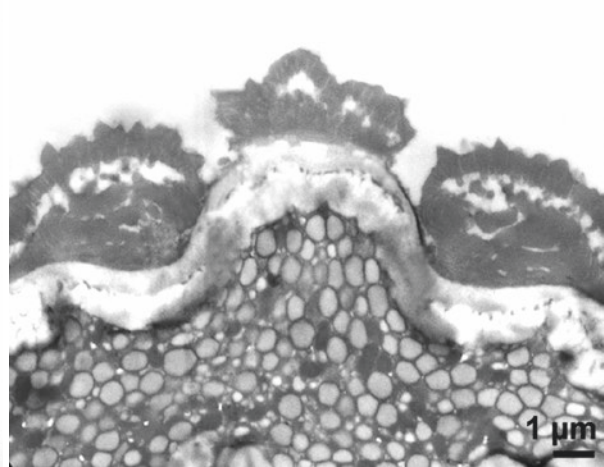
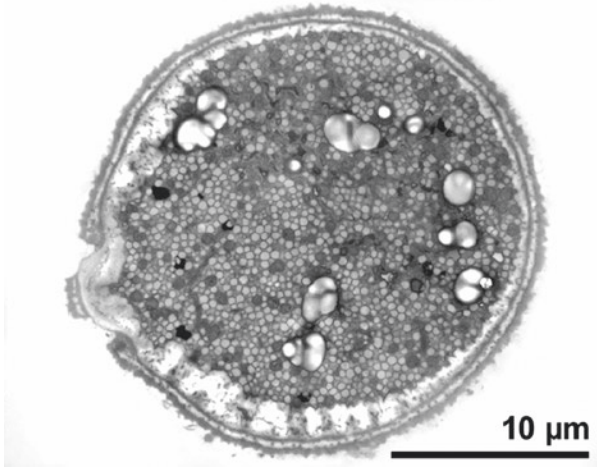
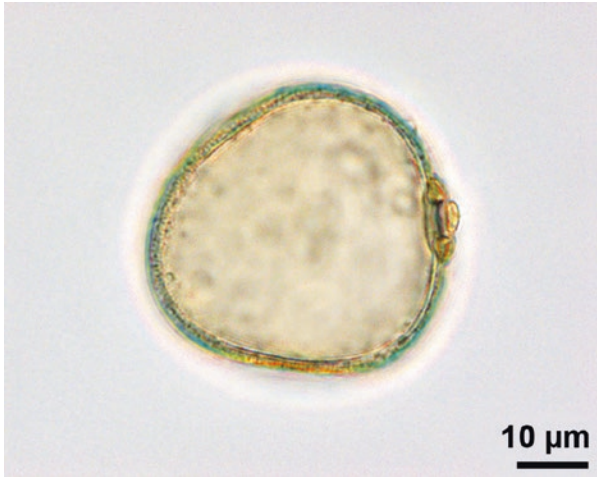
■ *Agave asperrima*, Asparagaceae
sulcate, distal polar view

■ *Erythronium dens-canis*, Liliaceae
sulcate, dry pollen

■ *Passiflora suberosa*, Passifloraceae
stephanocolpate, equatorial view

■ *Erythronium dens-canis*, Liliaceae
sulcate, distal polar view

■ *Potentilla erecta*, Rosaceae
tricolporate, equatorial view



■ *Avena sativa*, Poaceae
ulcerate, equatorial view

■ *Poa pratensis*, Poaceae
cross section

■ *Plantago lanceolata*, Plantaginaceae
cross section of aperture

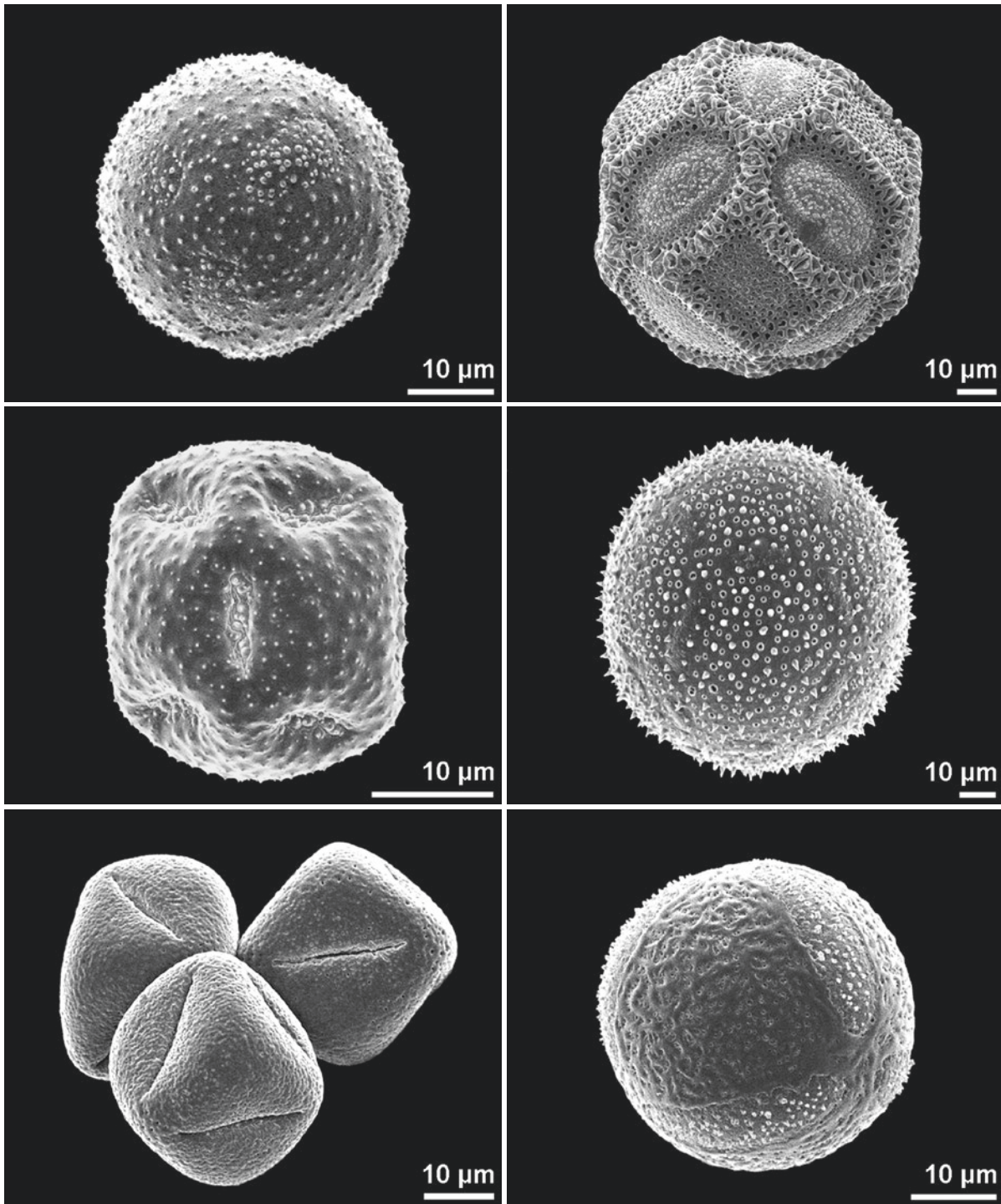
■ *Gladiolus illyricus*, Iridaceae
sulcate, two opercula, distal polar view

■ *Triticum aestivum*, Poaceae
cross section of aperture

■ *Poa angustifolia*, Poaceae
cross section of aperture

pantoaperturate, pantocolpate

pollen grain with apertures distributed more or less regularly over the surface



■ *Anemone transsilvanica*, Ranunculaceae

■ *Ranunculus lanuginosus*, Ranunculaceae
dry pollen

■ *Sideritis syriaca*, Lamiaceae
hexacolpate, dry pollen

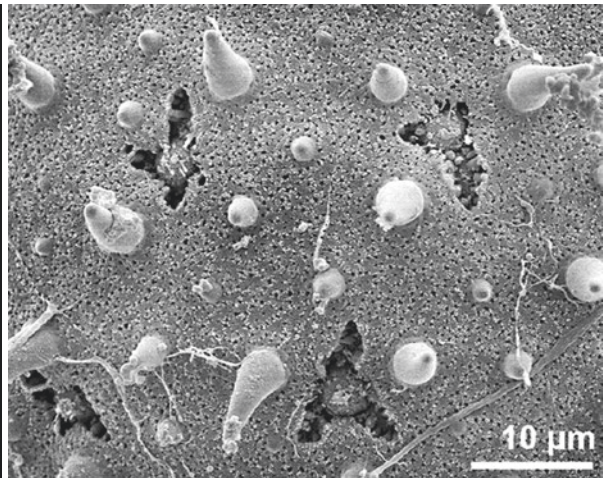
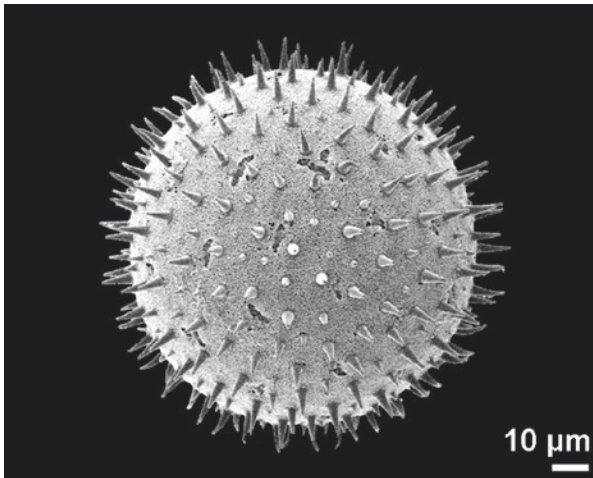
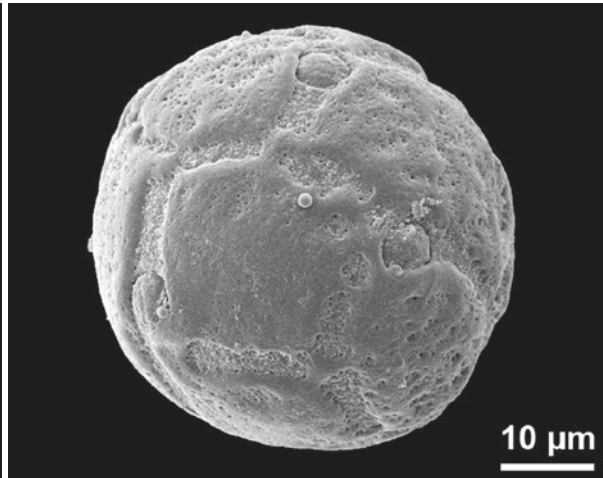
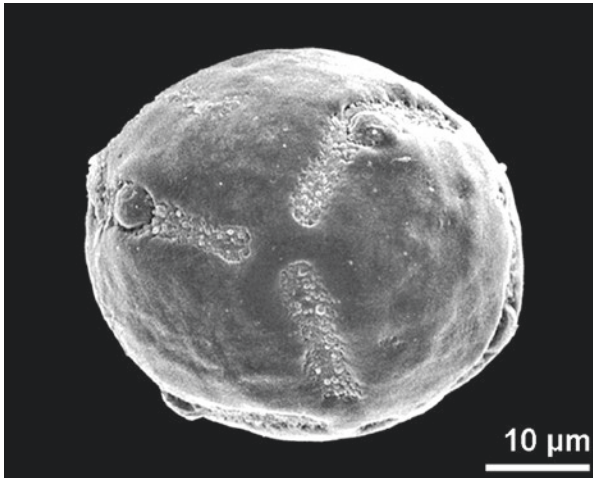
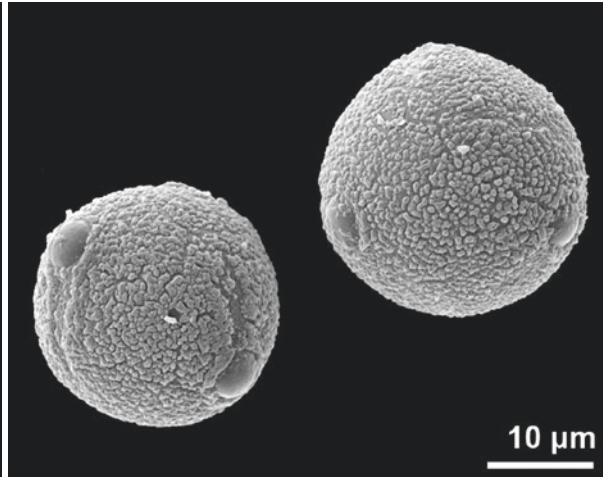
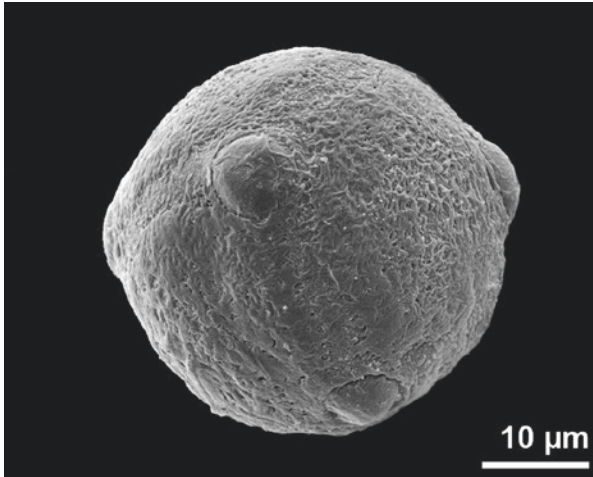
■ *Opuntia basilaris*, Cactaceae

■ *Portulaca grandiflora*, Portulacaceae

■ *Corydalis cava*, Papaveraceae
hexacolpate

pantoaperturate, pantocolporate, pantoporate

pantocolporate, pantoporate



■ *Stigmaphyllon lindenianum*, Malpighiaceae
pantocolporate

■ *Tristellateia australasiae*, Malpighiaceae
pantocolporate

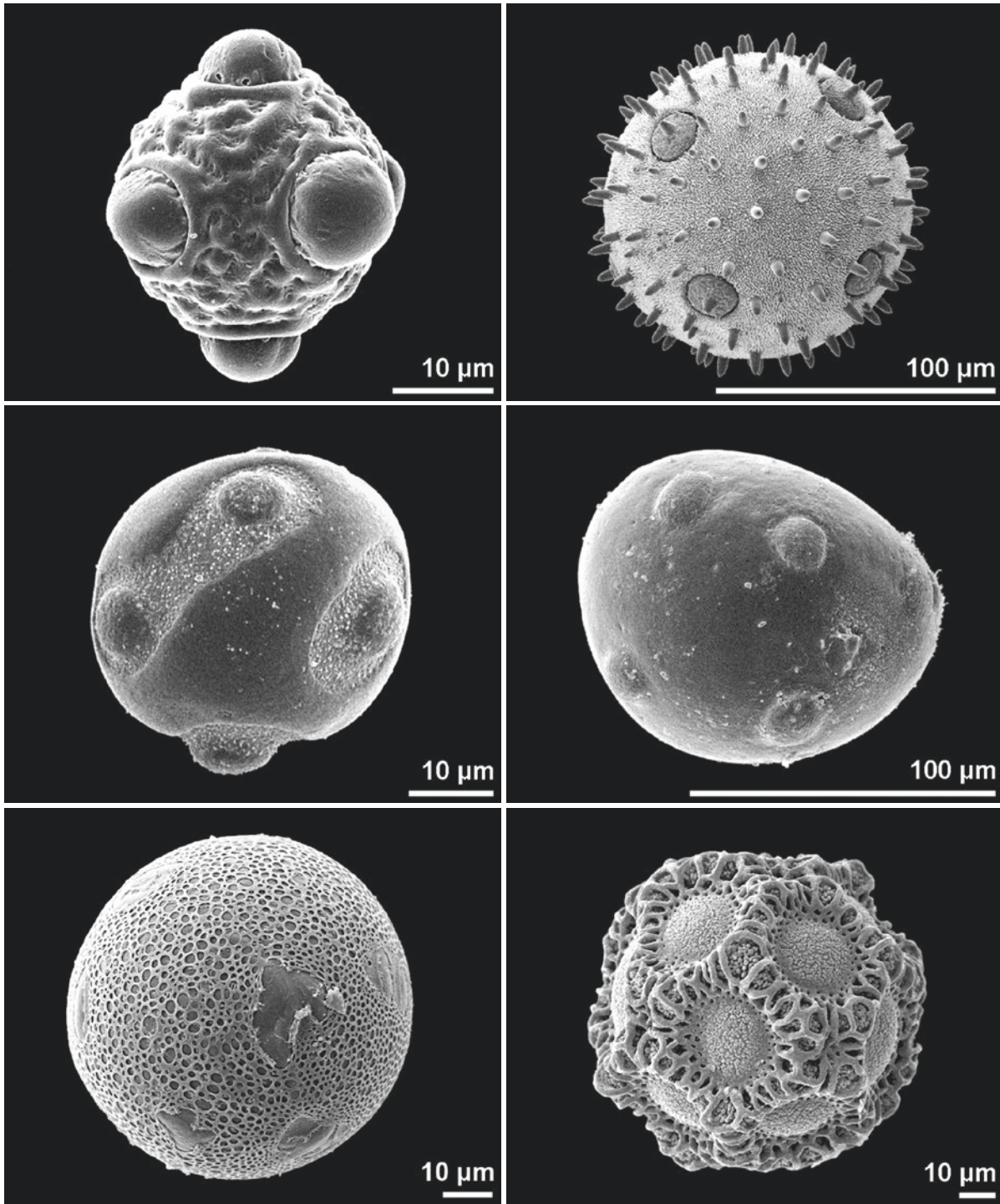
■ *Banisteria muricata*, Malpighiaceae
pantocolporate

■ *Malpighia glabra*, Malpighiaceae
pantocolporate

■ *Malva moschata*, Malvaceae
pantoporate, exine ruptured around pori

■ *Malva alcea*, Malvaceae
pantoporate, exine ruptured around pori

pantoaperturate, pantoporate



■ *Fumaria officinalis*, Papaveraceae

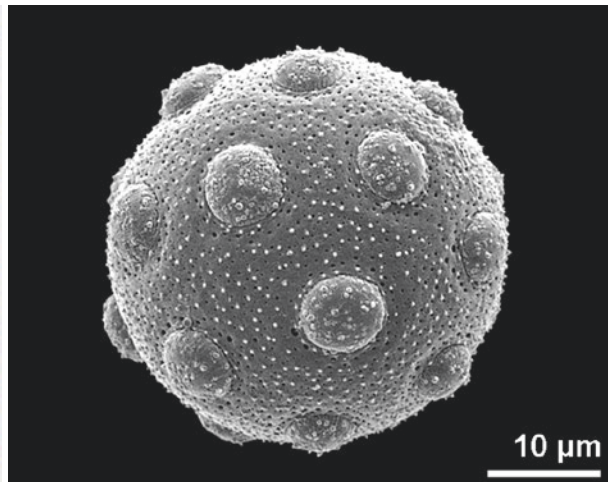
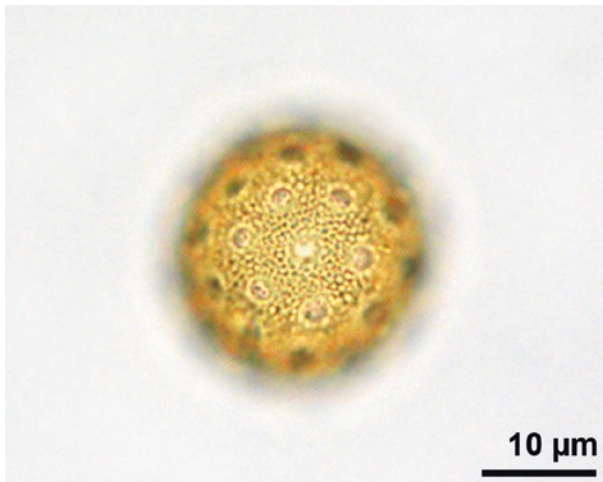
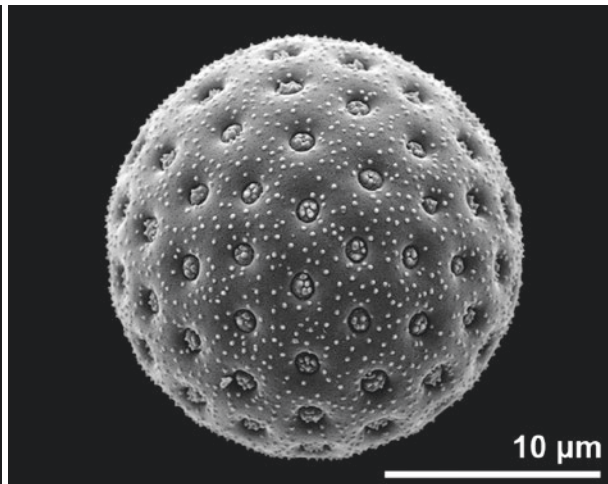
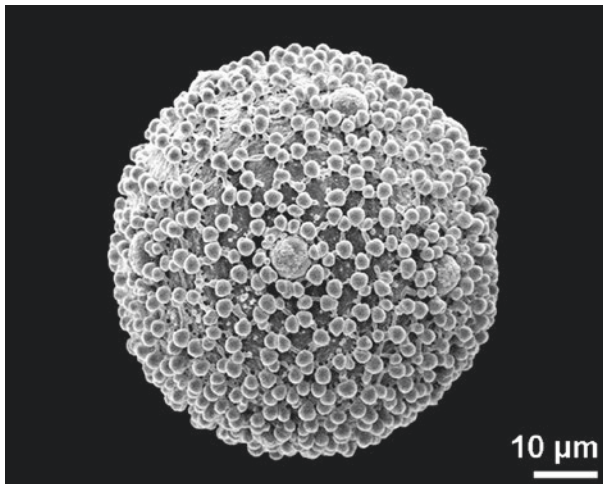
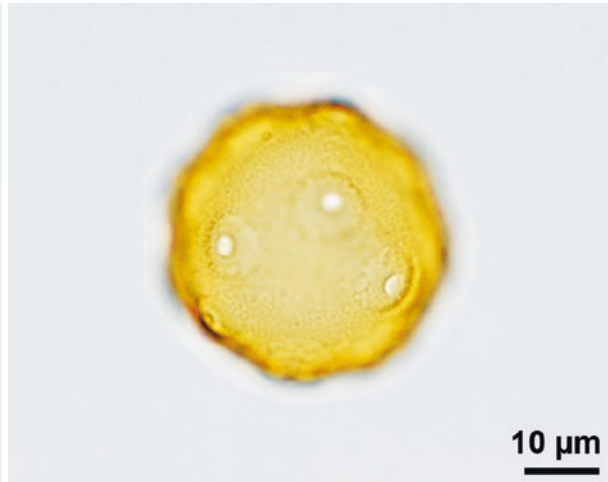
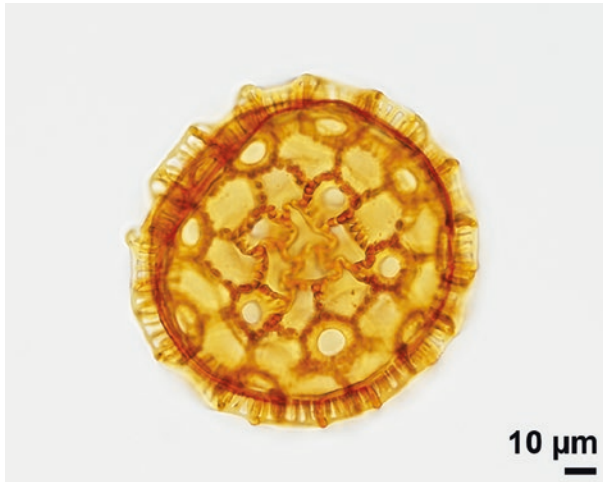
■ *Ribes aureum*, Grossulariaceae

■ *Amphitecna macrophylla*, Bignoniaceae

■ *Cucurbita pepo*, Cucurbitaceae

■ *Costus barbatus*, Zingiberaceae

■ *Opuntia phaeacantha*, Cactaceae



■ ■ *Cobaea scandens*, Polemoniaceae

■ ■ *Phaleria capitata*, Thymelaeaceae

■ ■ *Atriplex patula*, Amaranthaceae

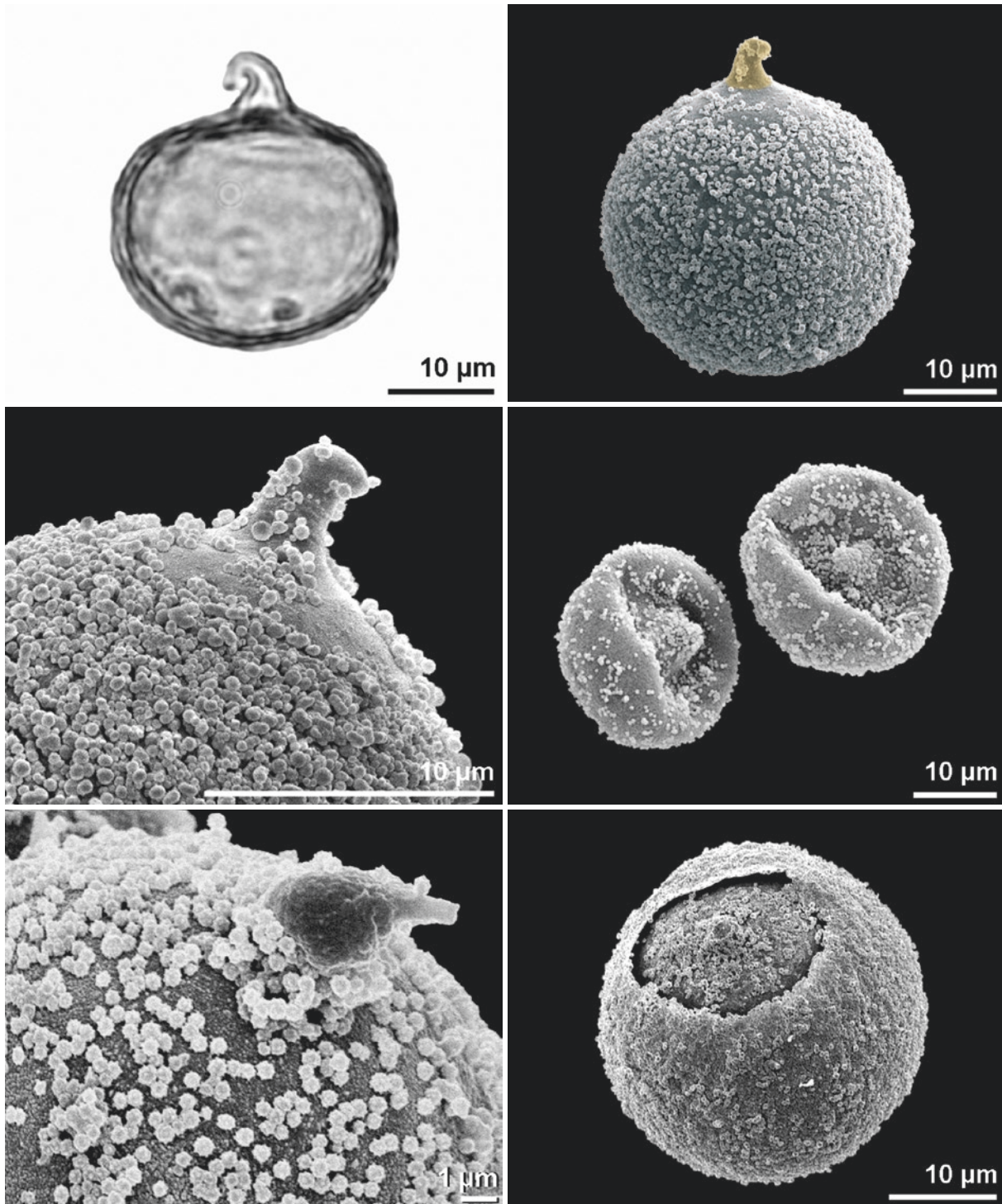
■ ■ *Juglans* sp., Juglandaceae
polar view

■ ■ *Dysphania ambrosioides*, Amaranthaceae

■ ■ *Stellaria graminea*, Caryophyllaceae

papilla

small protuberance typical for Taxodioideae pollen located distally



■ *Cryptomeria* sp., Cupressaceae
fossil, middle Miocene, Austria, equatorial view

■ *Cryptomeria japonica*, Cupressaceae

■ *Metasequoia glyptostroboides*, Cupressaceae

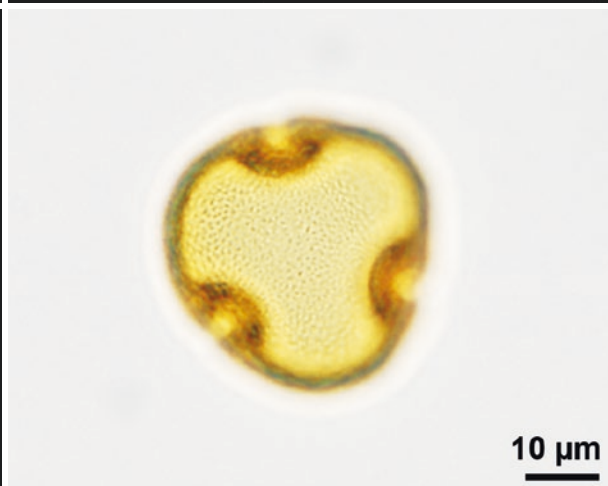
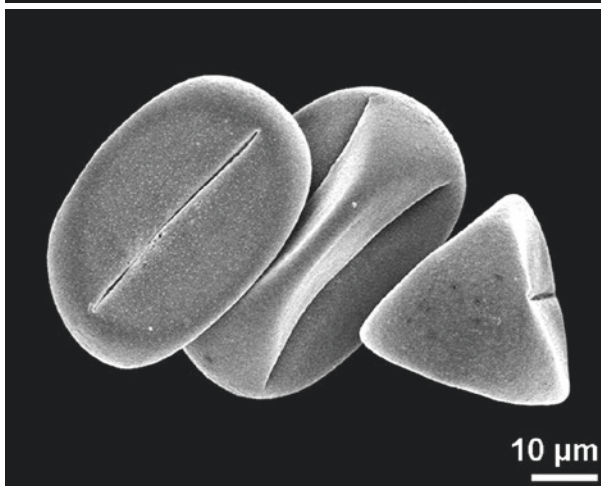
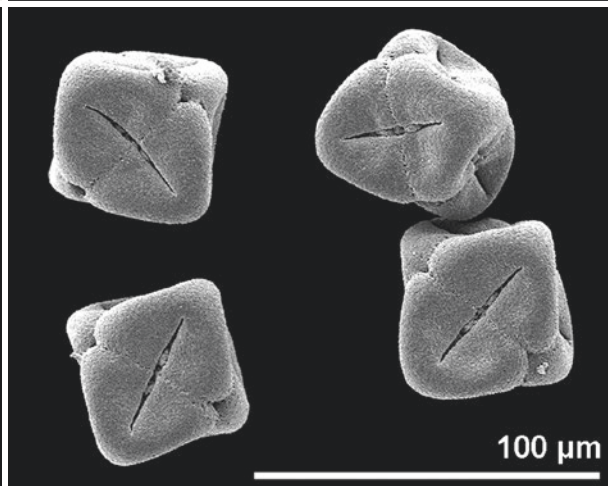
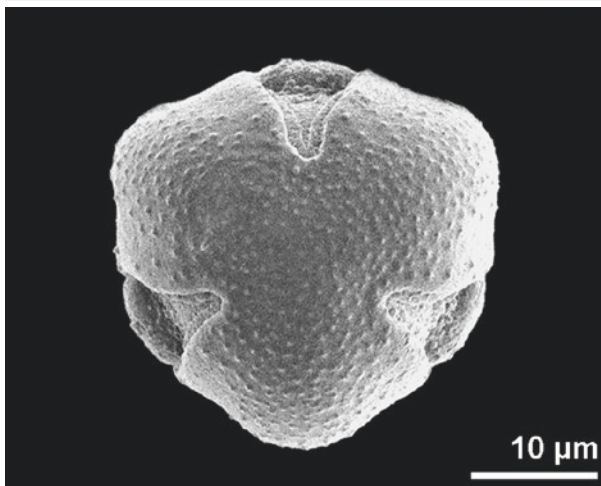
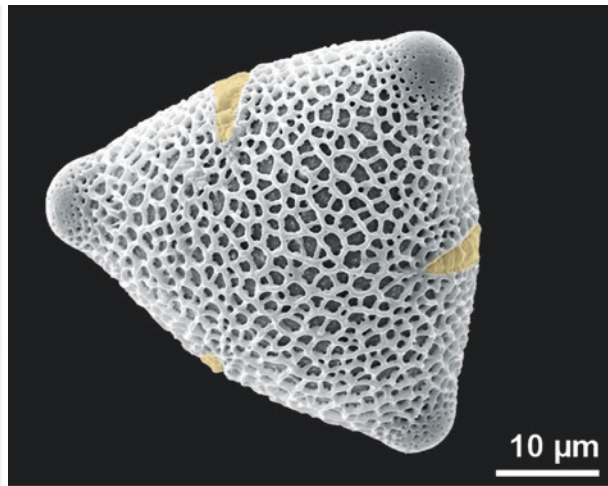
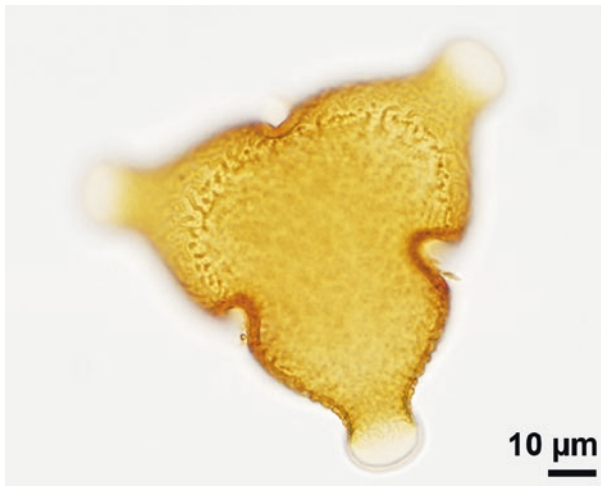
■ *Cryptomeria japonica*, Cupressaceae
papilla colored, equatorial view

■ *Metasequoia glyptostroboides*, Cupressaceae
dry pollen

■ *Cunninghamia lanceolata*, Cupressaceae
oblique distal polar view

planaperturate

pollen grain with an angular outline, where the apertures are situated between the angles



■ *Pachira sessilis*, Malvaceae
 ■ tricolpate, polar view

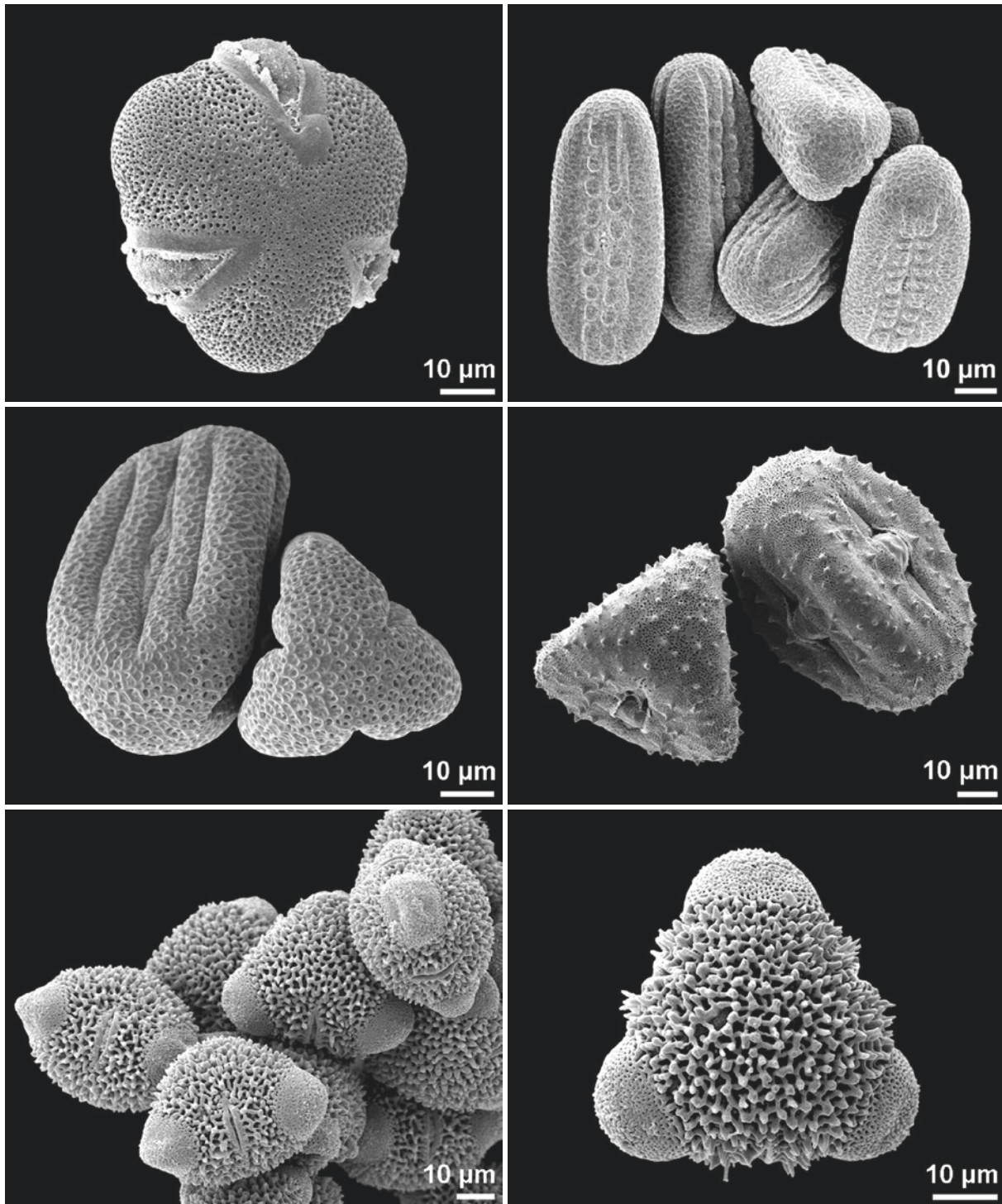
■ *Centaurea segetum*, Asteraceae
 ■ polar view

■ *Persicaria bistorta*, Polygonaceae
 ■ tricolporate, dry pollen

■ *Pachira quinata*, Malvaceae
 ■ tricolpate, apertures colored, polar view

■ *Arbutus unedo*, Ericaceae
 ■ tricolporate, tetrads, dry pollen

■ *Tilia platyphyllos*, Malvaceae
 ■ polar view



■ ■ *Euphorbia tithymaloides*, Euphorbiaceae
tricolporate, polar view

■ ■ *Schaueria flavicomis*, Acanthaceae
tricolporate

■ ■ *Pachira aquatica*, Malvaceae
tricolporate

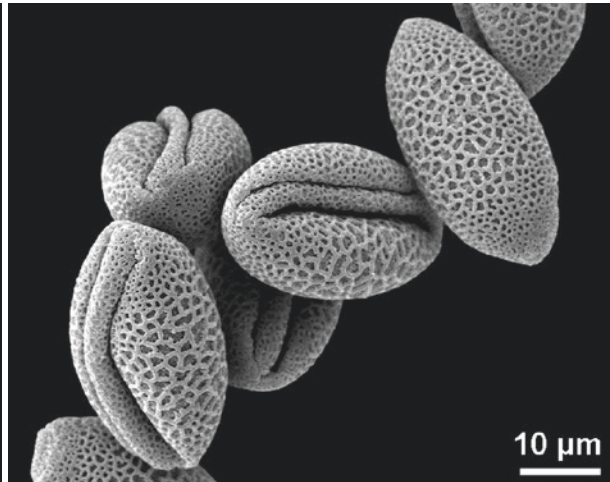
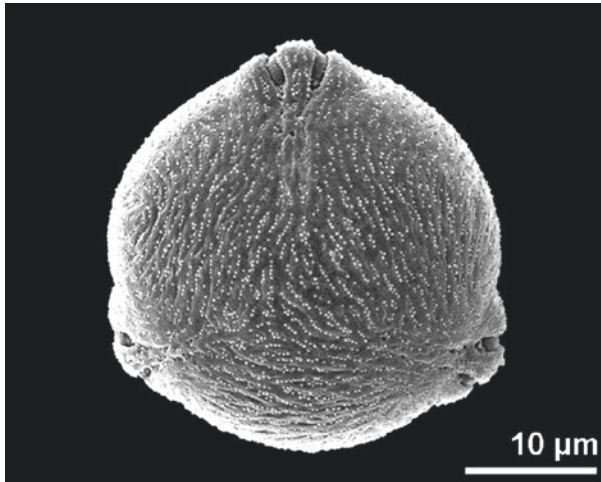
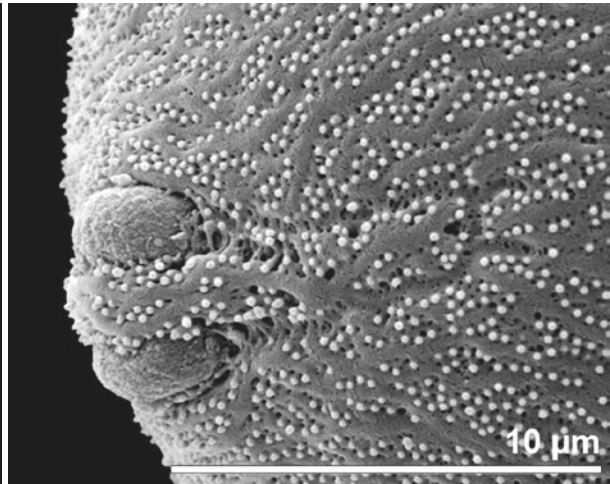
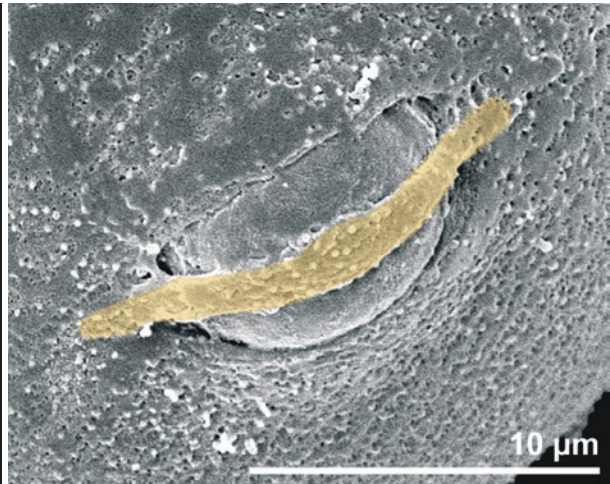
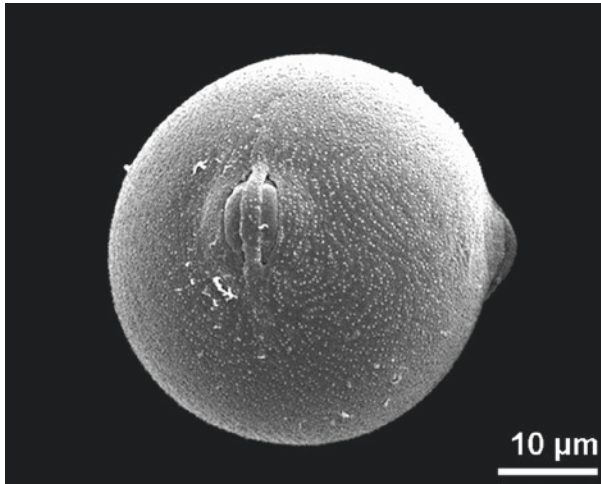
■ ■ *Justicia brandegeana*, Acanthaceae
tricolporate, dry pollen

■ ■ *Echinops exaltatus*, Asteraceae
tricolporate

■ ■ *Pachira aquatica*, Malvaceae
tricolporate, polar view

pontoperculum/pontoperculate

elongated operculum linked to the ends of the aperture



■ ■ *Sanguisorba cretica*, Rosaceae
tricolporate, equatorial view

■ ■ *Sanguisorba cretica*, Rosaceae
pontoperculum colored, close-up

■ ■ *Sarcopoterium spinosum*, Rosaceae
tricolporate, equatorial view

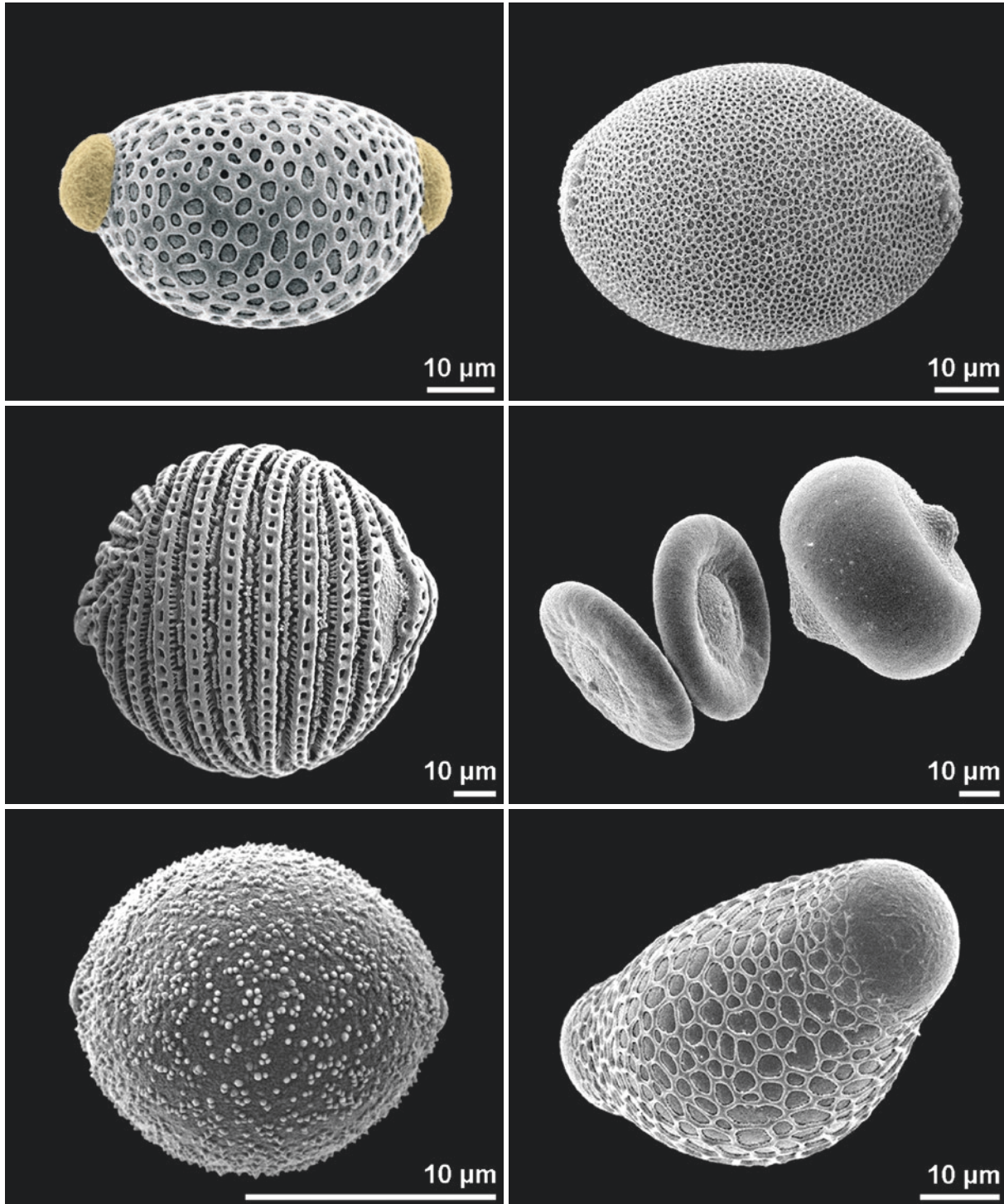
■ ■ *Sarcopoterium spinosum*, Rosaceae
close-up

■ ■ *Sanguisorba minor*, Rosaceae
tricolporate, polar view

■ ■ *Veratrum nigrum*, Melanthiaceae
sulcate, dry pollen

porus/porate, diporate

porus: more or less circular aperture; pori located at the equator or regularly spread over the pollen grain
 diporate: pollen grains with two pori



■ ■ *Aechmea allenii*, Bromeliaceae
 equatorial view, pori colored

■ ■ *Sanchezia nobilis*, Acanthaceae

■ ■ *Broussonetia papyrifera*, Moraceae
 equatorial view

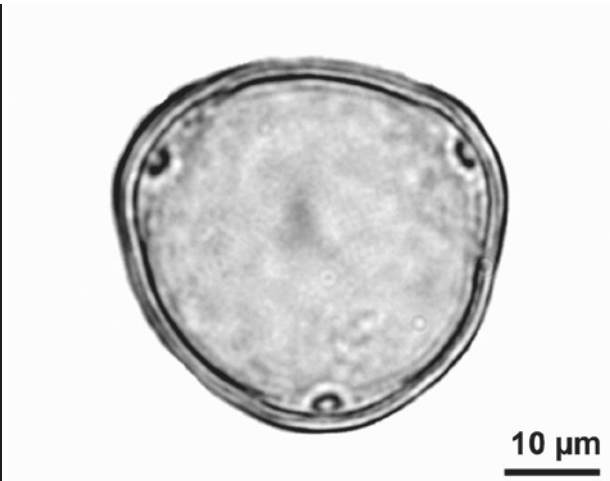
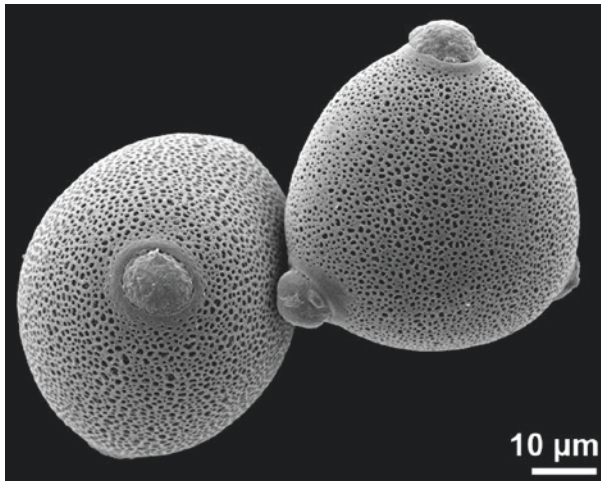
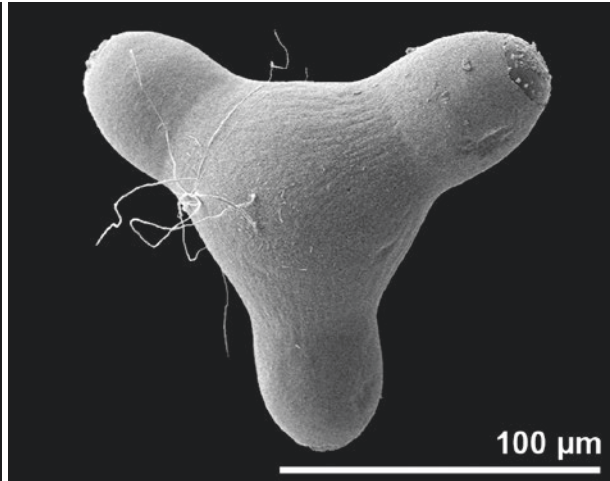
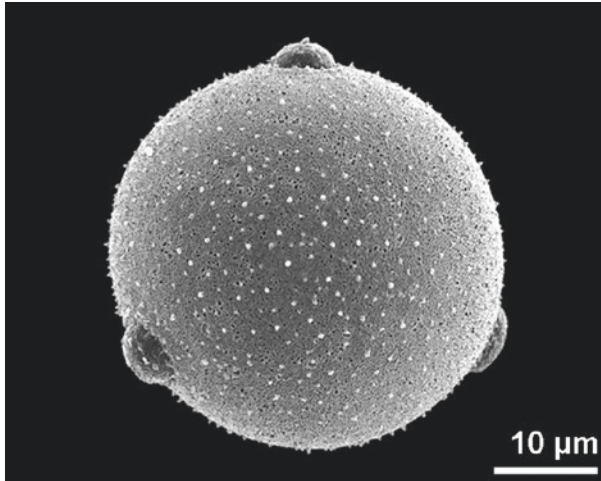
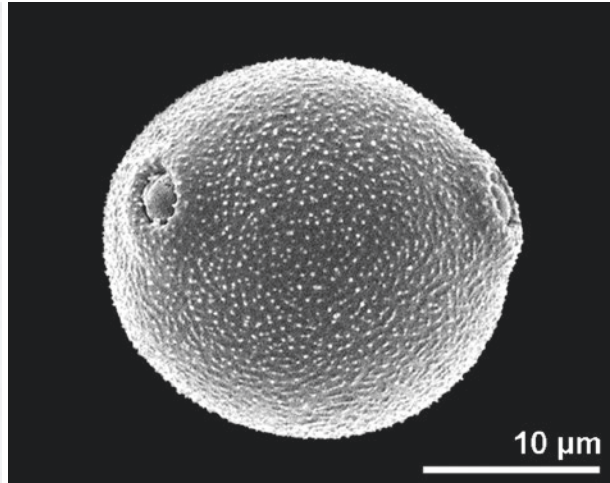
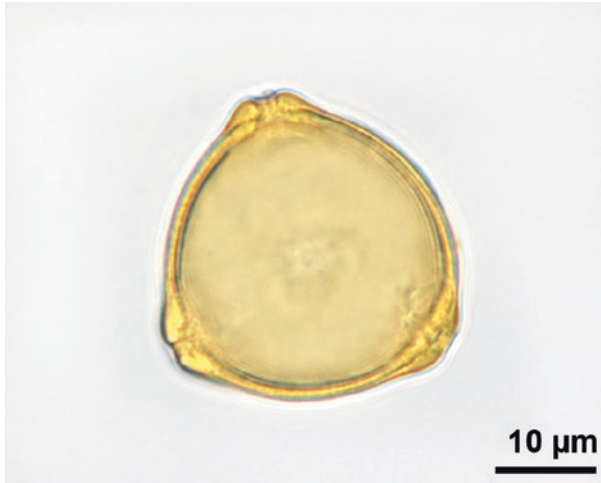
■ ■ *Colchicum autumnale*, Colchicaceae

■ ■ *Whitfieldia lateritia*, Acanthaceae
 dry (left) and turgescent pollen (right)

■ ■ *Quesnelia lateralis*, Bromeliaceae
 equatorial view

porus/porate, triporate

triporate: pollen grain with three pori



■ *Betula humilis*, Betulaceae
polar view

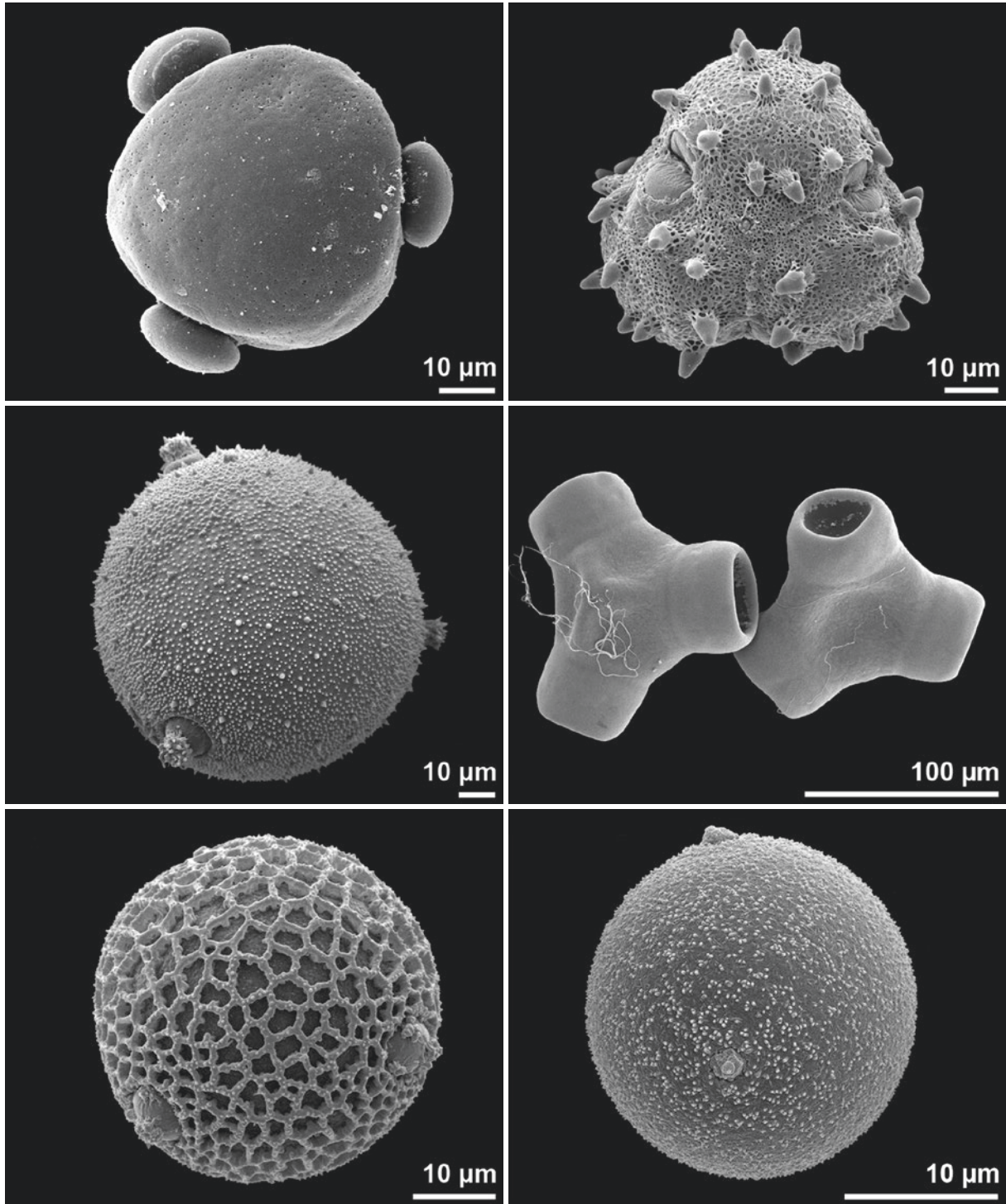
■ *Betula pendula*, Betulaceae
equatorial view

■ *Campanula saxatilis*, Campanulaceae
polar view

■ *Oenothera fruticosa*, Onagraceae
polar view, viscin threads

■ *Cucumis melo*, Cucurbitaceae

■ *Carya* sp., Juglandaceae
fossil, middle Miocene, Austria, polar view



■ *Amsonia ciliata*, Apocynaceae
 ■ polar view

■ *Knautia arvensis*, Caprifoliaceae
 ■ oblique polar view

■ *Cordia cylindrostachya*, Boraginaceae
 ■ oblique polar view

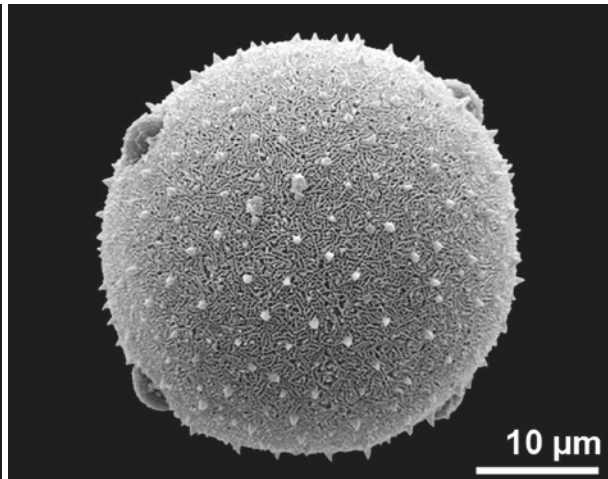
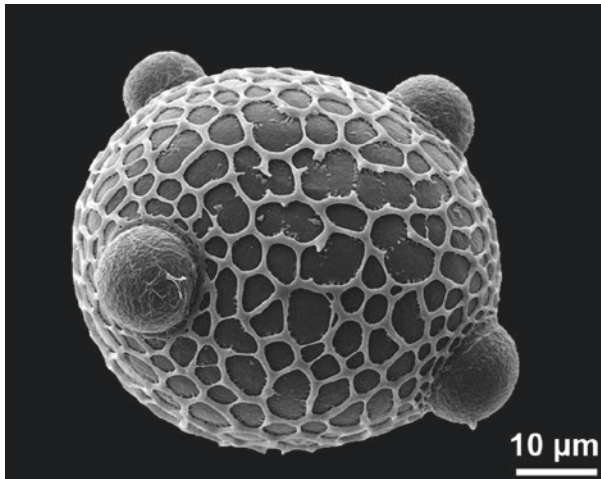
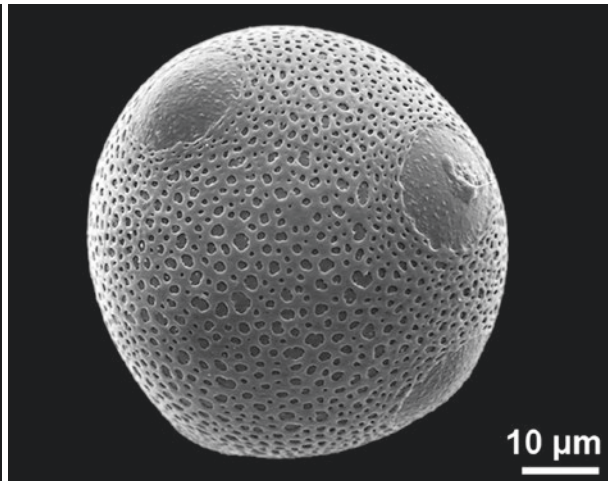
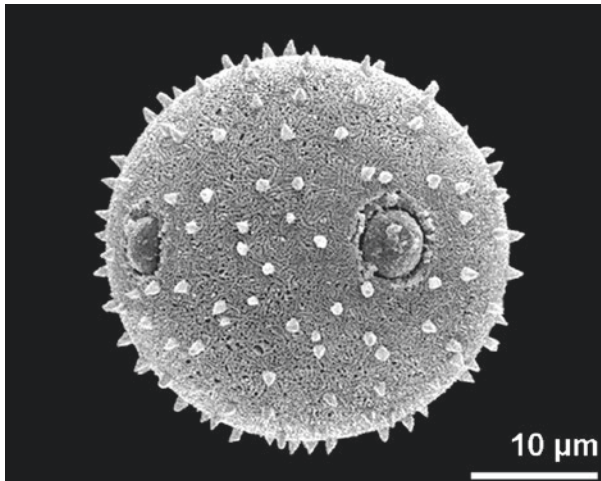
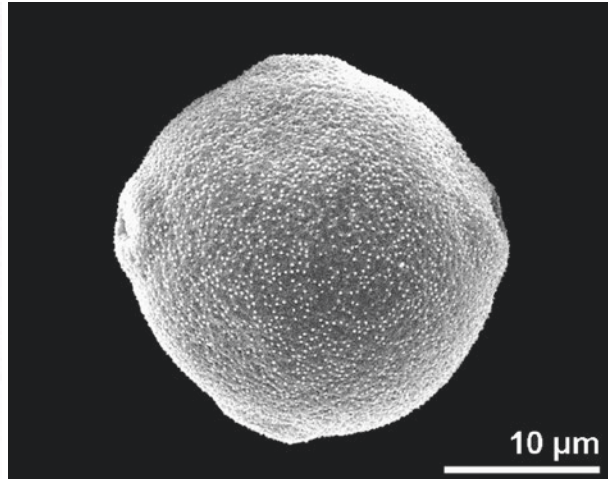
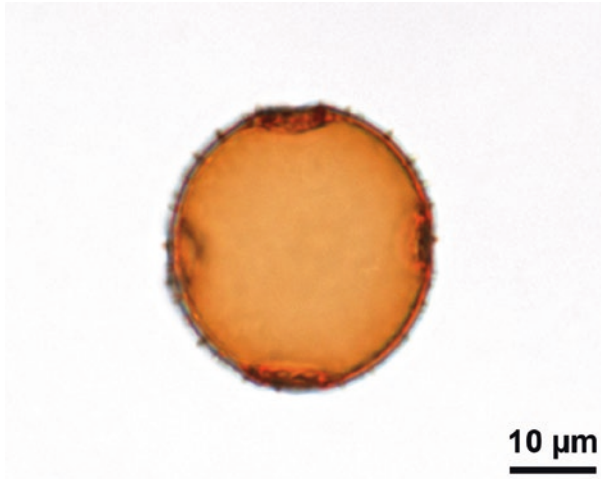
■ *Tetrapollinia caerulescens*, Gentianaceae
 ■ tetrad

■ *Clarkia unguiculata*, Onagraceae
 ■ dry pollen, viscin threads

■ *Maclura pomifera*, Moraceae
 ■ equatorial view

porus/porate, tetraporate

tetraporate: pollen grain with four pori



■ ■ *Phyteuma spicatum*, Campanulaceae
polar view

■ ■ *Myriophyllum spicatum*, Haloragaceae
polar view

■ ■ *Campanula alpina*, Campanulaceae
equatorial view

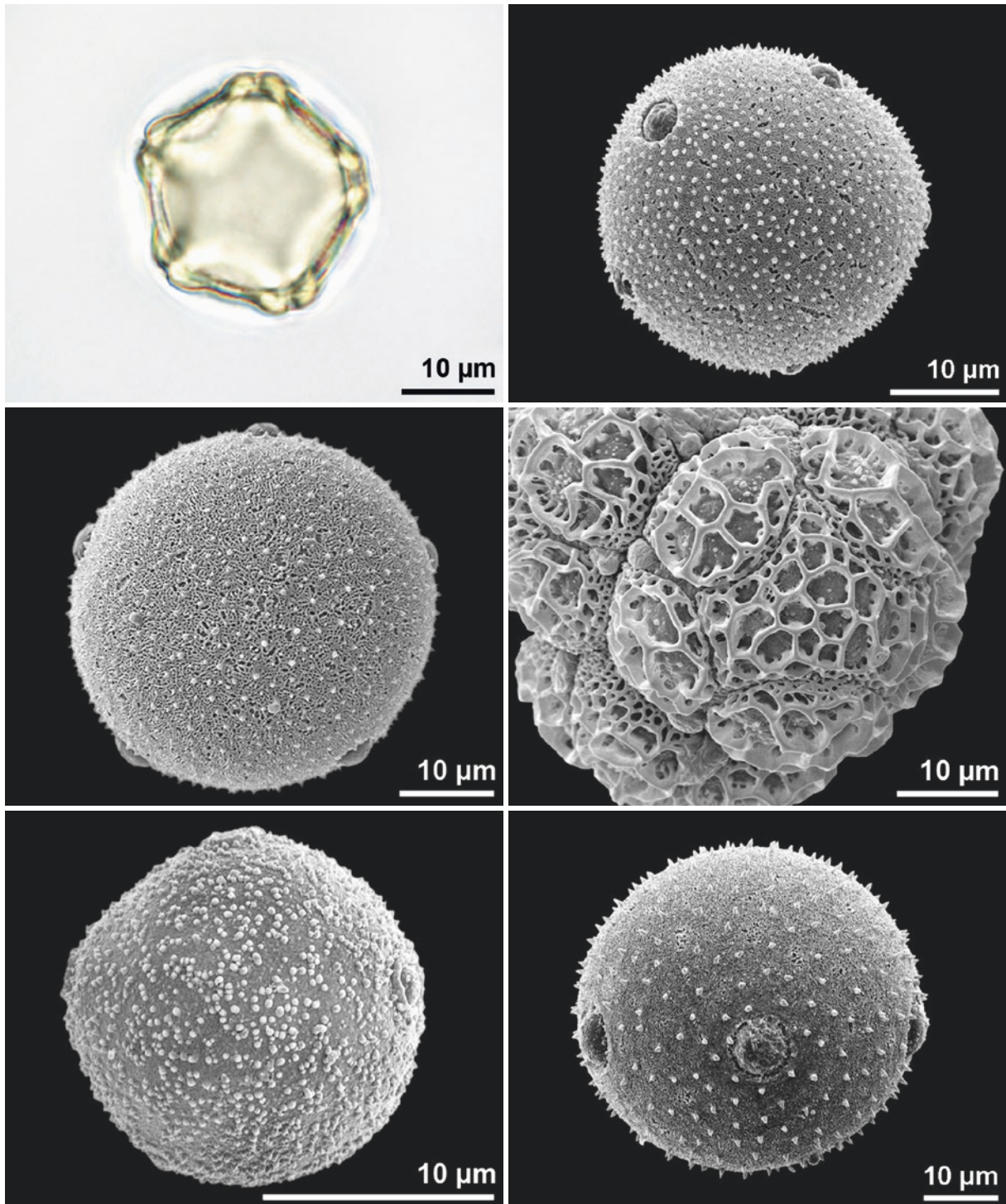
■ ■ *Aechmea fulgens*, Bromeliaceae

■ ■ *Aechmea tomentosa*, Bromeliaceae

■ ■ *Asyneuma canescens*, Campanulaceae
polar view

porus/porate, pentaporate

pentaporate: pollen grain with five pori



■ ■ *Alnus glutinosa*, Betulaceae
polar view

■ ■ *Campanula garganica*, Campanulaceae
polar view

■ ■ *Elatostema ambiguum*, Urticaceae
polar view

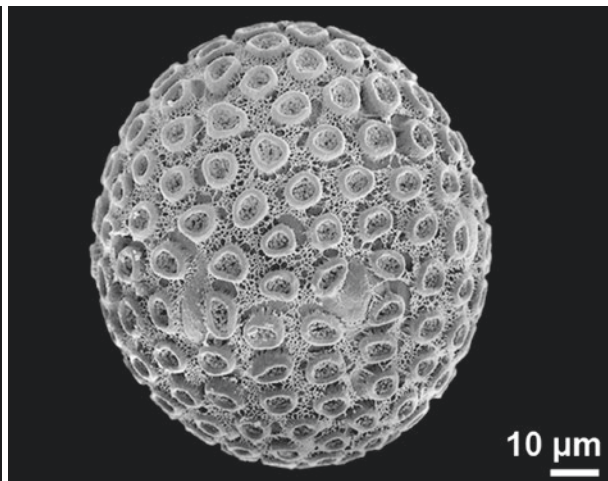
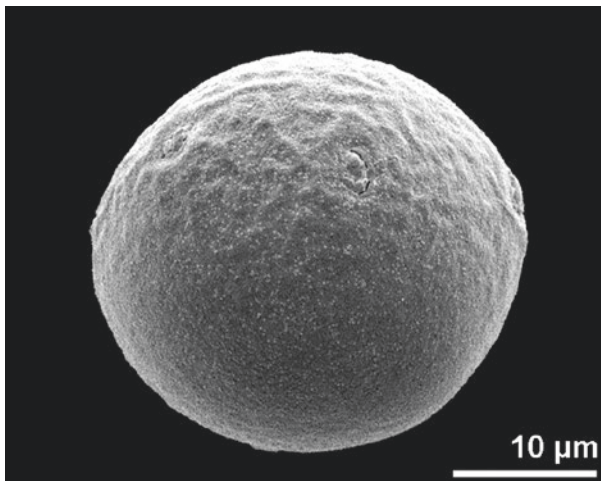
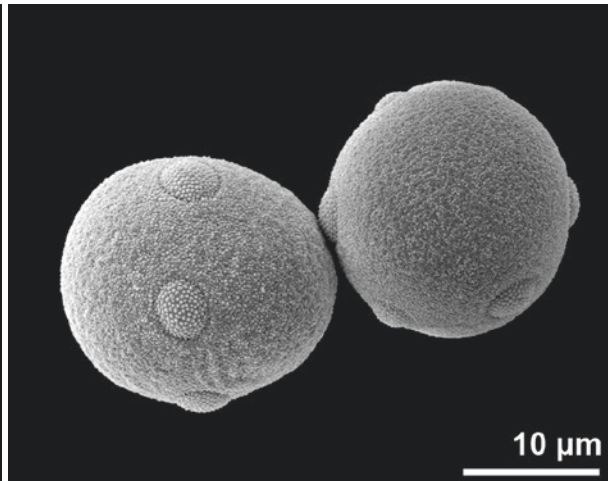
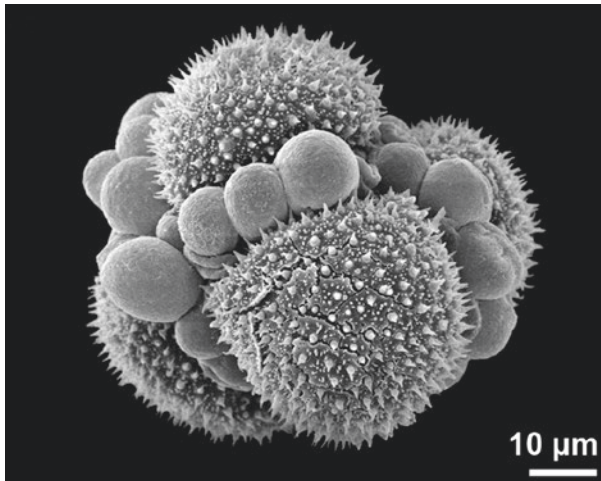
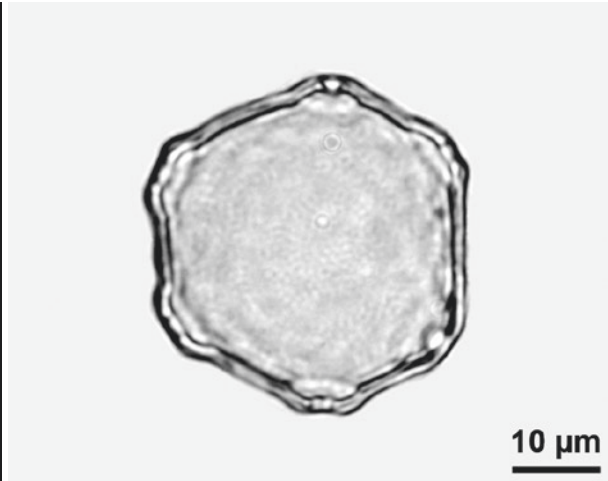
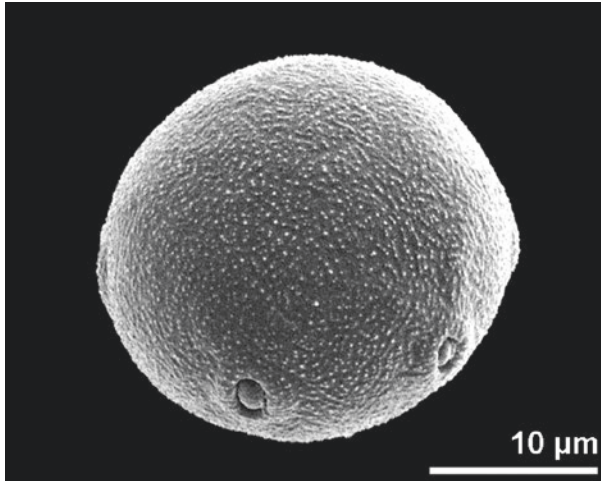
■ ■ *Legousia speculum-veneris*, Campanulaceae
polar view

■ ■ *Irlbachia pendula*, Gentianaceae
tetrad

■ ■ *Campanula rapunculoides*, Campanulaceae
equatorial view

porus/porate, stephanoporate

stephanoporate: pori situated at the equator (term usually used for six or more apertures)



■ ■ *Alnus viridis*, Betulaceae
oblique polar view

■ ■ *Drosera kansaiensis*, Droseraceae
tetrad

■ ■ *Ulmus minor*, Ulmaceae
oblique equatorial view

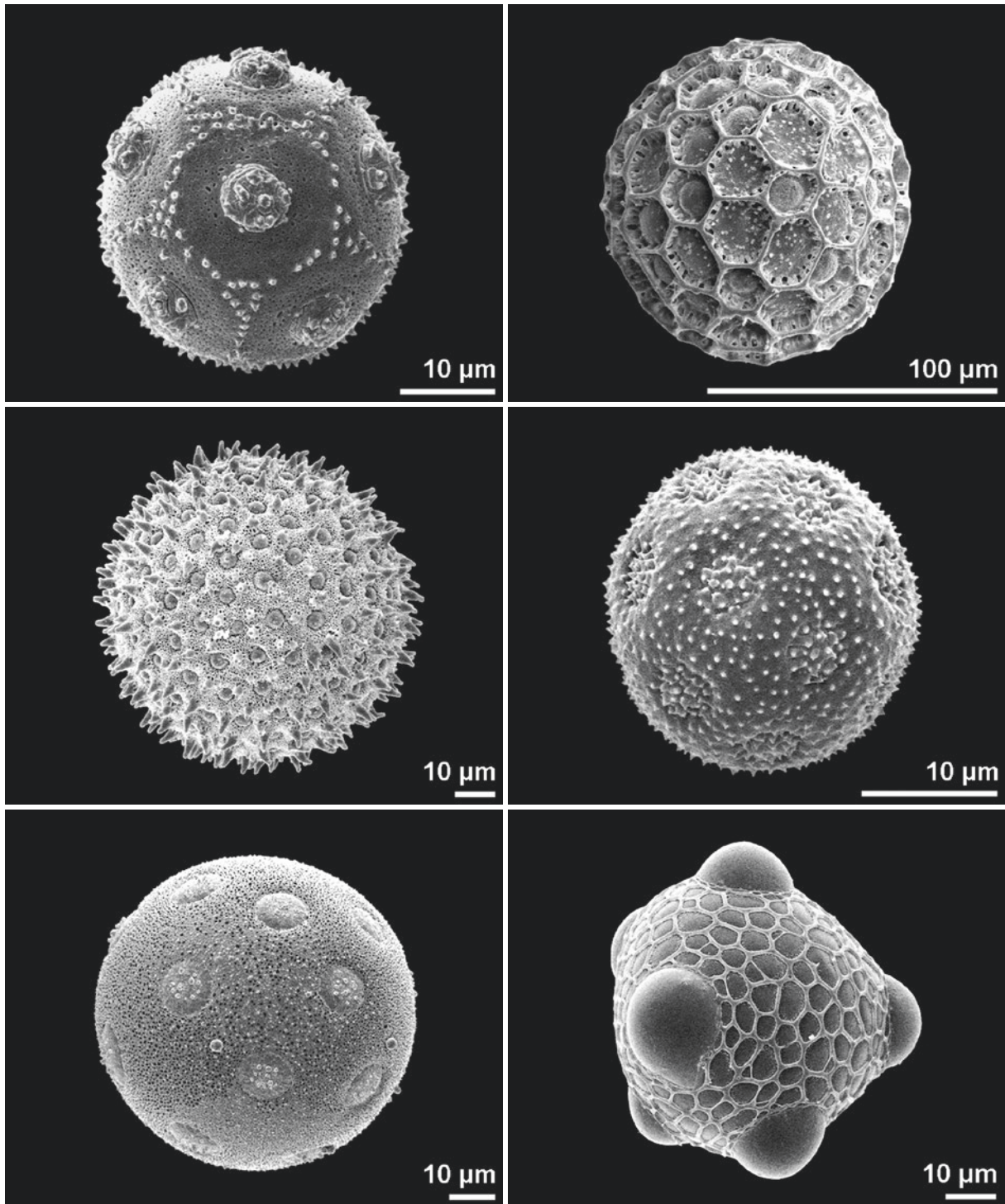
■ ■ *Pterocarya* sp., Juglandaceae
fossil, middle Miocene, Austria, polar view

■ ■ *Paramoltkia doerfleri*, Boraginaceae

■ ■ *Megaskepasma erythrochlamys*, Acanthaceae
equatorial view

porus/porate, pantoporate

pantoporate: pori distributed more or less regularly over the surface



■ ■ ■ *Stellaria holostea*, Caryophyllaceae

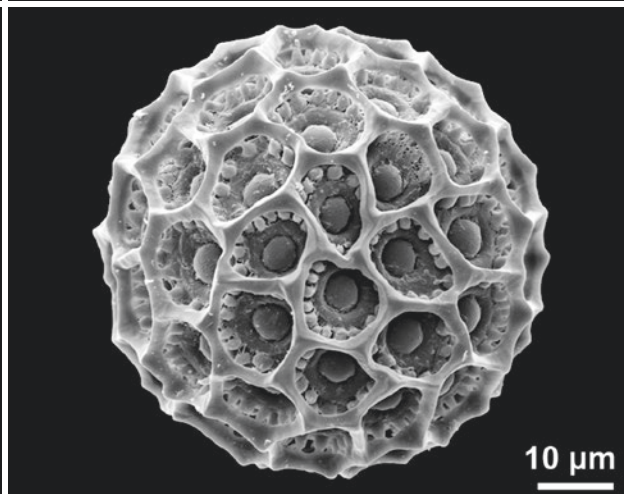
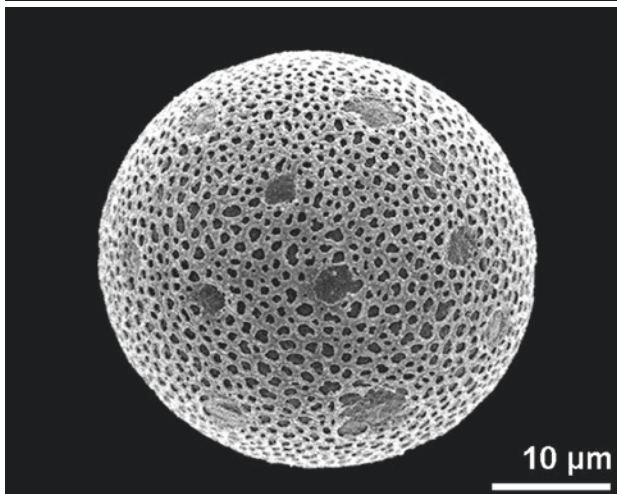
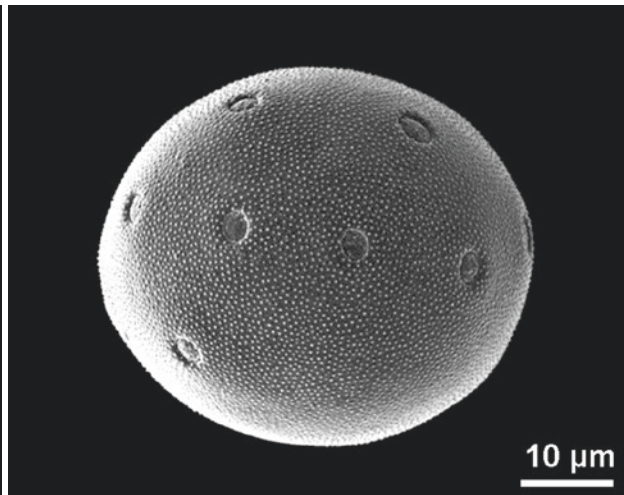
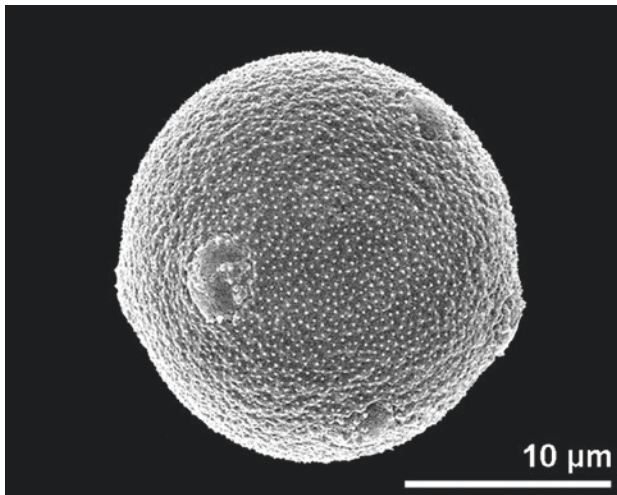
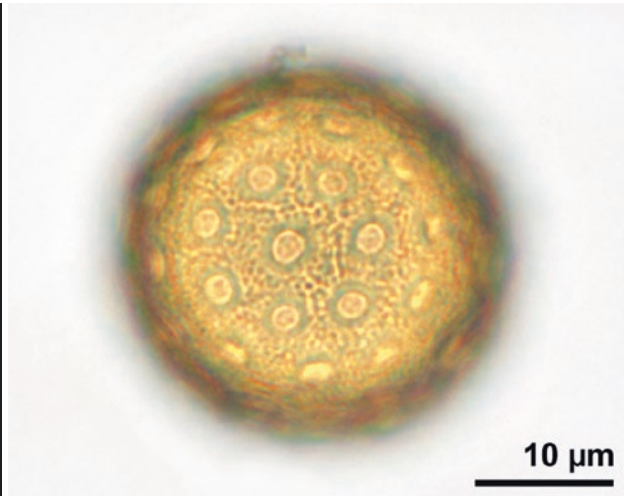
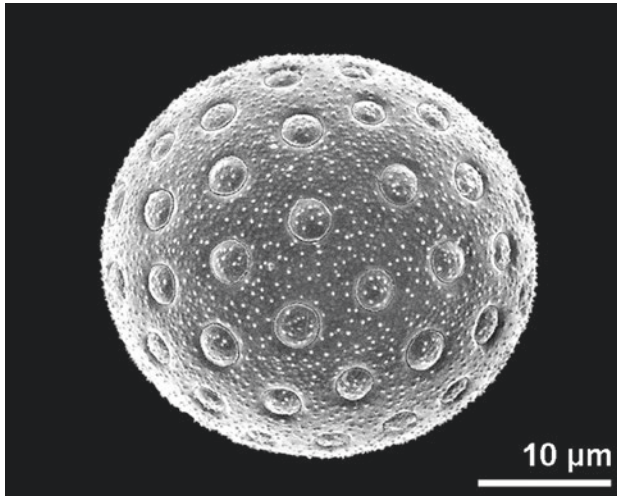
■ ■ ■ *Ipomoea batatas*, Convolvulaceae

■ ■ ■ *Calystegia sepium*, Convolvulaceae

■ ■ ■ *Cobaea scandens*, Polemoniaceae

■ ■ ■ *Helianthium bolivianum*, Alismataceae

■ ■ ■ *Aechmea azurea*, Bromeliaceae



■ ■ ■ *Bassia scoparia*, Amaranthaceae

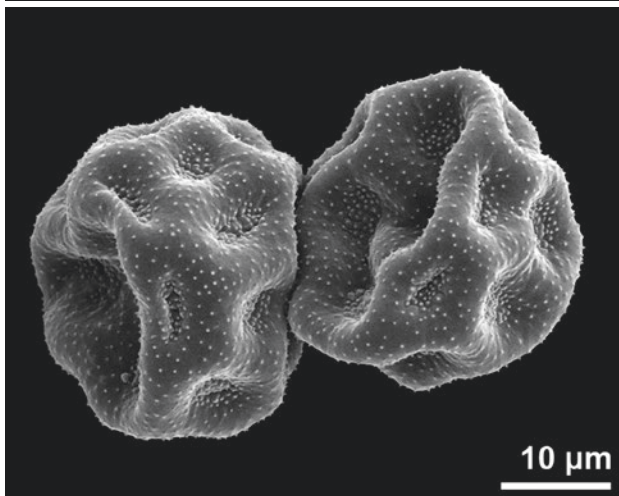
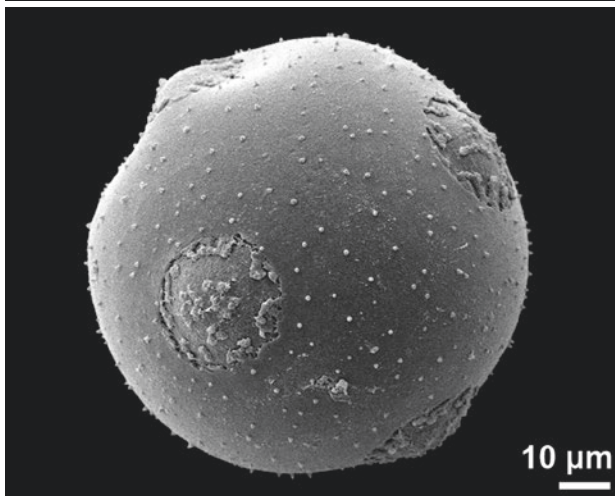
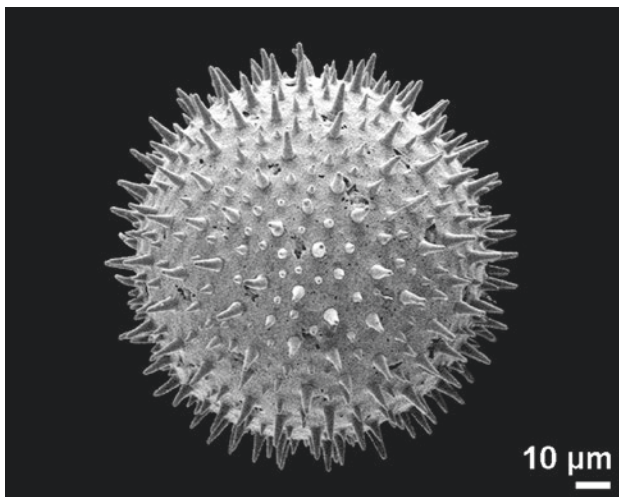
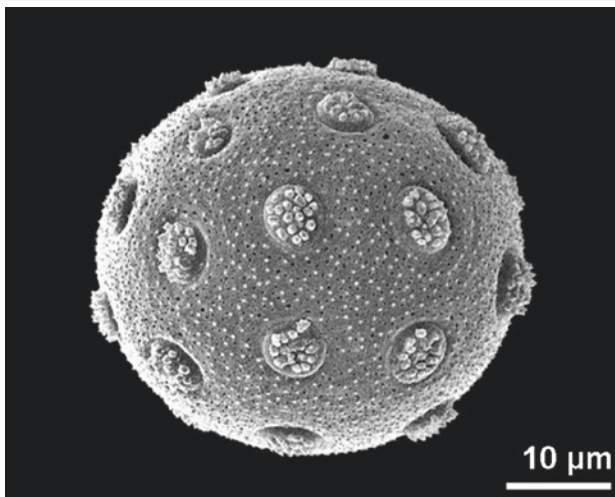
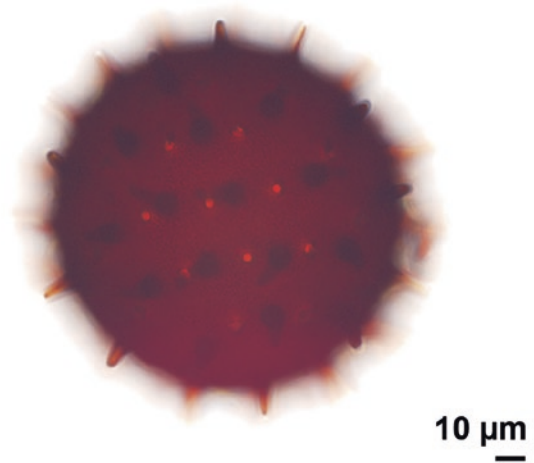
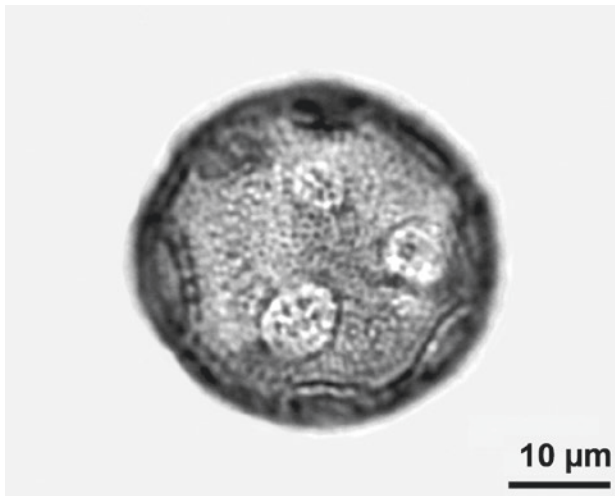
■ ■ ■ *Plantago major*, Plantaginaceae

■ ■ ■ *Buxus sempervirens*, Buxaceae

■ ■ ■ *Bassia scoparia*, Amaranthaceae

■ ■ ■ *Juglans regia*, Juglandaceae
equatorial view, pores irregularly spread (exception)

■ ■ ■ *Kallstroemia maxima*, Zygophyllaceae



■ ■ *Liquidambar* sp., Altingiaceae
fossil, middle Miocene, Austria

■ ■ *Arenaria ciliata*, Caryophyllaceae

■ ■ *Whitfieldia elongata*, Acanthaceae

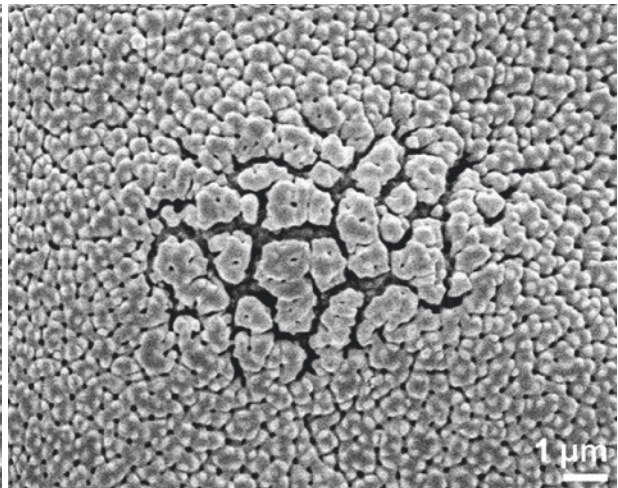
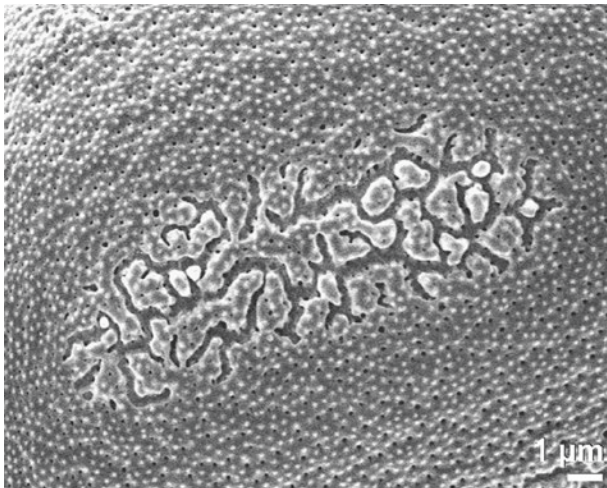
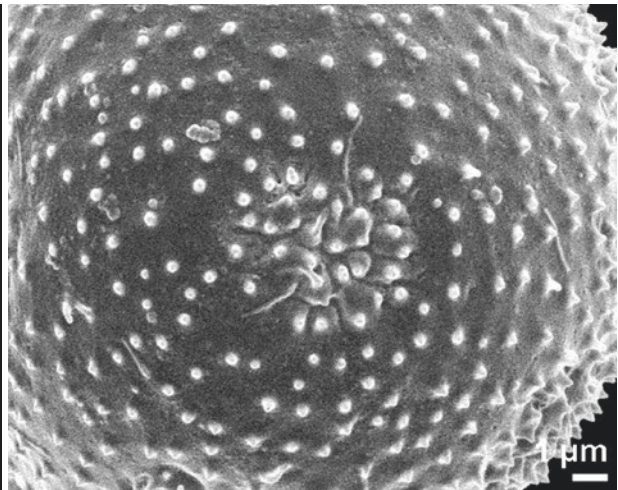
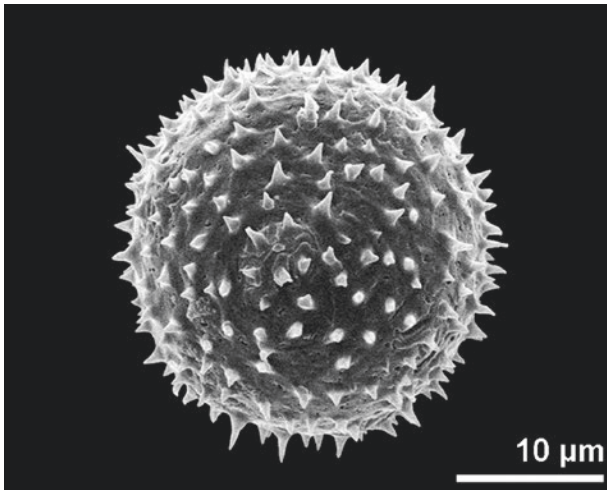
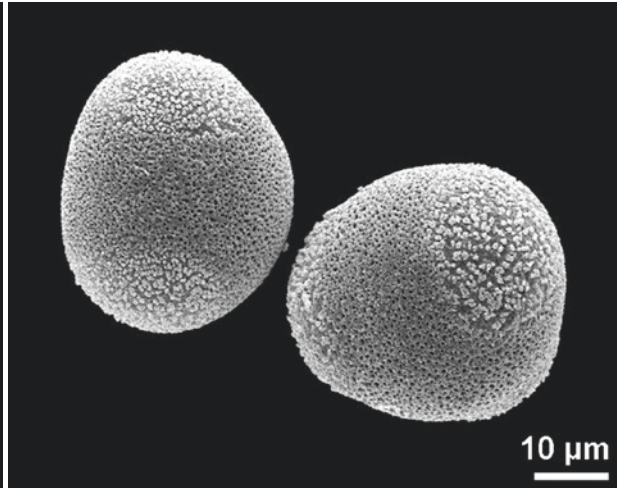
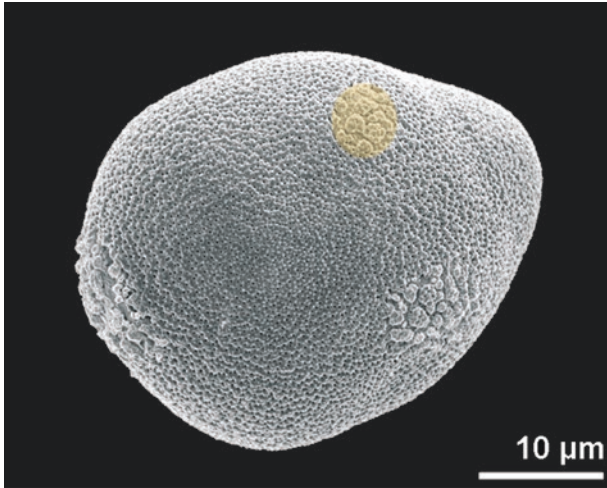
■ ■ *Pavonia multiflora*, Malvaceae

■ ■ *Lavatera thuringiaca*, Malvaceae

■ ■ *Alisma lanceolatum*, Alismataceae
dry pollen

poroid/poroidate

indistinct circular or elliptic aperture



■ *Carex remota*, Cyperaceae
 pseudomonad, poroid colored

■ *Sagittaria sagittifolia*, Alismataceae

■ *Schoenoplectus lacustris*, Cyperaceae

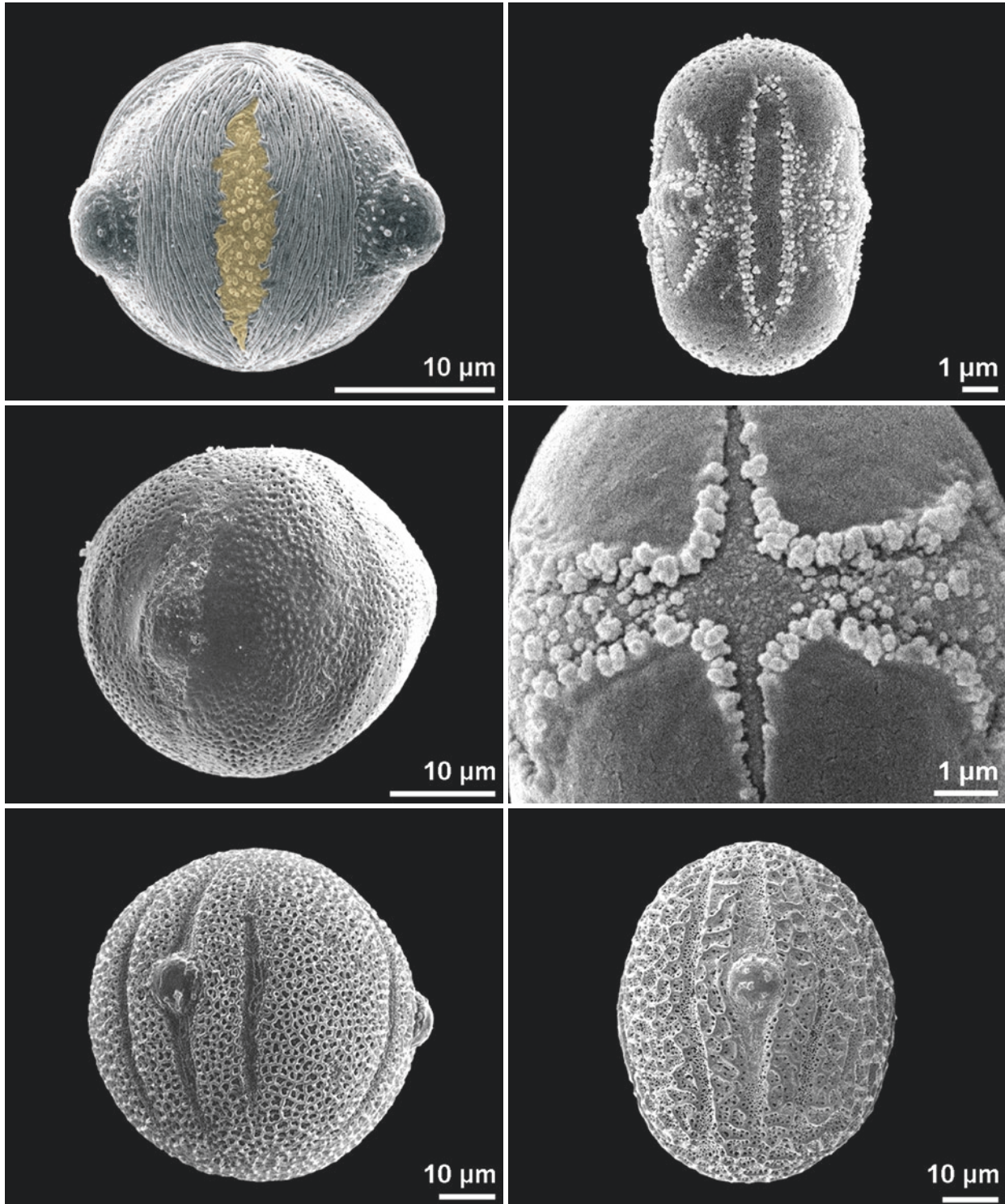
■ *Cercidiphyllum japonicum*, Cercidiphyllaceae
 triporoidate (turgescent pollen)

■ *Caldesia parnassifolia*, Alismataceae

■ *Scirpus sylvaticus*, Cyperaceae

pseudocolpus

colpus in a heteroaperturate pollen grain, presumed not to function as germination site



■ *Lythrum salicaria*, Lythraceae
tricolporate, equatorial view, pseudocolpus colored

■ *Lumnitzera racemosa*, Combretaceae
tricolporate, equatorial view

■ *Justicia furcata*, Acanthaceae
equatorial view, two pseudocolpi flanking colporus

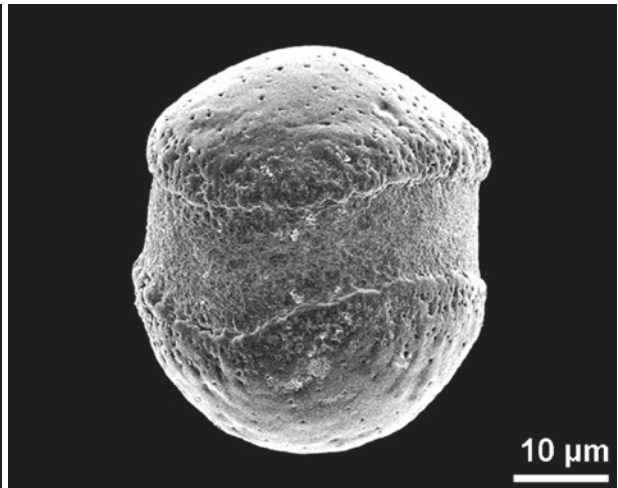
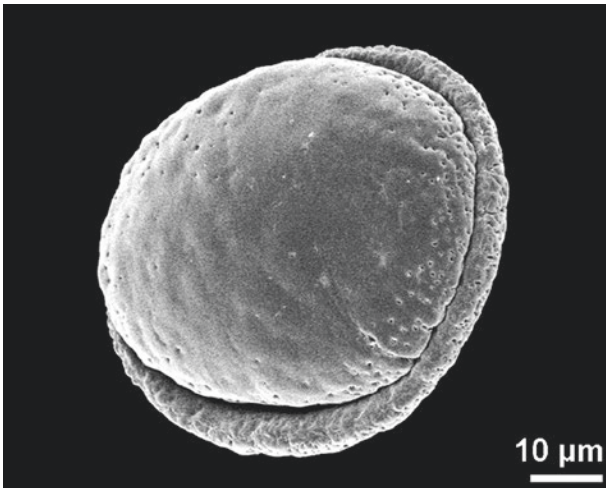
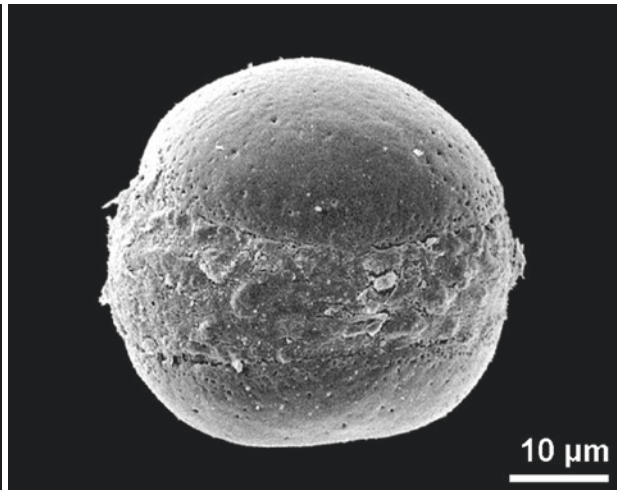
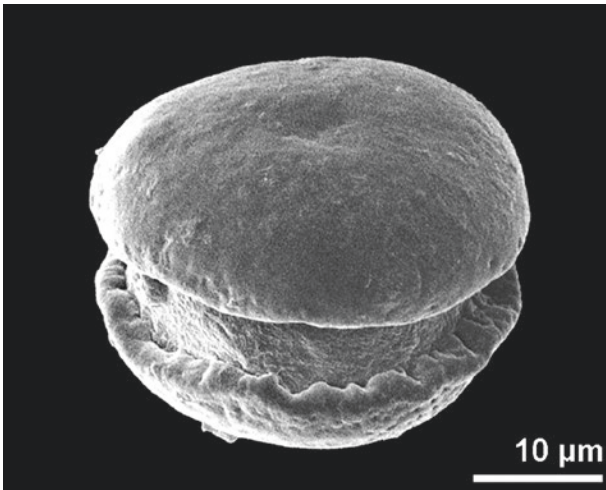
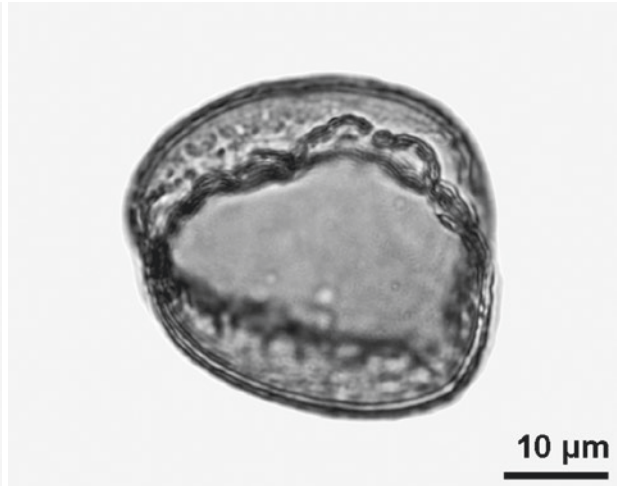
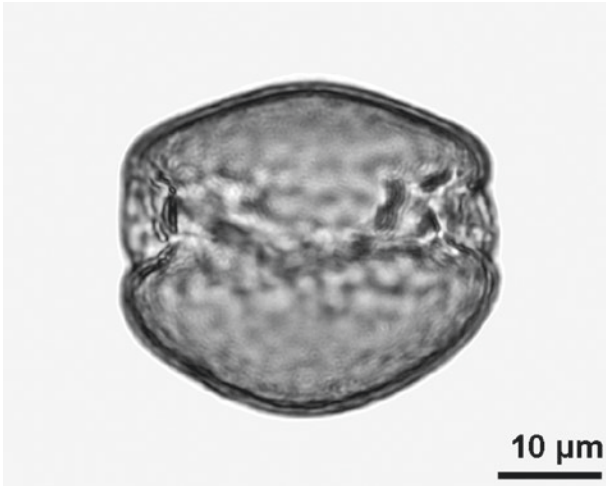
■ *Asperugo procumbens*, Boraginaceae
tricolporate, equatorial view

■ *Cynoglossum officinale*, Boraginaceae

■ *Pachystachys lutea*, Acanthaceae
equatorial view, two pseudocolpi flanking colporus

ring-like aperture

circumferential aperture (situated more or less equatorially or, rarely, meridionally)



Zamioculcas zamiifolia, Araceae
equatorial view

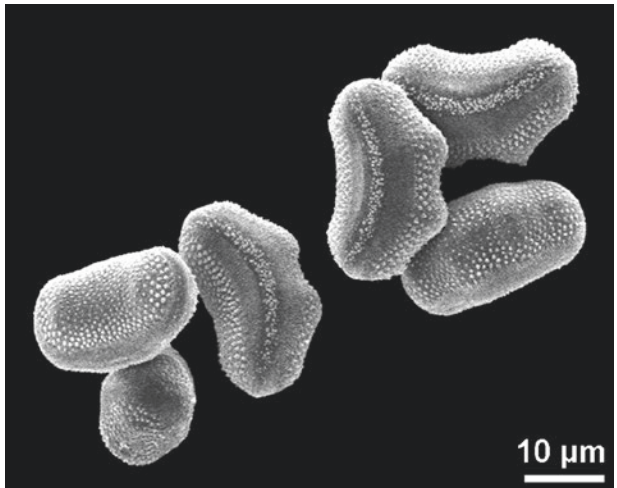
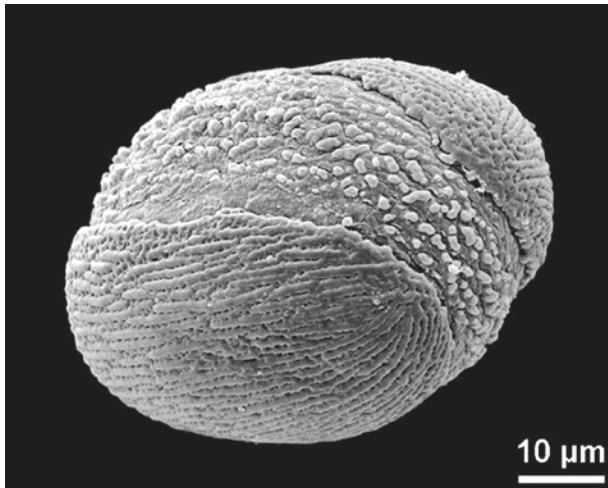
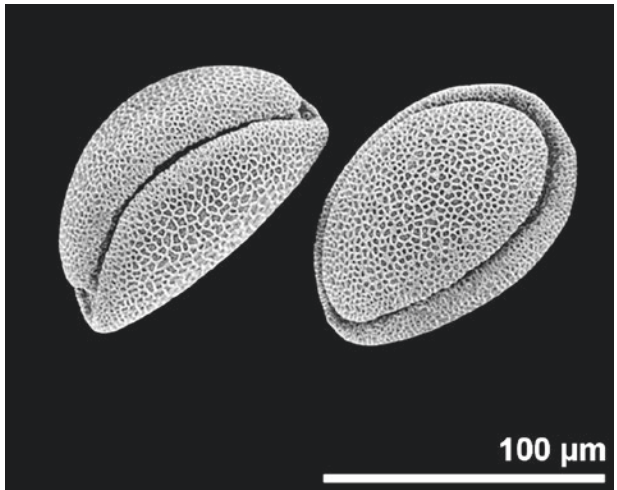
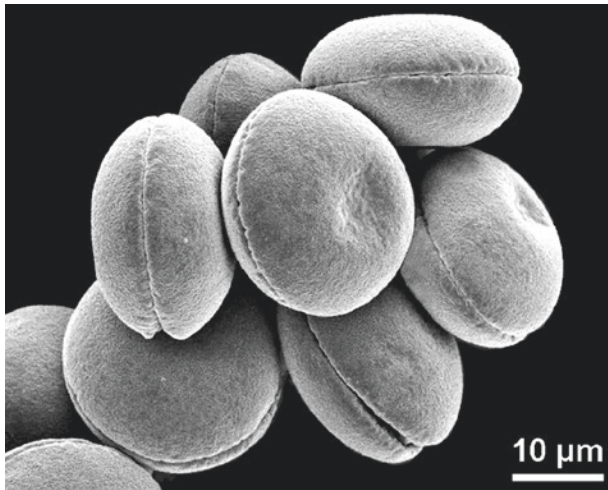
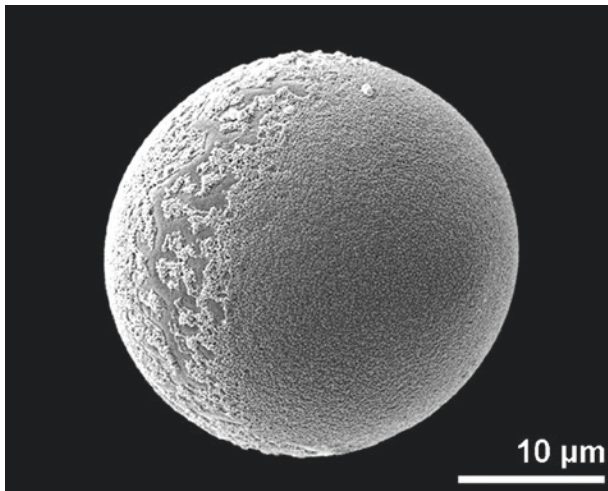
Zamioculcas zamiifolia, Araceae
oblique polar view, artificially ruptured

Zamioculcas zamiifolia, Araceae
equatorial view

Monstera deliciosa, Araceae
equatorial view

Gonatopus angustus, Araceae
oblique polar view, dry pollen

Gonatopus angustus, Araceae
equatorial view



■ ■ *Pedicularis palustris*, Orobanchaceae
aperture running meridionally

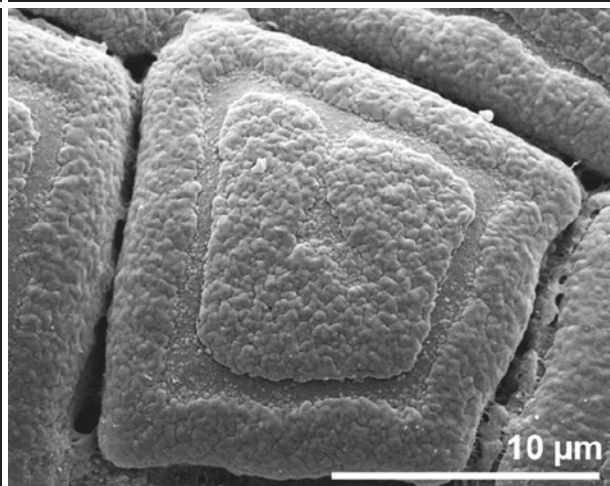
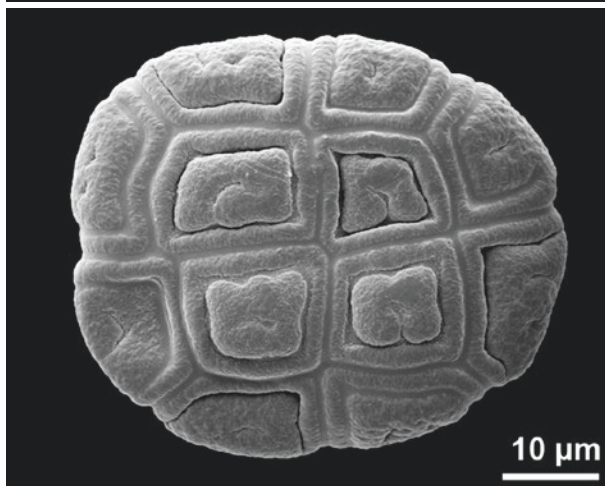
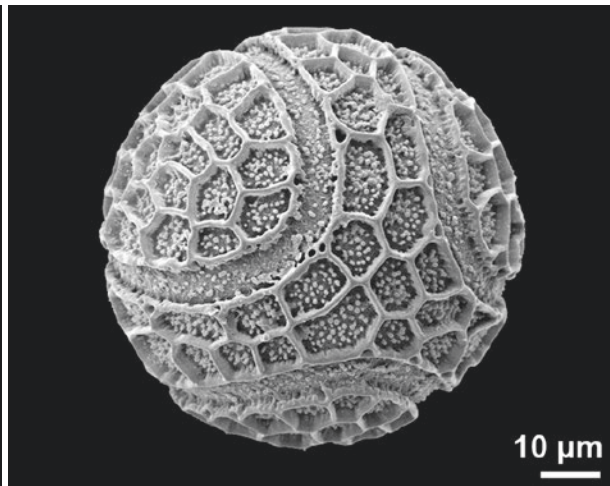
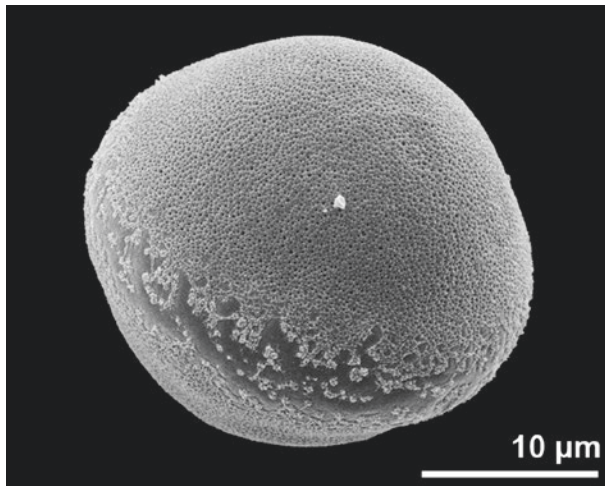
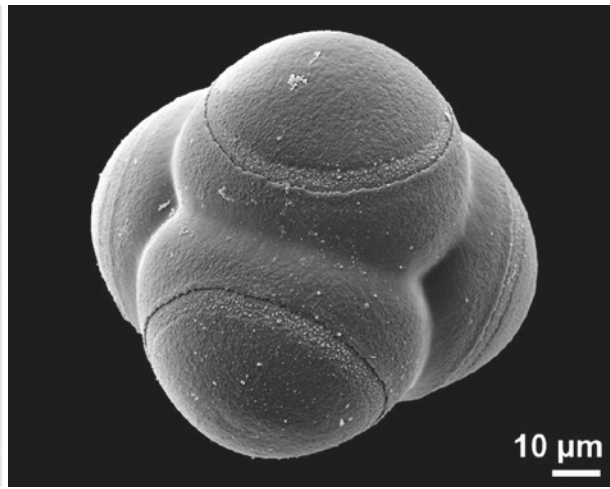
■ ■ *Pedicularis palustris*, Orobanchaceae
aperture running meridionally, dry pollen

■ ■ *Pedicularis rostratocapitata*, Orobanchaceae
aperture running meridionally, dry pollen

■ ■ *Iris histrioides*, Iridaceae
aperture running equatorially, dry pollen

■ ■ *Cephalostemon riedelianus*, Rapateaceae
aperture running equatorially, oblique equatorial view

■ ■ *Limnanthes douglasii*, Limnanthaceae
aperture running equatorially



■ ■ ■ *Gonatopus boivinii*, Araceae

■ ■ ■ *Victoria regia*, Nymphaeaceae
tetrad

■ ■ ■ *Pedicularis gyroflexa*, Orobanchaceae
aperture running meridionally

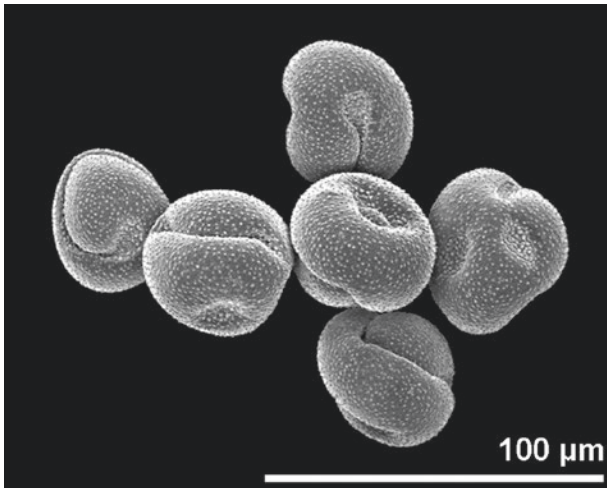
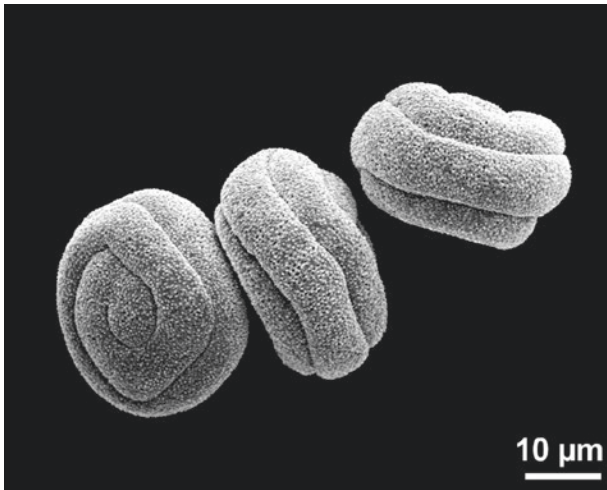
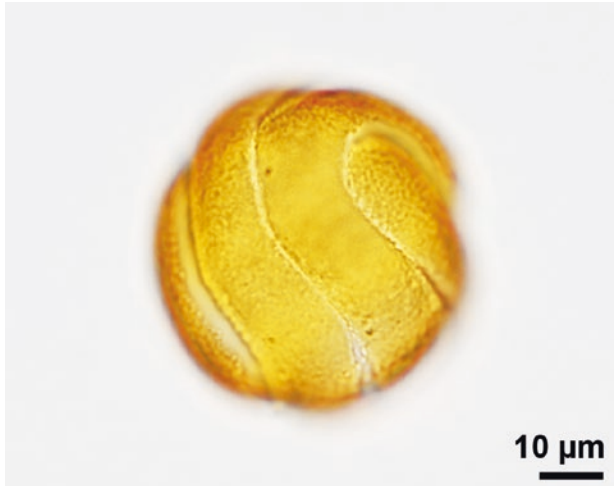
■ ■ ■ *Passiflora amethystina*, Passifloraceae
debatable: 3 ring-like apertures or triporate with opercula

■ ■ ■ *Acacia dealbata*, Fabaceae
debatable: polyad, monads with ring-like structure/thinning

■ ■ ■ *Acacia dealbata*, Fabaceae
close-up of polyad

spiral aperture/spiraperturate

elongated, coiled aperture



■ ■ *Mimulus* sp., Phrymaceae

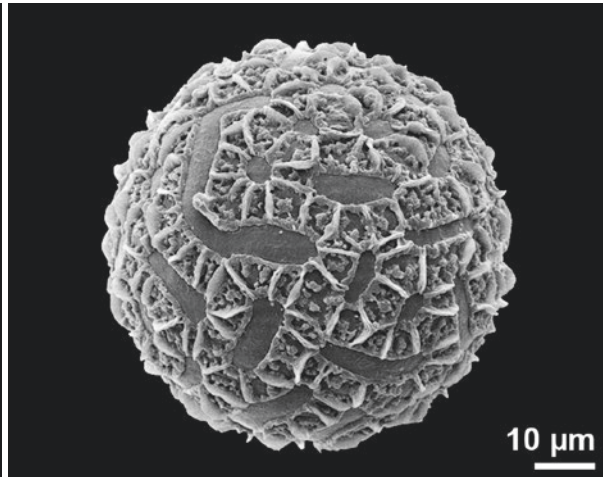
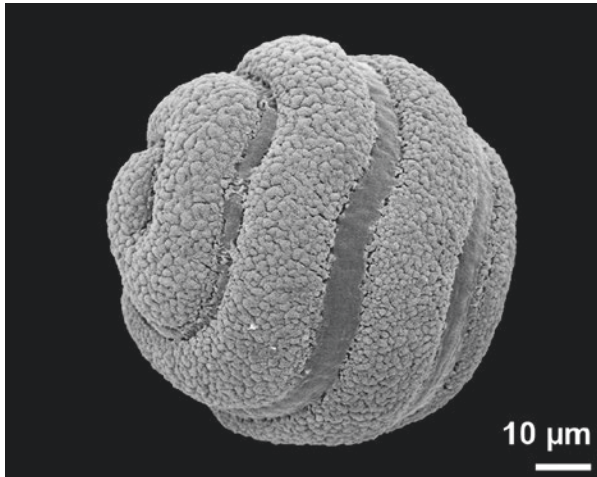
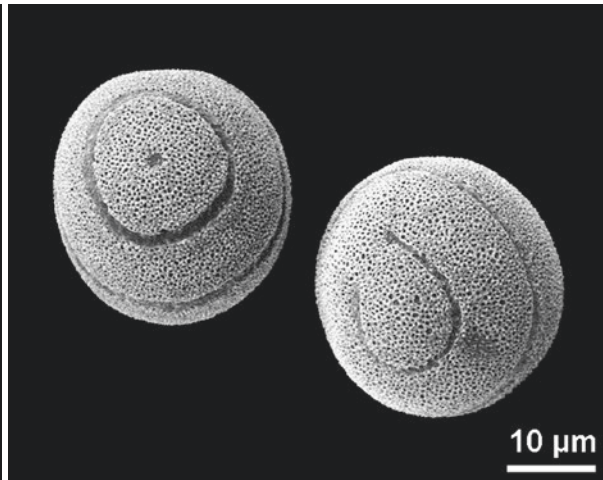
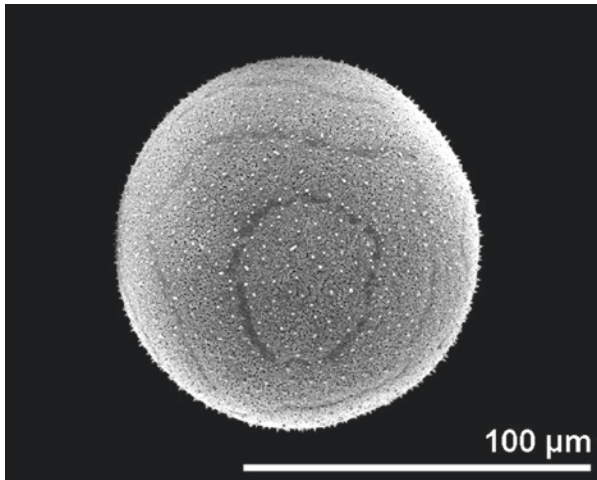
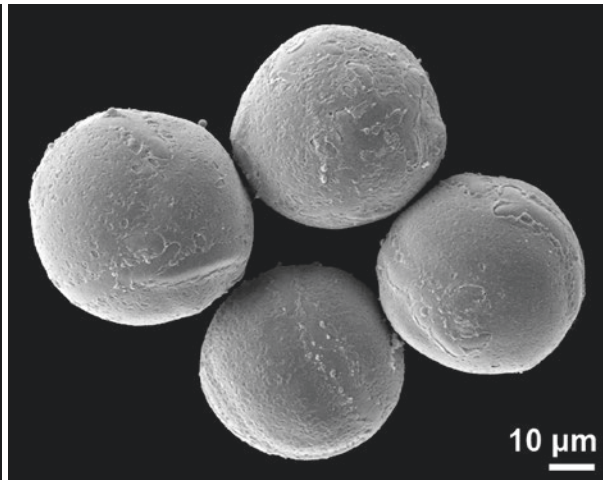
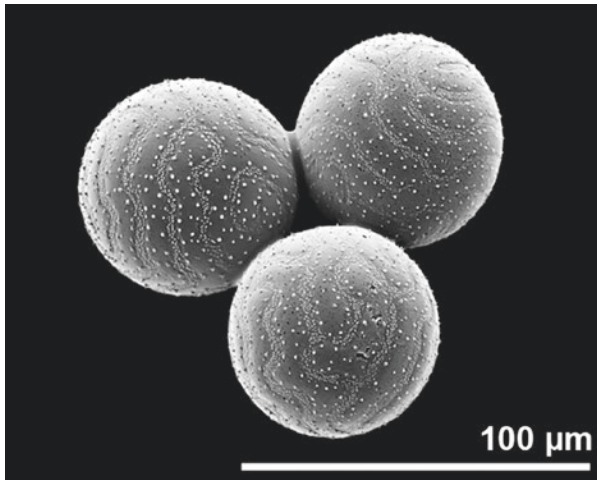
■ ■ *Mimulus guttatus*, Phrymaceae
dry pollen

■ ■ *Claytonia perfoliata*, Montiaceae
dry pollen

■ ■ *Thunbergia alata*, Acanthaceae

■ ■ *Thunbergia alata*, Acanthaceae

■ ■ *Berberis vulgaris*, Berberidaceae



■ *Apphyllanthes monspeliensis*, Asparagaceae

■ *Berberis amurensis*, Berberidaceae

■ *Crocus speciosus*, Iridaceae

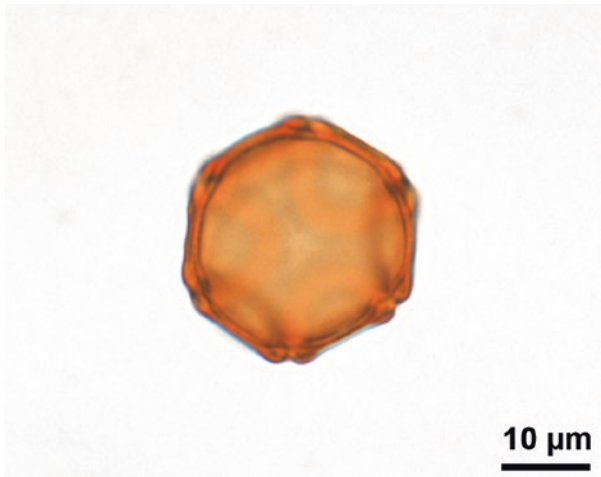
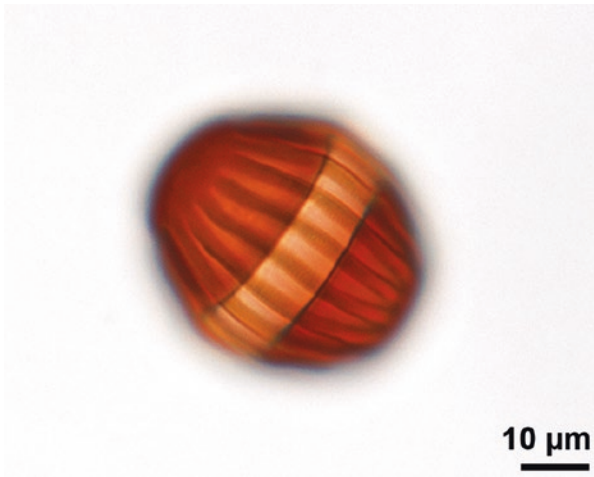
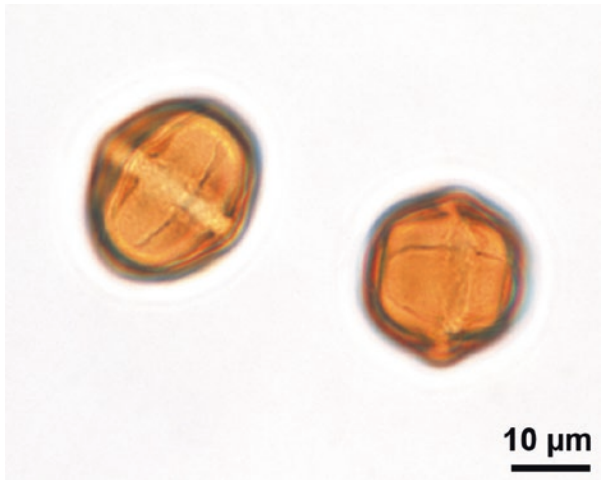
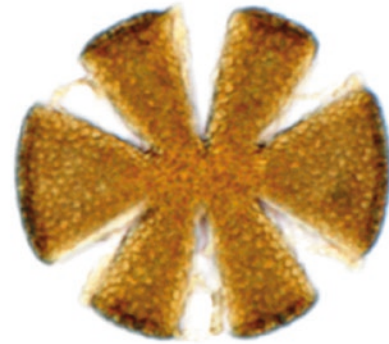
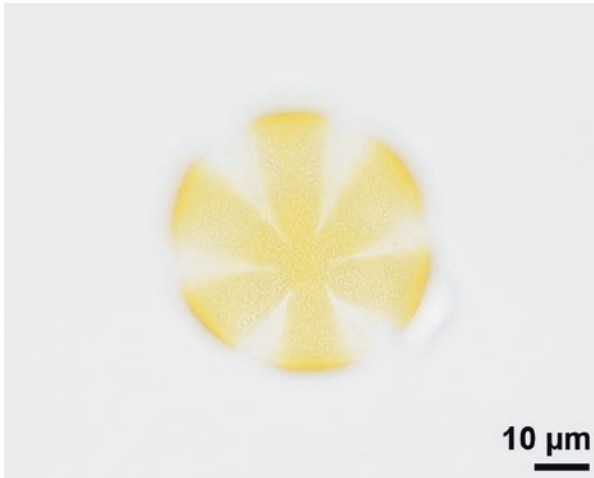
■ *Mimulus guttatus*, Phrymaceae

■ *Thunbergia laurifolia*, Acanthaceae

■ *Bignonia magnifica*, Bignoniaceae

stephanoaperturate

apertures situated at the equator (term usually used for more than six apertures): stephanocolpate, stephanocolporate, stephanoporate



■ *Dracocephalum austriacum*, Lamiaceae
hexacolpate, polar view

■ *Plectranthus esculentus*, Lamiaceae
hexacolpate, polar view

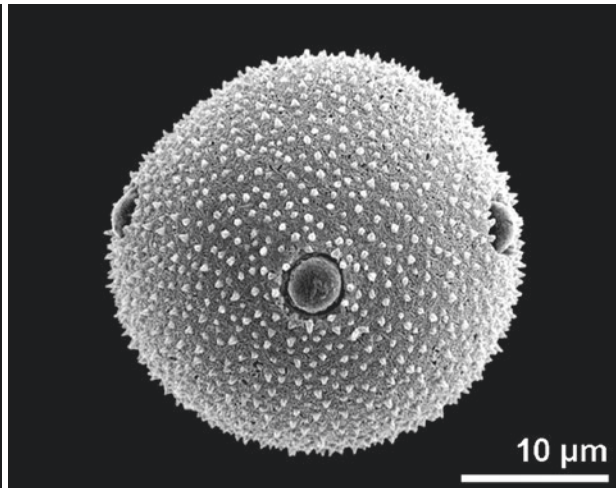
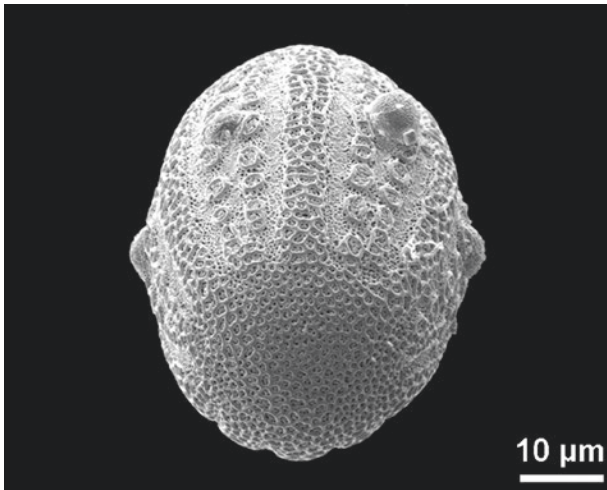
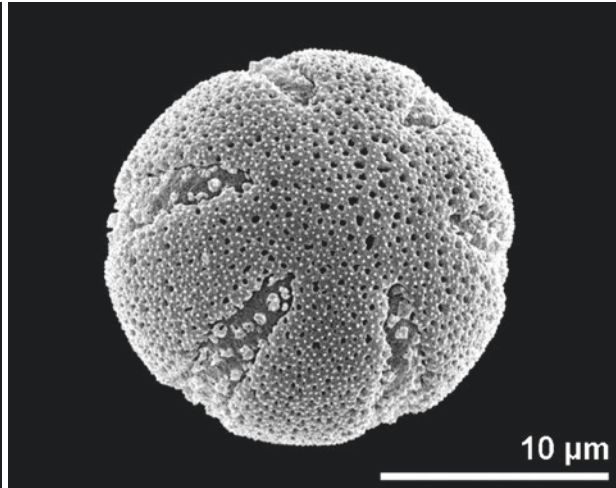
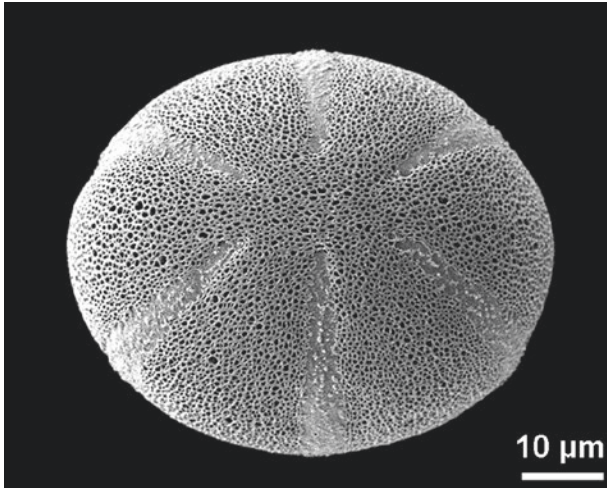
■ *Polygala myrtifolia*, Polygalaceae
colporate, equatorial view

■ *Salvia glutinosa*, Lamiaceae
hexacolpate, polar view

■ *Sanguisorba officinalis*, Rosaceae
colporate, equatorial view

■ *Alnus glutinosa*, Betulaceae
porate

stephanocolpate, stephanocolporate, stephanoporate



■ ■ *Dracocephalum austriacum*, Lamiaceae
hexacolpate, polar view

■ ■ *Asperula tinctoria*, Rubiaceae
hexacolpate, polar view

■ ■ *Justicia menesii*, Acanthaceae
colporate, oblique polar view

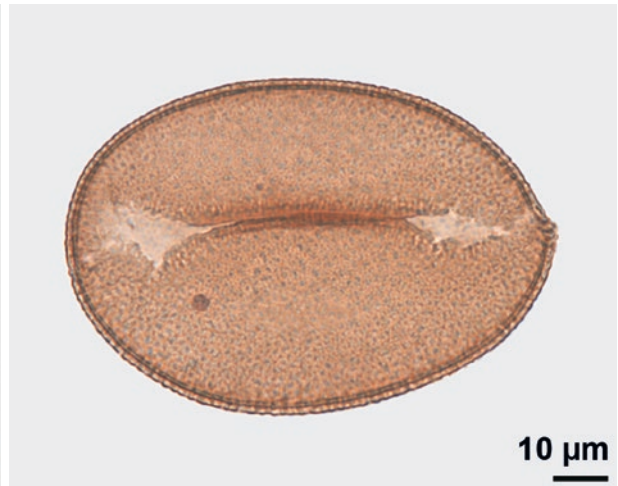
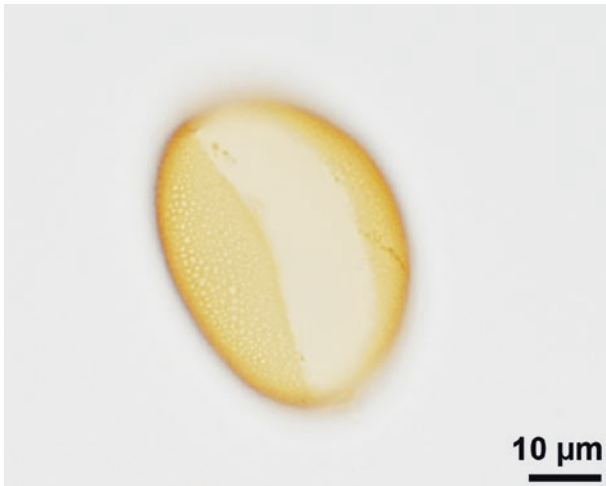
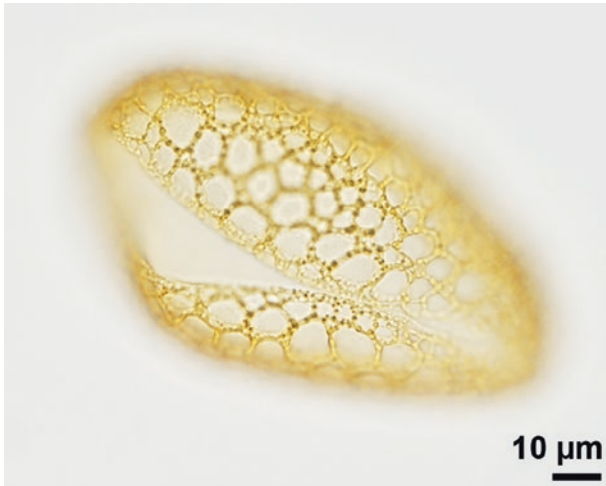
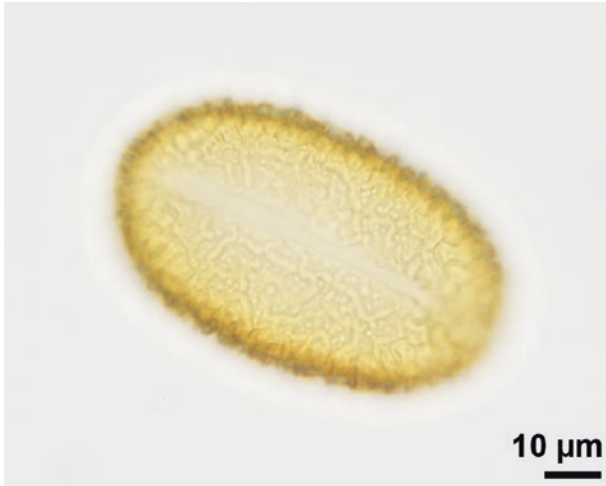
■ ■ *Borago officinalis*, Boraginaceae
colporate, equatorial view

■ ■ *Polygala myrtifolia*, Polygalaceae
colporate, oblique equatorial view

■ ■ *Legousia speculum-veneris*, Campanulaceae
porate, equatorial view

sulcus/sulcate

elongated aperture located distally



■ ■ *Iris domestica*, Iridaceae
distal polar view

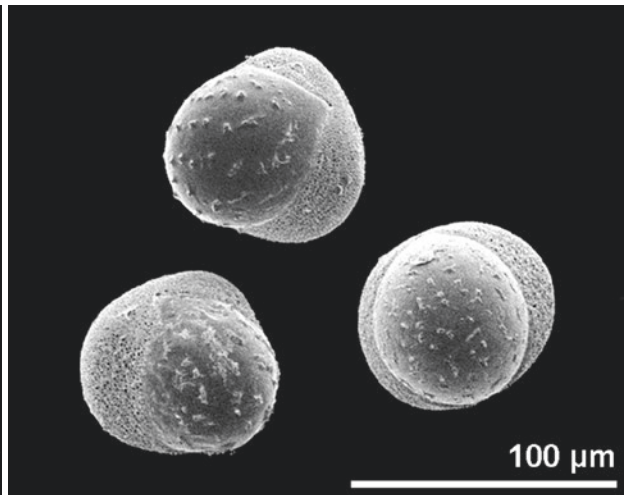
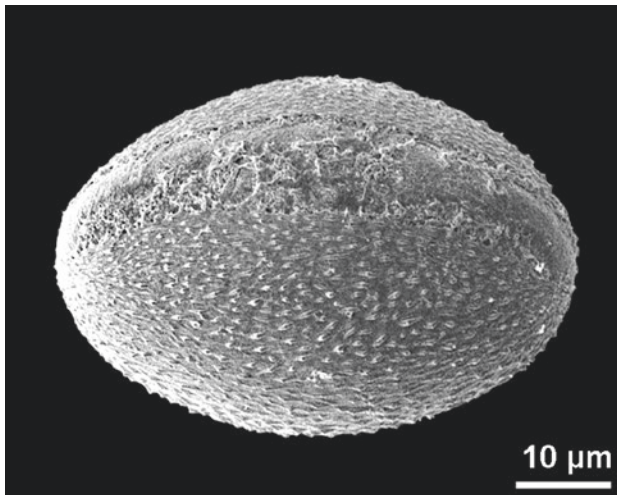
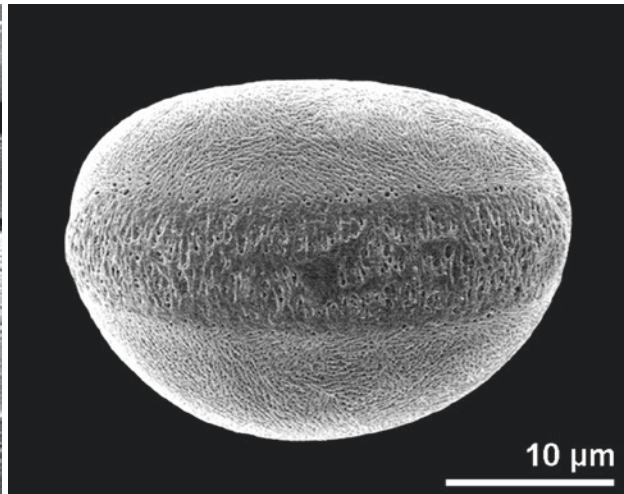
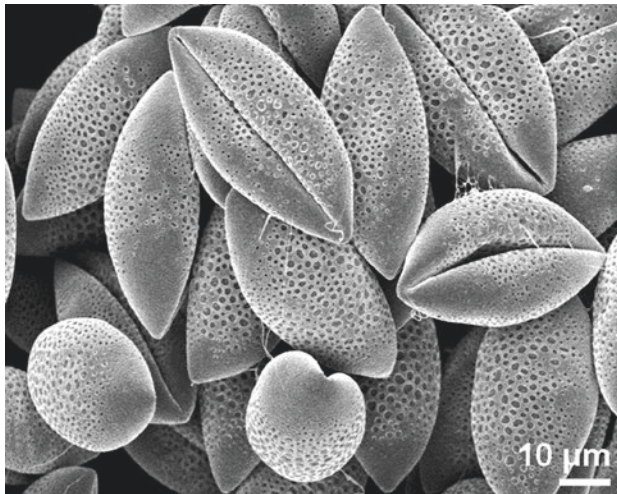
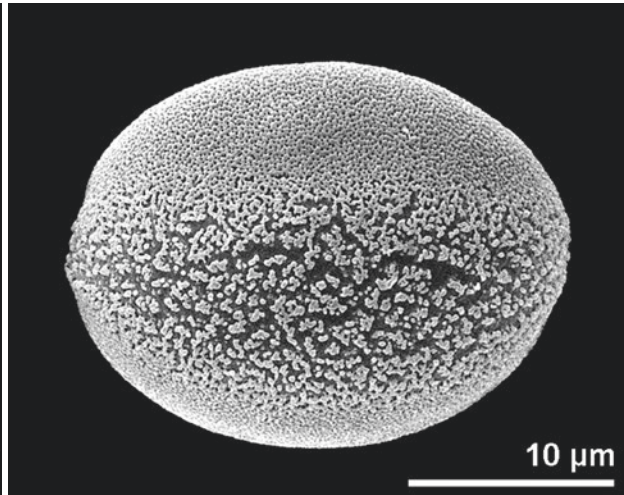
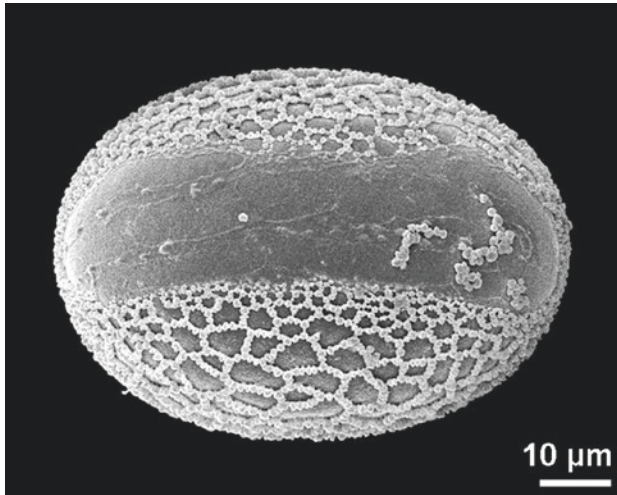
■ ■ *Nuphar lutea*, Nymphaeaceae
distal polar view

■ ■ *Bessera elegans*, Asparagaceae
distal polar view

■ ■ *Freesia* sp., Iridaceae
distal polar view

■ ■ *Fritillaria pontica*, Liliaceae
distal polar view

■ ■ *Iris pseudacorus*, Iridaceae
distal polar view



■ ■ *Lilium martagon*, Liliaceae
distal polar view

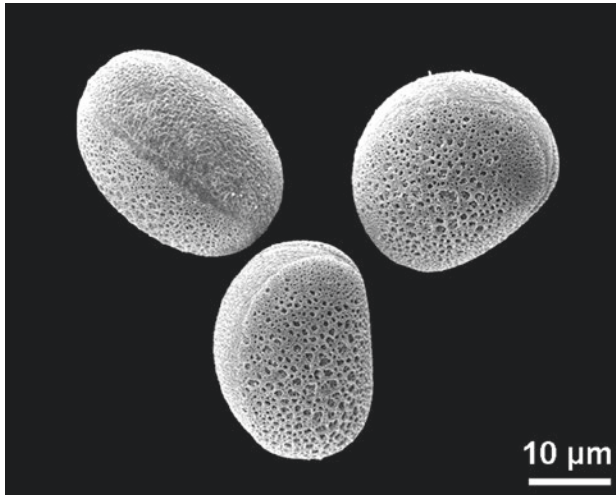
■ ■ *Doryanthes palmeri*, Doryanthaceae
dry pollen

■ ■ *Cabomba palaeformis*, Cabombaceae
oblique distal polar view

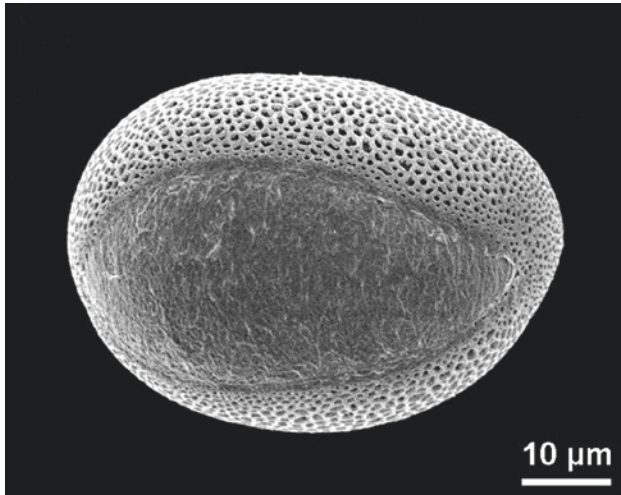
■ ■ *Galanthus nivalis*, Amaryllidaceae
distal polar view

■ ■ *Allium ursinum*, Amaryllidaceae
distal polar view

■ ■ *Asphodeline lutea*, Xanthorrhoeaceae



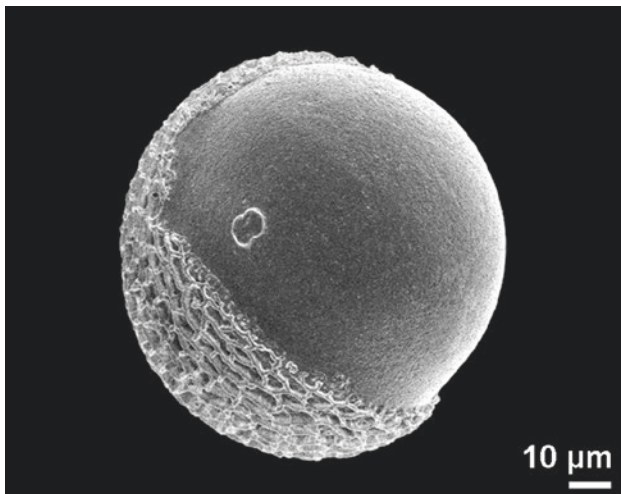
10 μm



10 μm



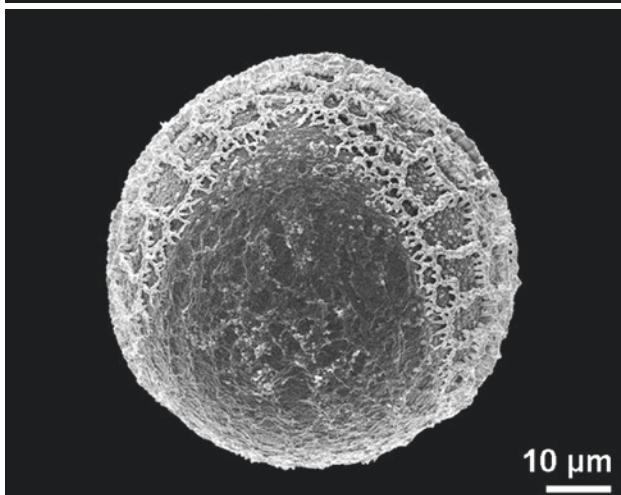
10 μm



10 μm



10 μm



10 μm

■ ■ ■ *Lachenalia aloides*, Asparagaceae

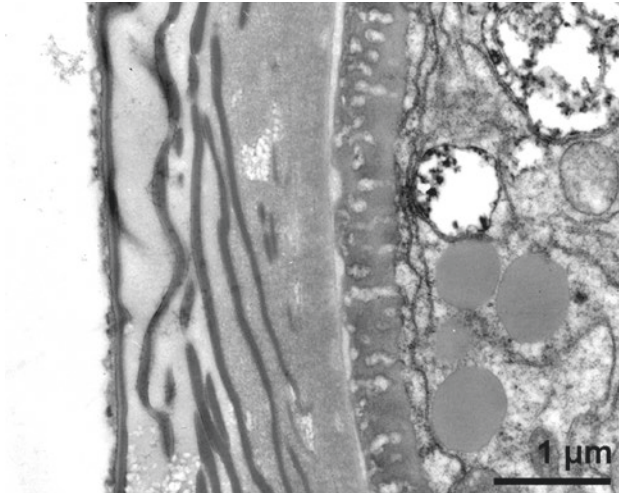
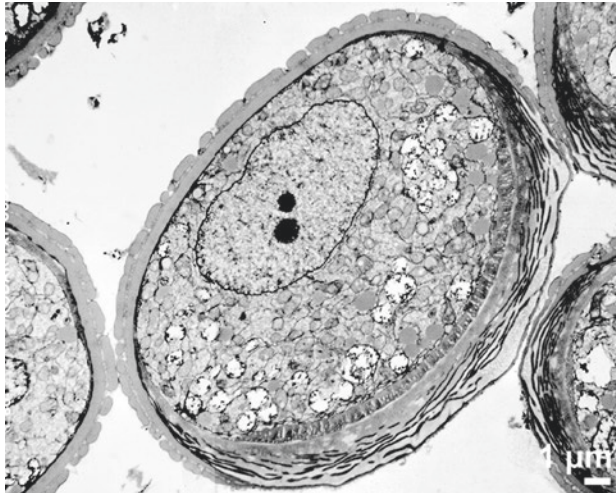
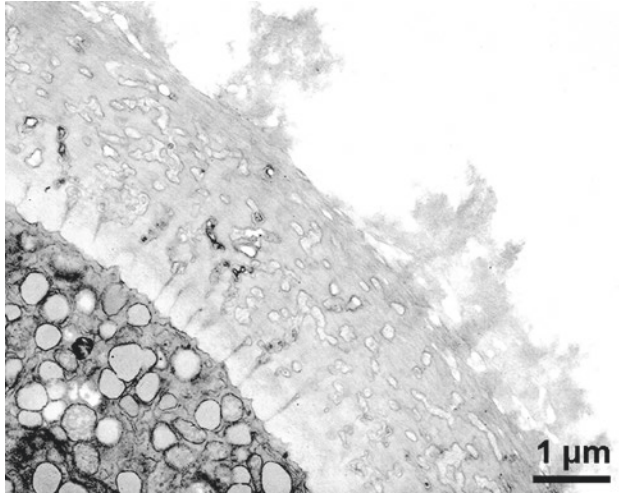
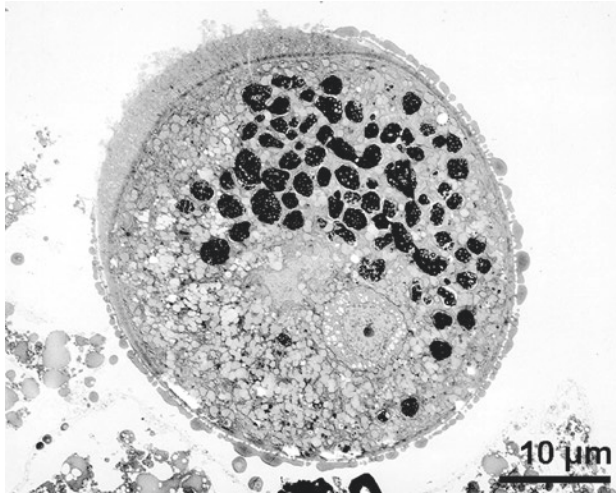
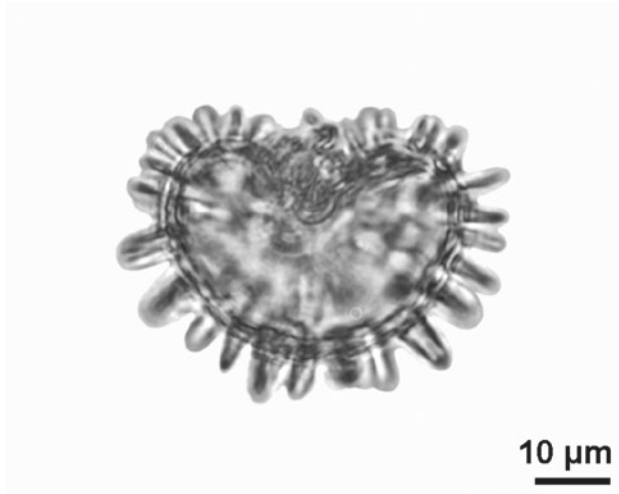
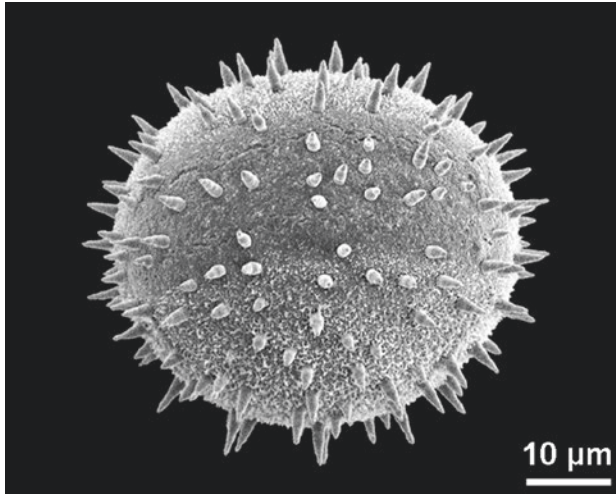
■ ■ ■ *Iris pseudacorus*, Iridaceae
hydrated, equatorial view

■ ■ ■ *Vriesea neoglutinosa*, Bromeliaceae
dry pollen

■ ■ ■ *Catopsis floribunda*, Bromeliaceae
distal polar view

■ ■ ■ *Iris reichenbachii*, Iridaceae
oblique distal polar view

■ ■ ■ *Paradisea liliastrum*, Asparagaceae
equatorial view



■ ■ *Nuphar lutea*, Nymphaeaceae
oblique distal polar view

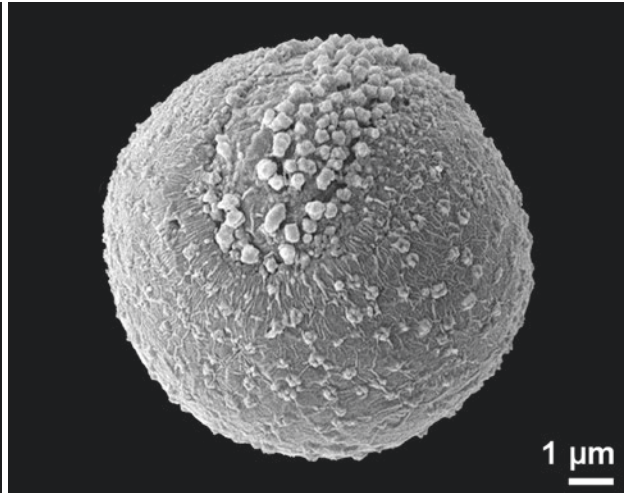
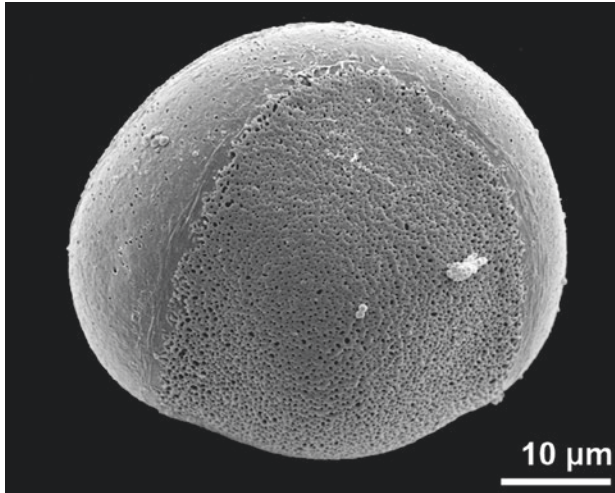
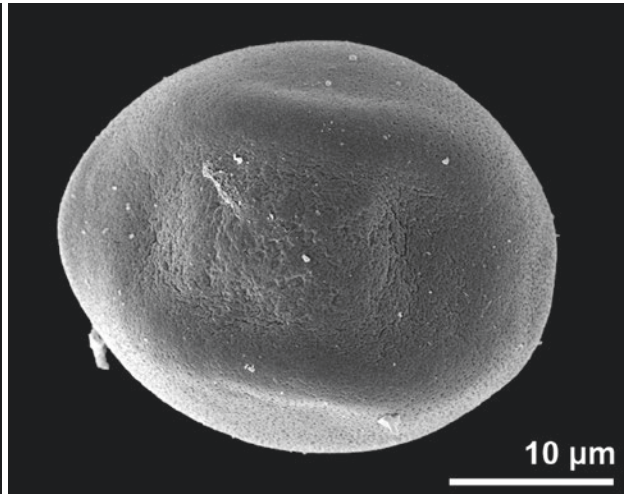
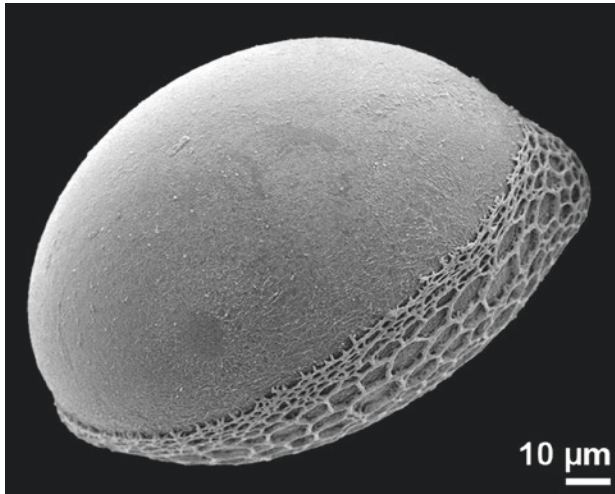
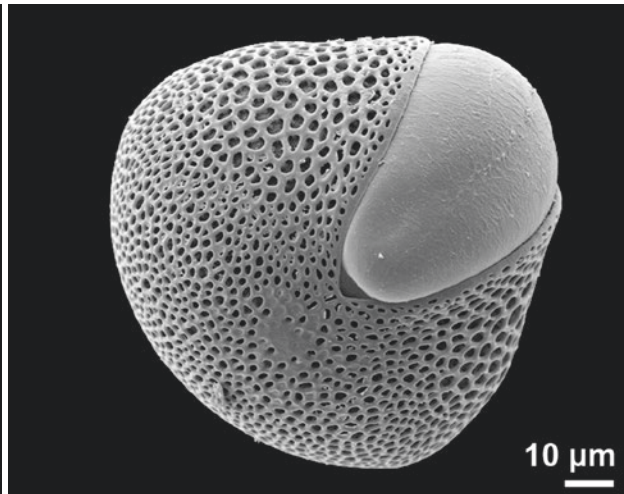
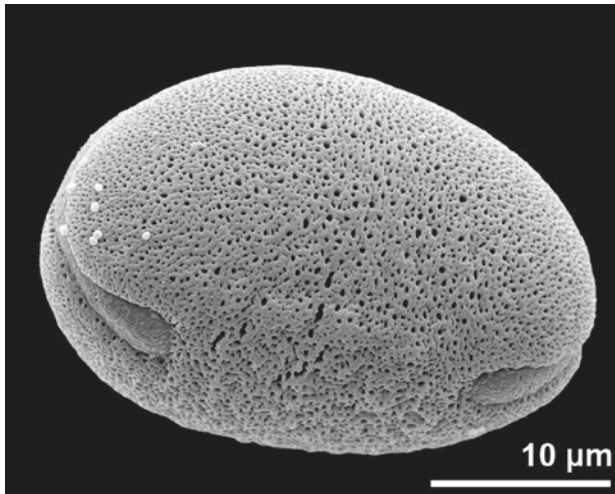
■ ■ *Nuphar lutea*, Nymphaeaceae
equatorial view

■ ■ *Liriodendron tulipifera*, Magnoliaceae
cross section of pollen grain

■ ■ *Liriodendron tulipifera*, Magnoliaceae
cross section of aperture

■ ■ *Anaphyllopsis americana*, Araceae
cross section of pollen grain

■ ■ *Anaphyllopsis americana*, Araceae
cross section of aperture



■ ■ *Allium sphaerocephalum*, Amaryllidaceae
sulcus extended to proximal face, oblique proximal polar view

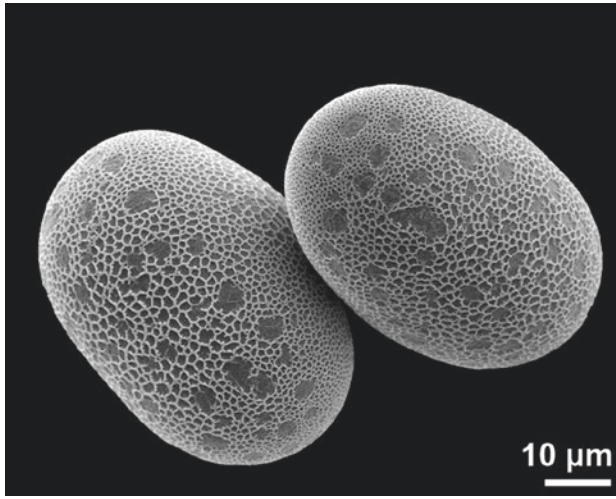
■ ■ *Asphodelus fistulosus*, Xanthorrhoeaceae
equatorial view

■ ■ *Bessera elegans*, Asparagaceae
oblique distal polar view

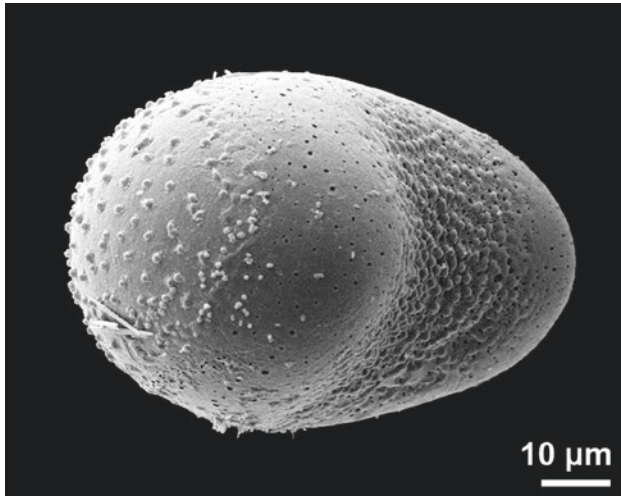
■ ■ *Ceratozamia kuesteriana*, Zamiaceae
distal polar view

■ ■ *Cordyline fruticosa*, Asparagaceae
extended sulcus, equatorial view

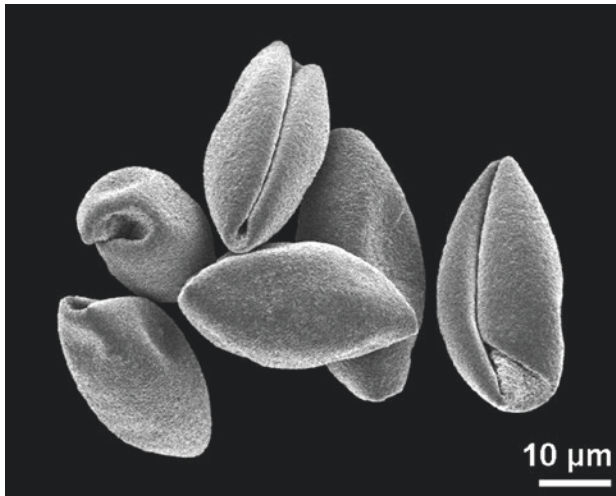
■ ■ *Saururus cernuus*, Saururaceae
equatorial view



10 μm



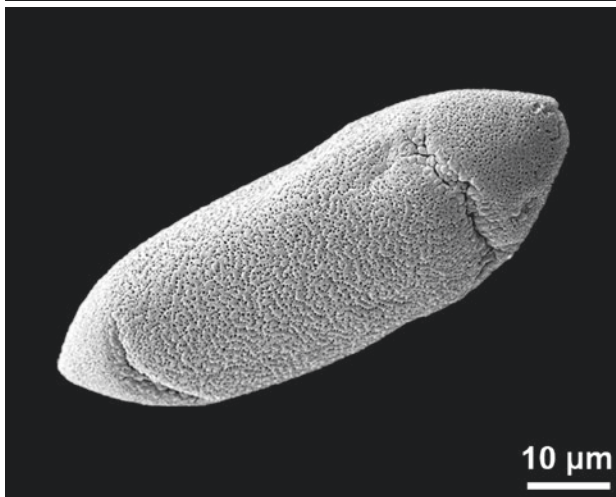
10 μm



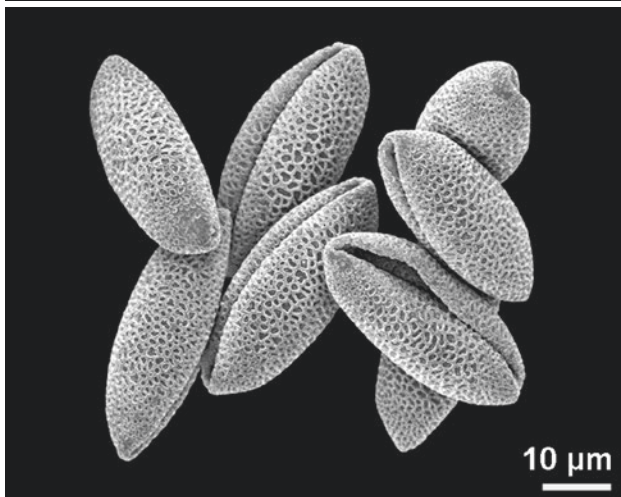
10 μm



10 μm



10 μm



10 μm

■ ■ *Guzmania elvallensis*, Bromeliaceae
 ■ ■ inconspicuous sulcus with broken reticulum, distal polar view

■ ■ *Chamaedorea microspadix*, Arecaceae
 ■ ■ dry pollen

■ ■ *Tradescantia zebrina*, Commelinaceae
 ■ ■ additional 2 tenuitates, proximal polar view, dry pollen

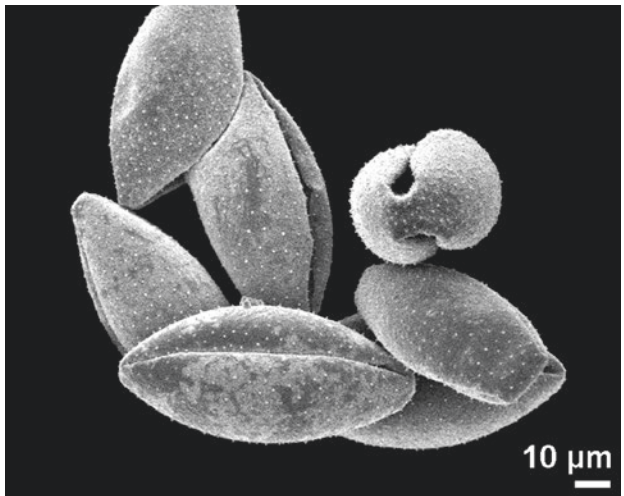
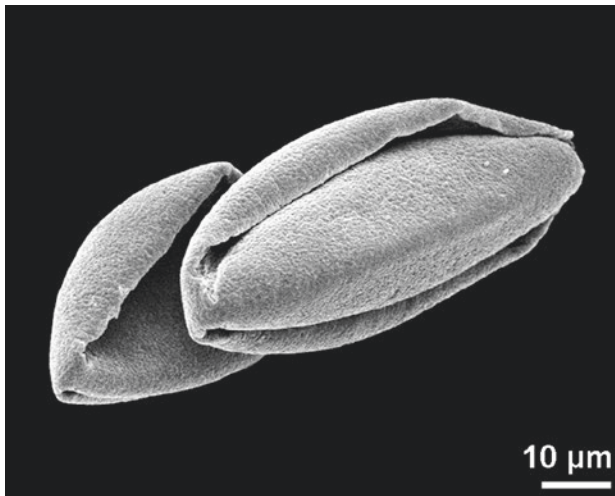
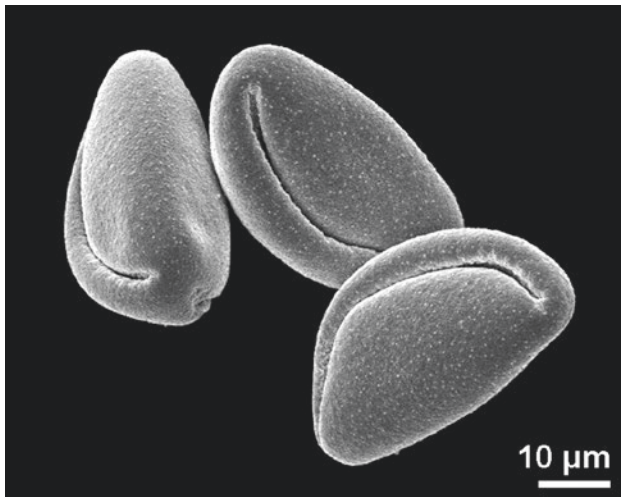
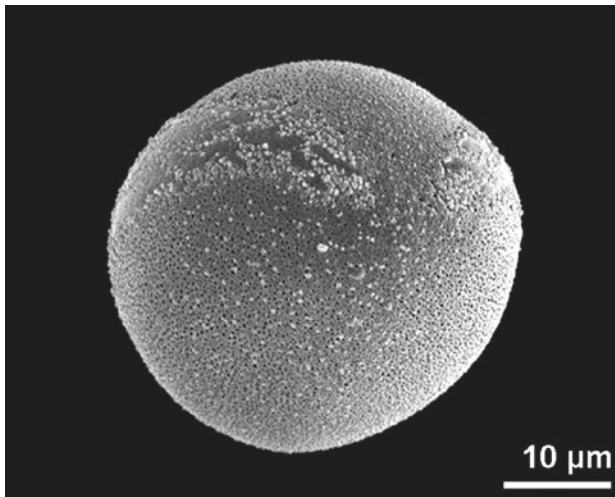
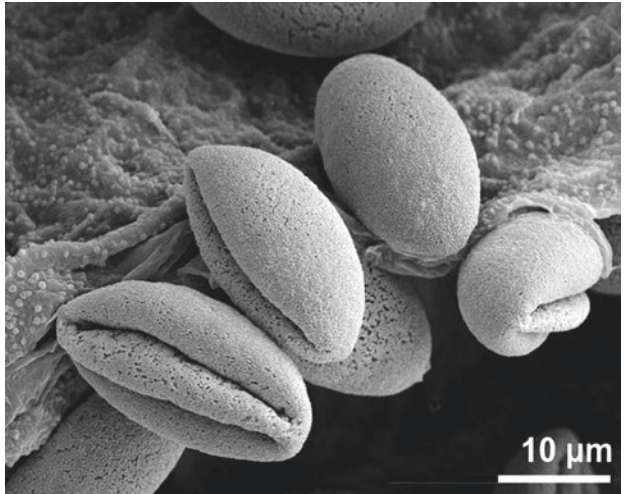
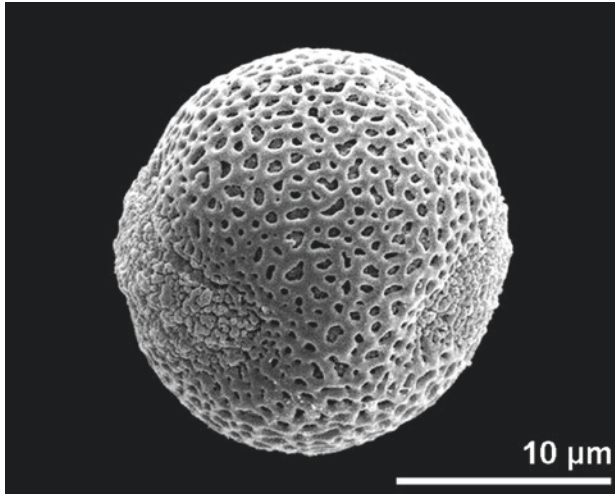
■ ■ *Wachendorfia thyrsiflora*, Haemodoraceae
 ■ ■ equatorial view

■ ■ *Tradescantia zebrina*, Commelinaceae
 ■ ■ additional 2 proximal situated tenuitates, dry pollen

■ ■ *Veratrum album*, Melianthaceae
 ■ ■ dry pollen

sulcus/sulcate, disulcate

disulcate: pollen grain with two sulci



■ ■ *Tofieldia calyculata*, Tofieldiaceae
equatorial view

■ ■ *Xerophyta elegans*, Velloziaceae
dry pollen

■ ■ *Uvularia grandiflora*, Colchicaceae
equatorial view

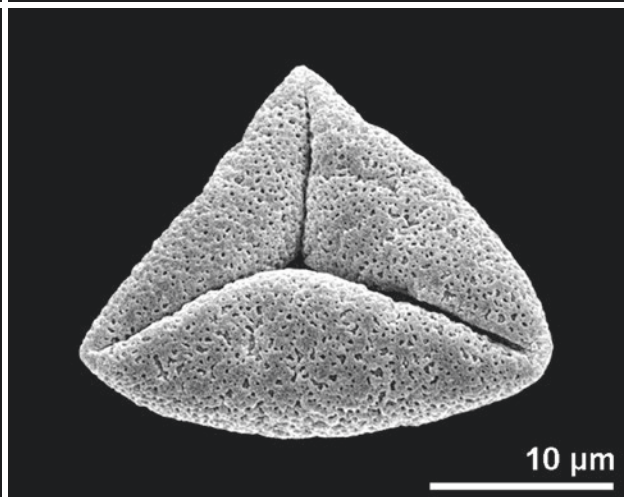
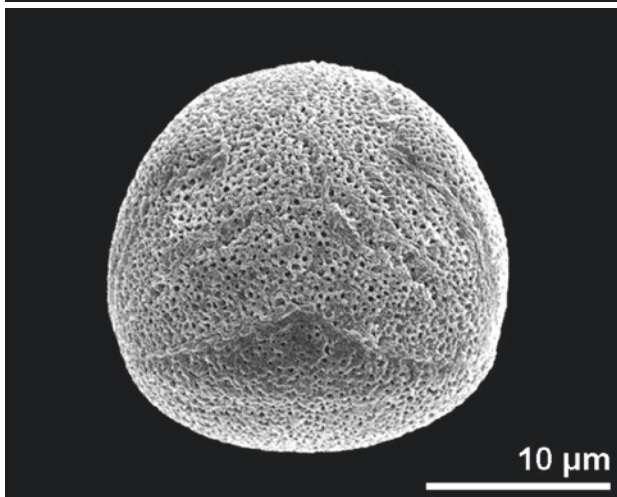
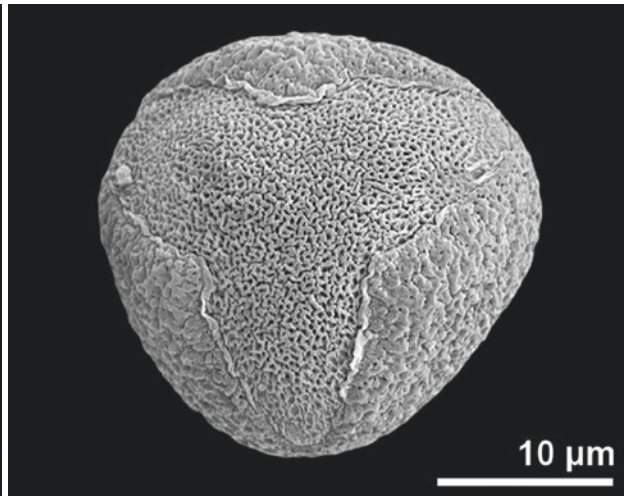
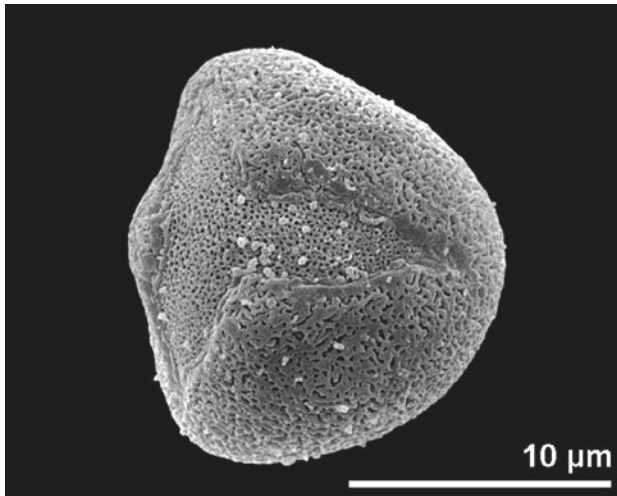
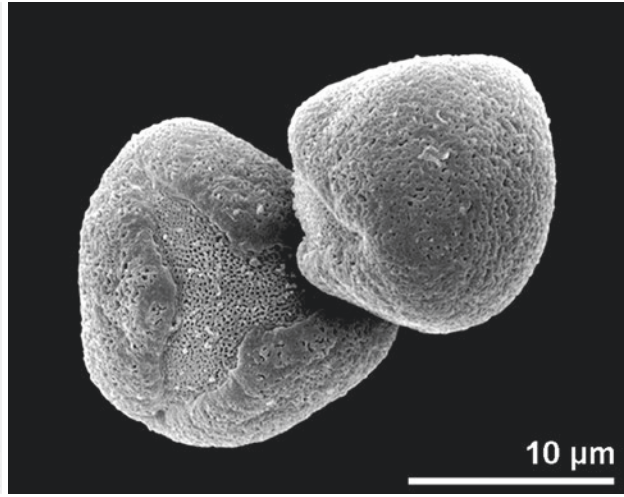
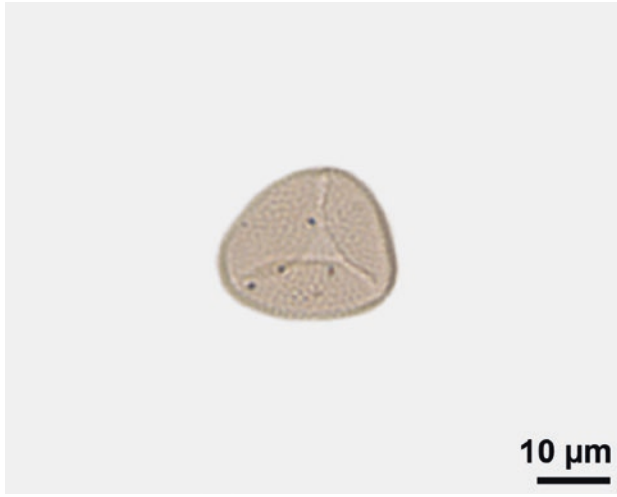
■ ■ *Uvularia grandiflora*, Colchicaceae
dry pollen

■ ■ *Eichhornia crassipes*, Pontederiaceae
dry pollen

■ ■ *Crinum x amabile*, Amaryllidaceae
dry pollen

sulcus/sulcate, trichotomosulcate

trichotomosulcus/trichotomosulcate: 3-radiate sulcus



■ *Areaceae*
fossil, early Miocene, South Africa

■ *Dianella intermedia*, Xanthorrhoeaceae
oblique distal polar view

■ *Dianella tasmanica*, Xanthorrhoeaceae
distal polar view

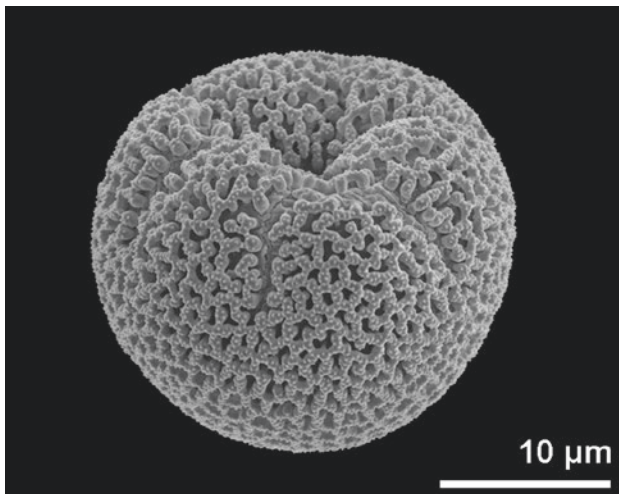
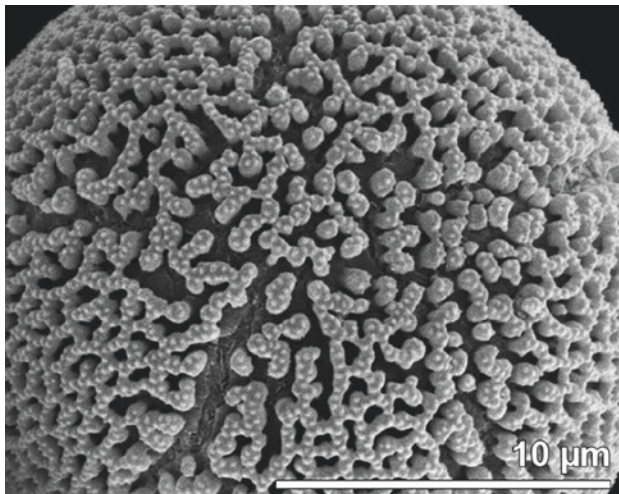
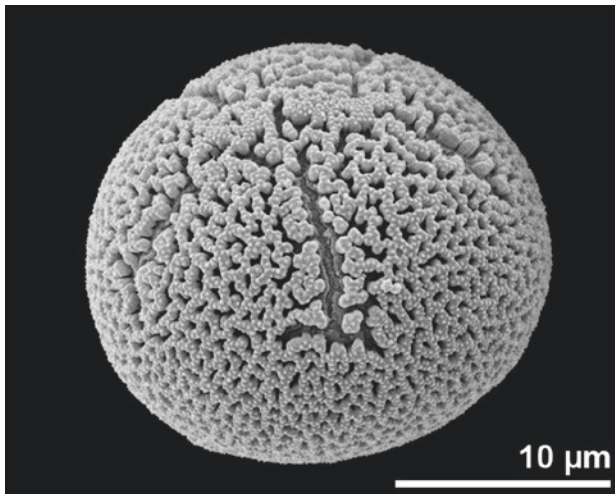
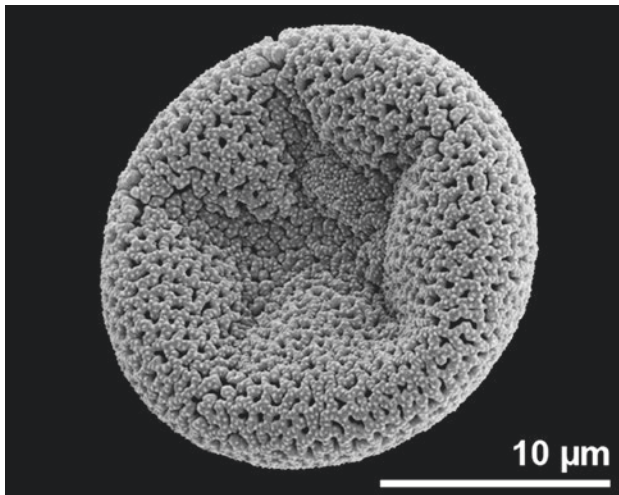
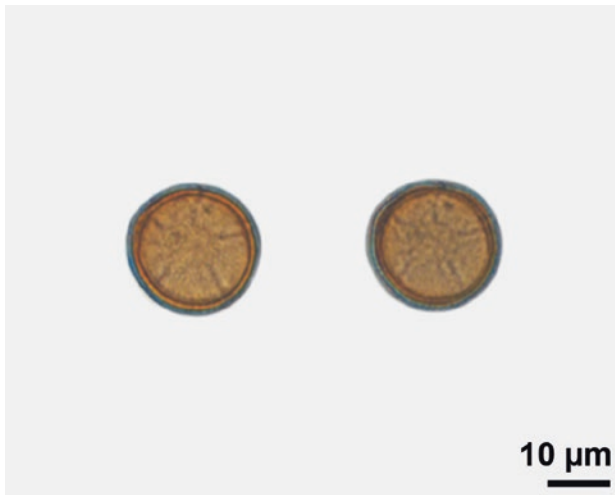
■ *Dianella intermedia*, Xanthorrhoeaceae

■ *Dianella caerulea*, Xanthorrhoeaceae
distal polar view

■ *Dianella tasmanica*, Xanthorrhoeaceae
distal polar view, dry pollen

sulcus/sulcate, polychotomosulcate

polychotomosulcus/polychotomosulcate: sulcus with more than three arms



■ ■ *Hedyosmum scaberrimum*, Chloranthaceae
polar view

■ ■ *Hedyosmum scaberrimum*, Chloranthaceae
oblique equatorial view

■ ■ *Hedyosmum brasiliense*, Chloranthaceae
polar view

■ ■ *Hedyosmum scaberrimum*, Chloranthaceae
distal polar view, dry pollen

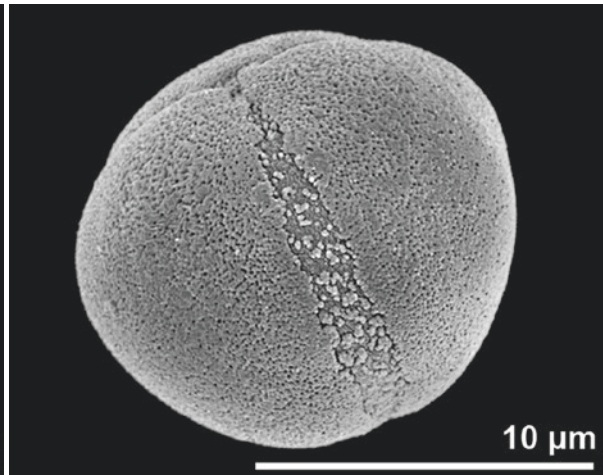
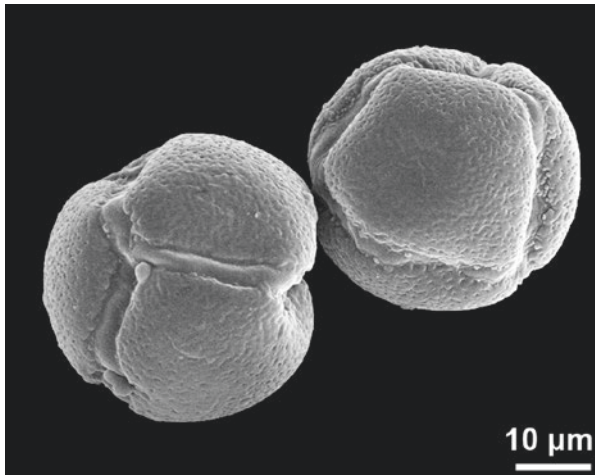
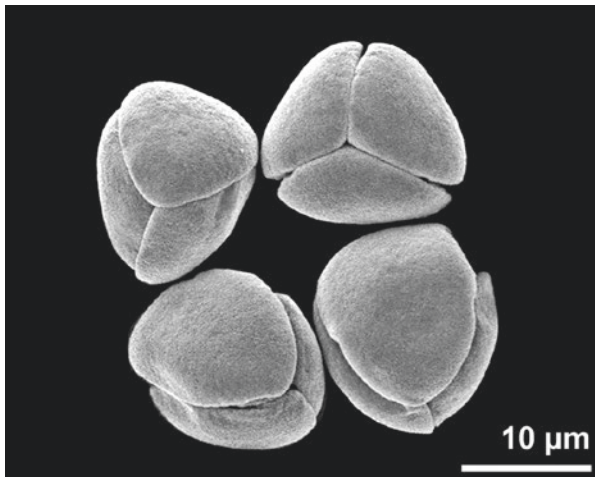
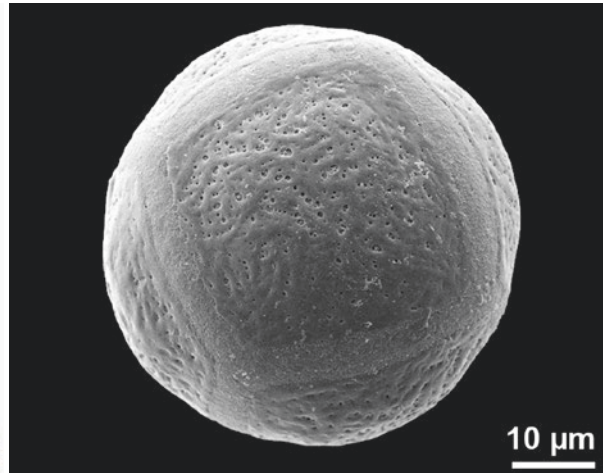
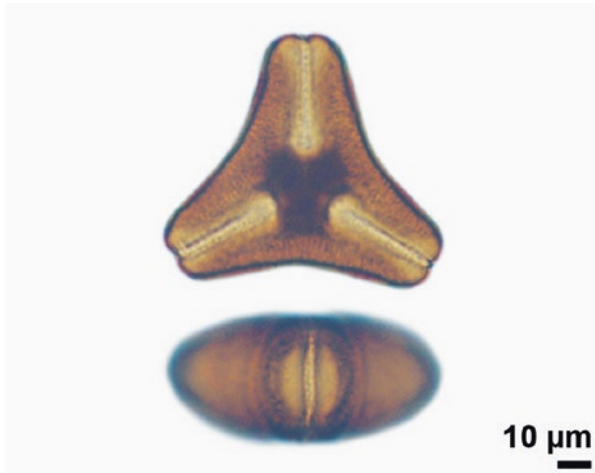
■ ■ *Hedyosmum scaberrimum*, Chloranthaceae
close-up

■ ■ *Hedyosmum brasiliense*, Chloranthaceae
oblique equatorial view

synaperturate, syncolpate, syncolporate

synaperturate: pollen grain with anastomosing apertures

syncolpate: pollen grain with anastomosing colpi



■ *Aetanthus macranthus*, Loranthaceae
polar and equatorial view

■ *Pedicularis verticillata*, Orobanchaceae
dry pollen

■ *Berberis nervosa*, Berberidaceae
dry pollen

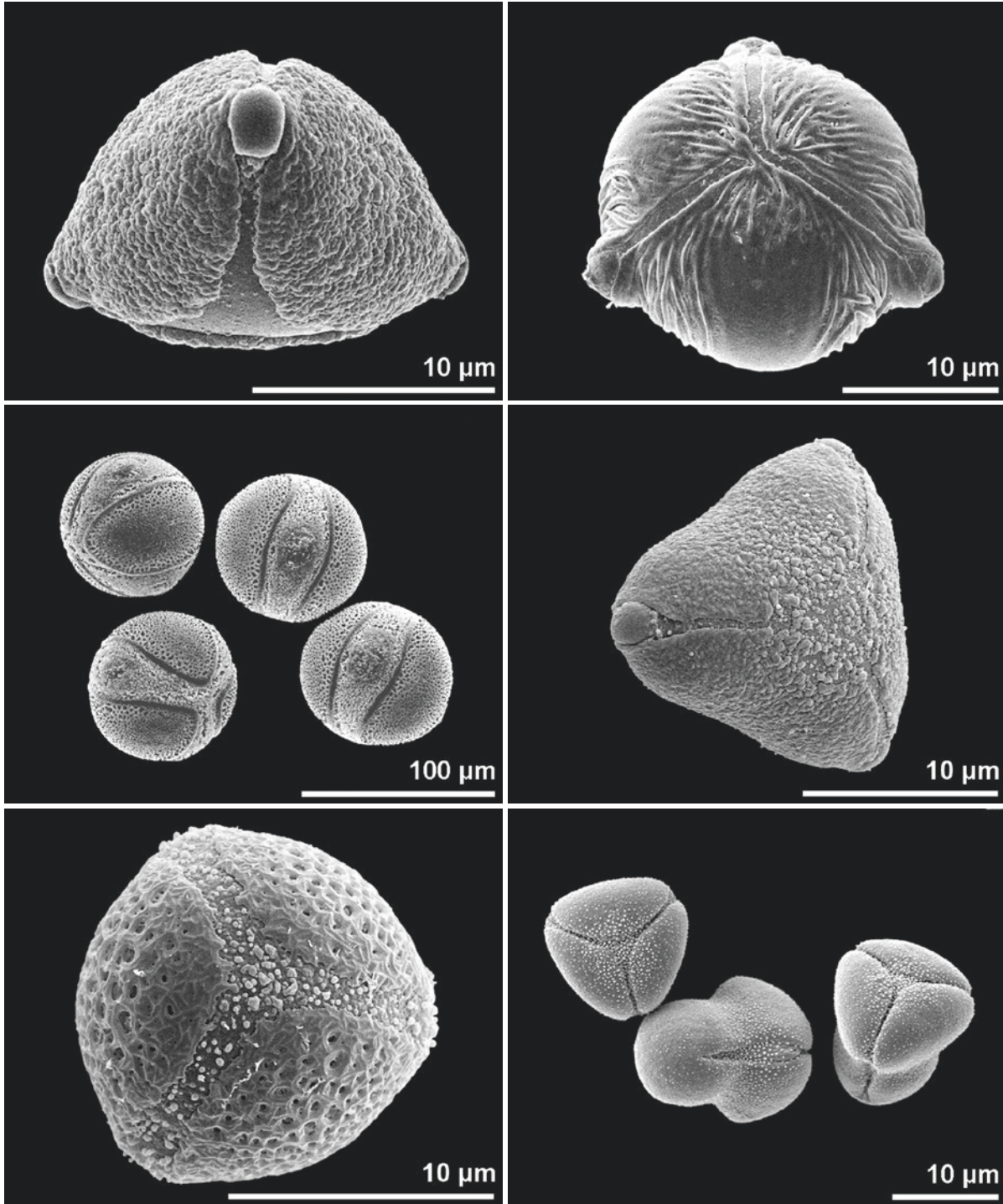
■ *Pseudofumaria lutea*, Papaveraceae

■ *Barringtonia asiatica*, Lecythidaceae
dry pollen

■ *Dodecatheon meadia*, Primulaceae
oblique equatorial view

synaperturate, syncolporate

syncolporate: pollen grain with anastomosing colpi



■ *Callistemon coccineus*, Myrtaceae
equatorial view

■ *Cassia pulcherrima*, Fabaceae

■ *Ardisia crenata*, Primulaceae
polar view

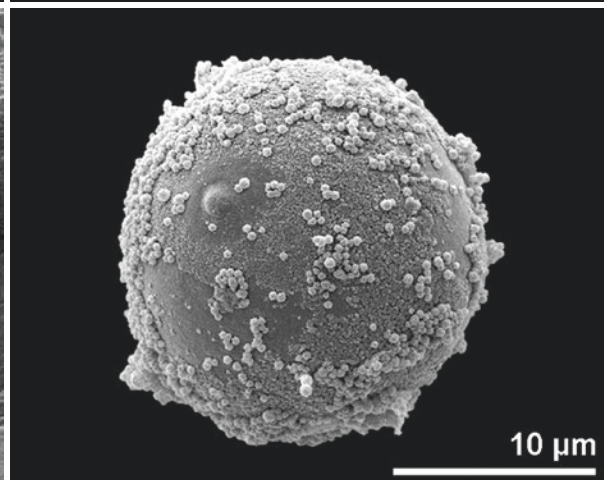
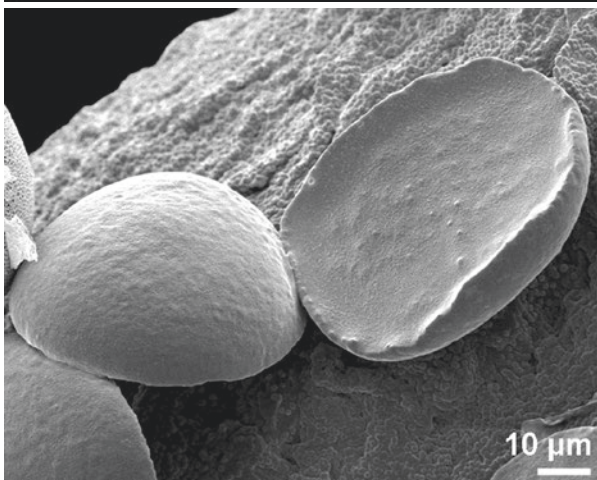
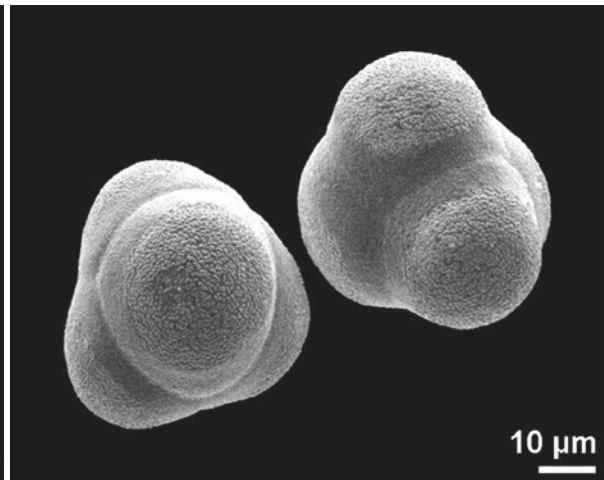
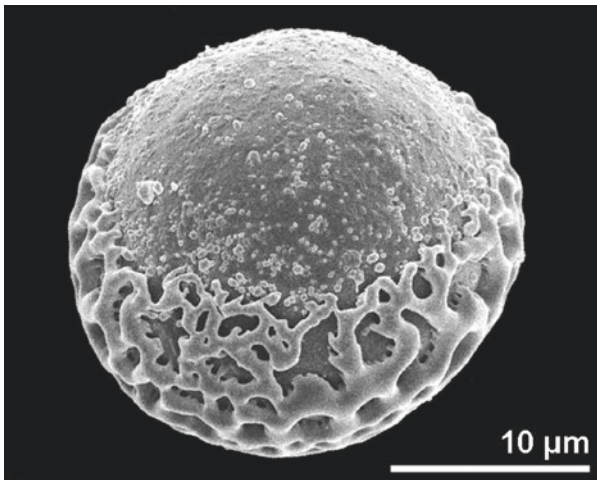
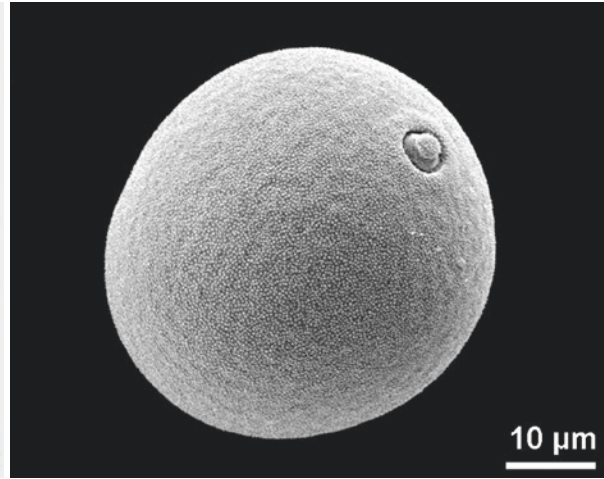
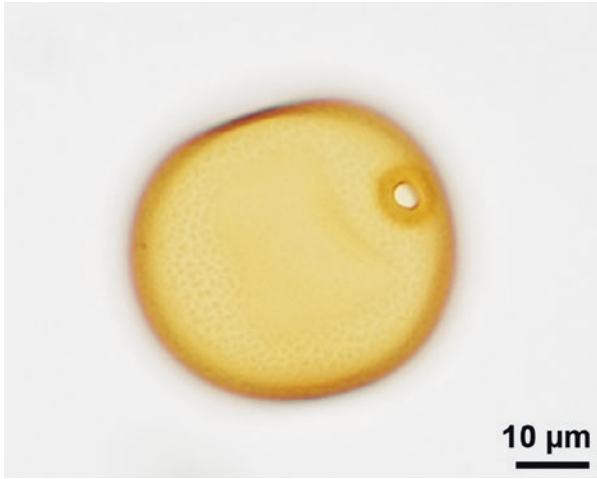
■ *Cuphea procumbens*, Lythraceae
polar view

■ *Myrtus communis*, Myrtaceae
polar view

■ *Onosma visianii*, Boraginaceae
dry pollen

ulcus/ulcerate

more or less circular aperture located distally



■ Poaceae
■ oblique equatorial view

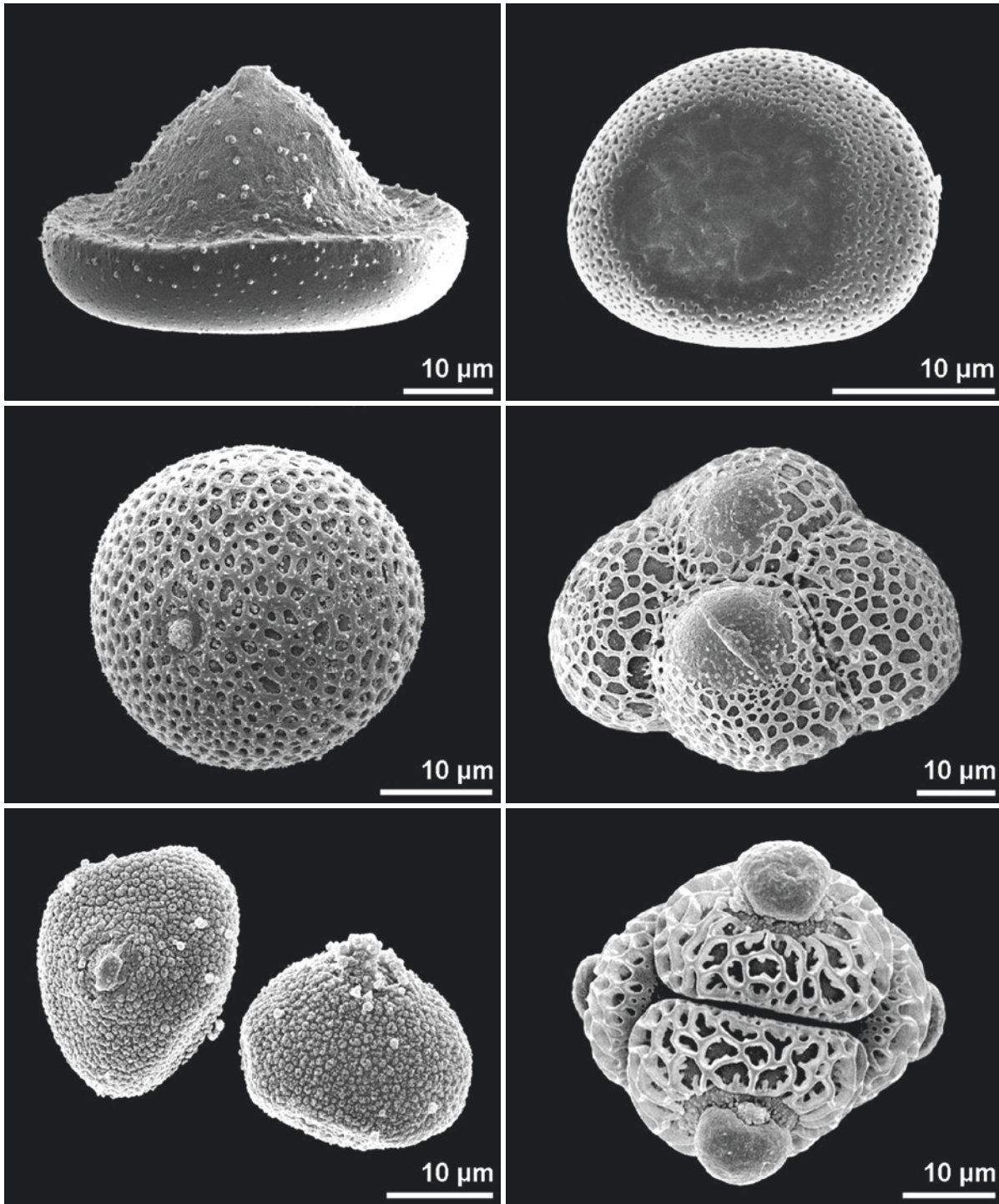
■ *Cephalanthera longifolia*, Orchidaceae
■ oblique distal polar view

■ *Sansevieria parva*, Asparagaceae
■ dry pollen

■ *Bromus erectus*, Poaceae
■ oblique equatorial view

■ *Luzula luzuloides*, Juncaceae
■ tetrads

■ *Juniperus communis*, Cupressaceae
■ distal polar view



■ *Heliconia* sp., Heliconiaceae
equatorial view, dry pollen

■ *Sparganium erectum*, Typhaceae
distal polar view

■ *Amborella trichopoda*, Amborellaceae

■ *Cyrtosperma beccarianum*, Araceae
distal polar view

■ *Neottia nidus-avis*, Orchidaceae
tetrad

■ *Drimys granadensis*, Winteraceae
tetrad

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