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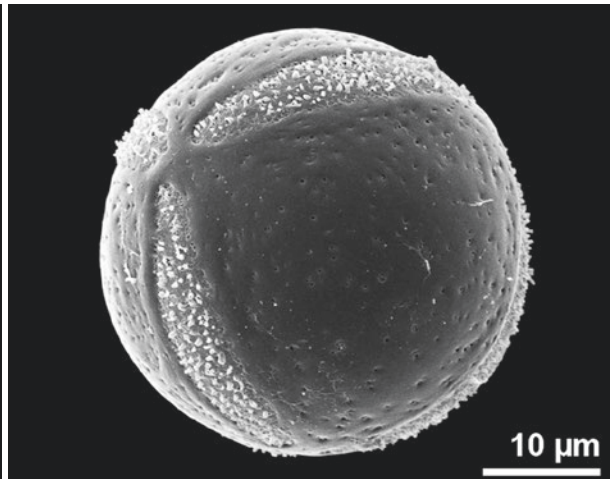
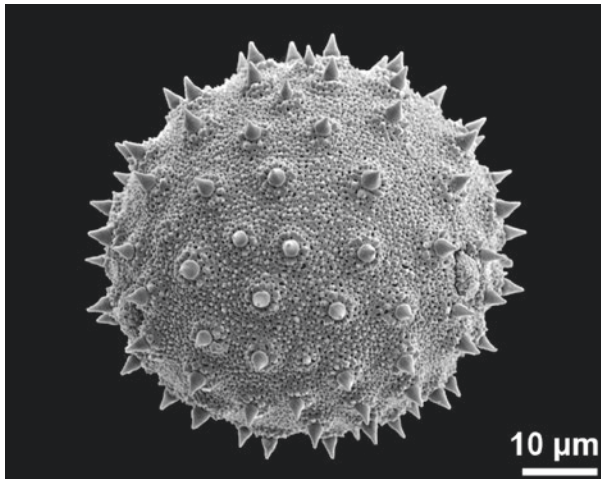
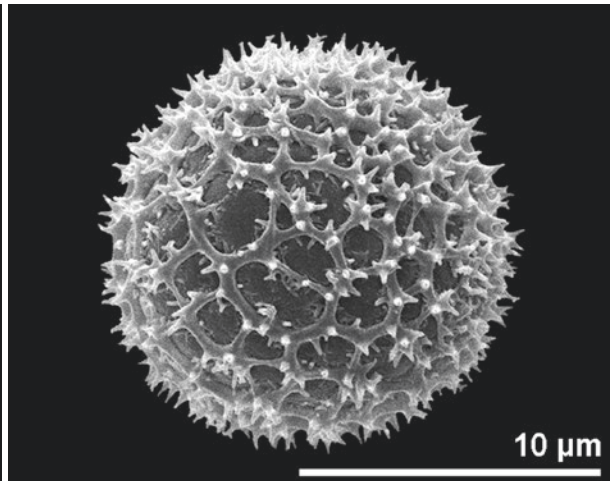
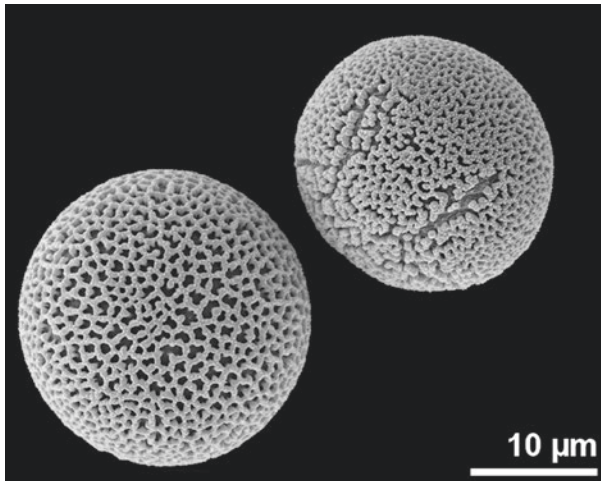
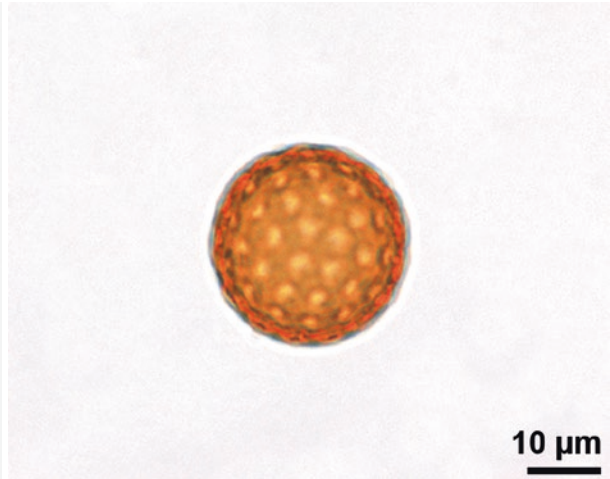
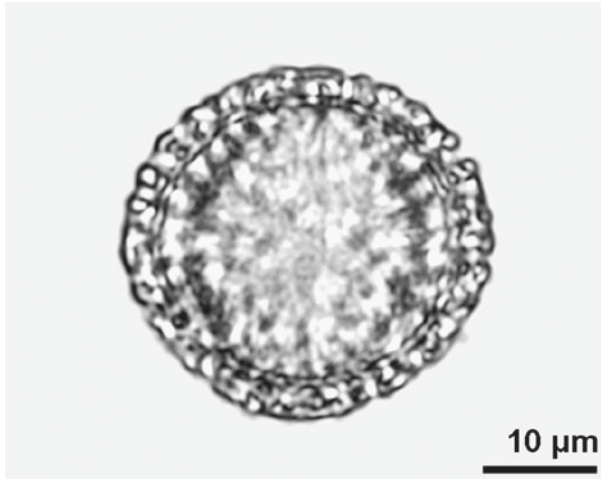
infoldings, cup-shaped – 199

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outline circular

outline describes the contour of pollen grains in polar and/or equatorial view



■ *Ligustrum* sp., Oleaceae
fossil, middle Miocene, Austria, equatorial view

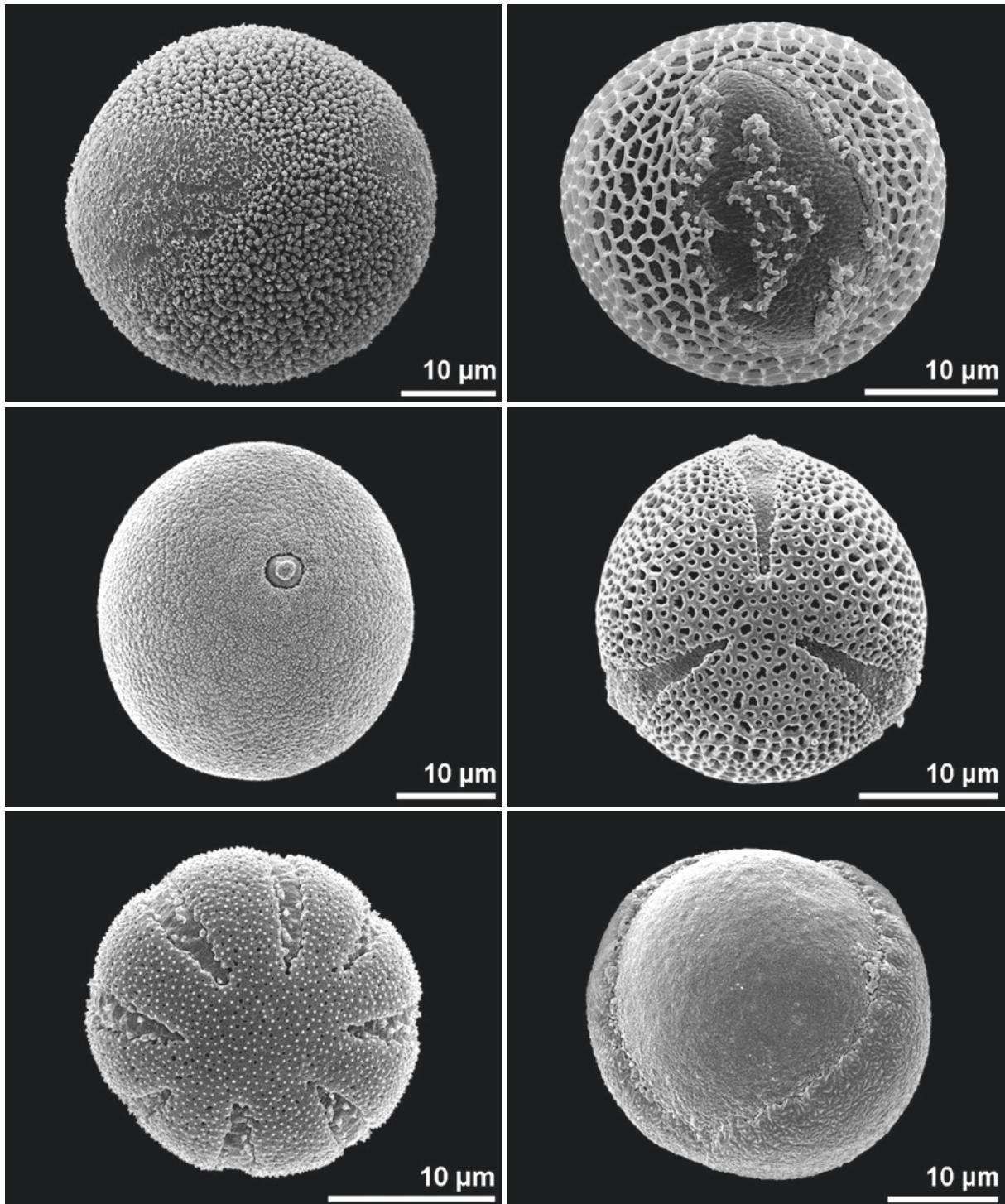
■ *Hedyosmum scaberrimum*, Chloranthaceae
polychotomosulcate

■ *Abutilon theophrasti*, Malvaceae
triporate, equatorial view

■ Chenopodiaceae

■ *Anthurium ovatifolium*, Araceae
porate

■ *Corydalis ophiocarpa*, Papaveraceae
hexacolpate



■ *Mayna odorata*, Achariaceae
dicolpate, polar view

■ *Phleum pratense*, Poaceae
ulcerate, distal polar view

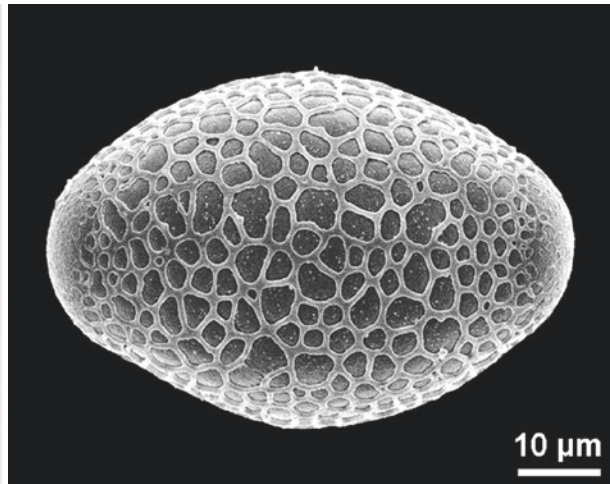
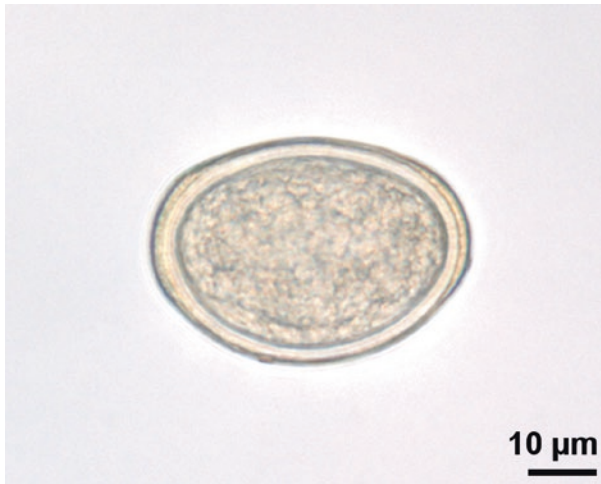
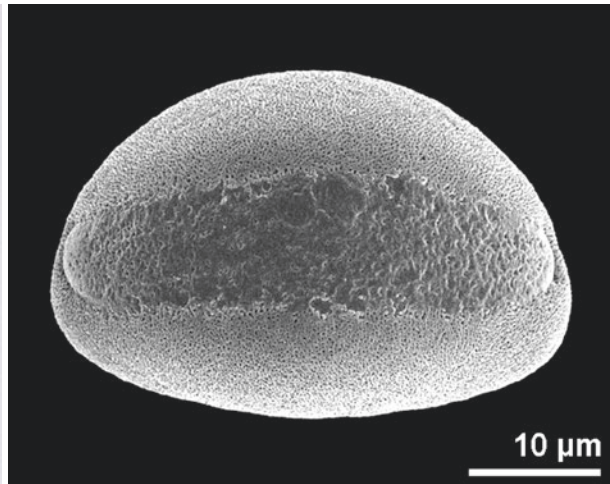
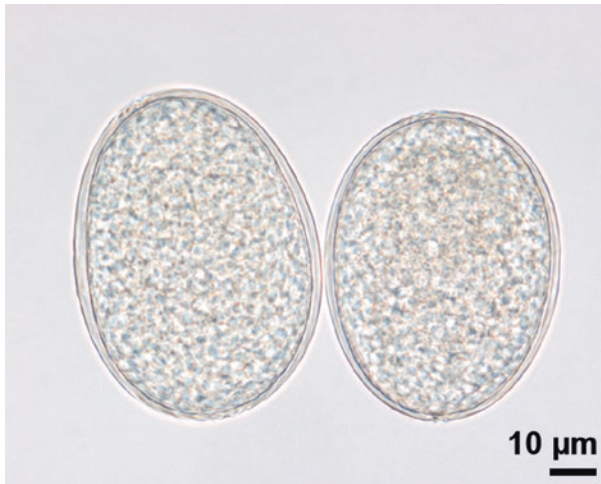
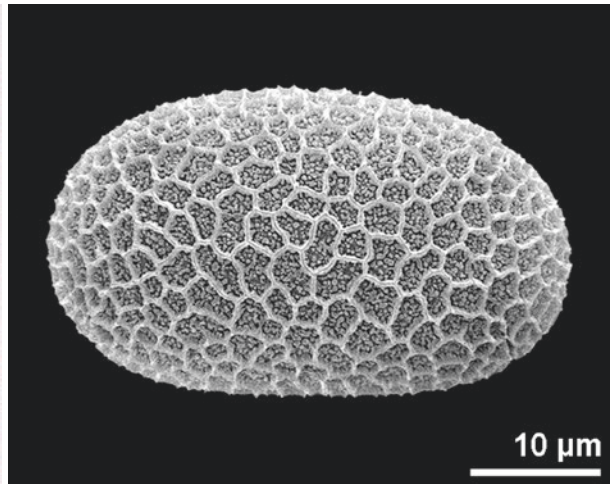
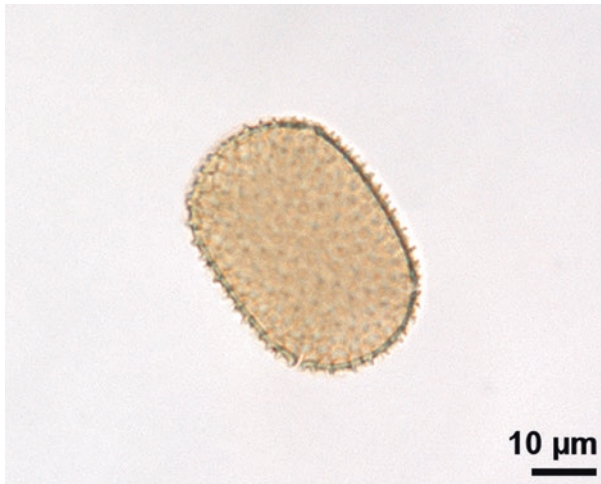
■ *Galium lucidum*, Rubiaceae
stephanocolpate, polar view

■ *Saruma henryi*, Aristolochiaceae
sulcate, distal polar view

■ *Fraxinus ornus*, Oleaceae
tricolpate, polar view

■ *Ginkgo biloba*, Ginkgoaceae
sulcate, oblique distal polar view

outline elliptic



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

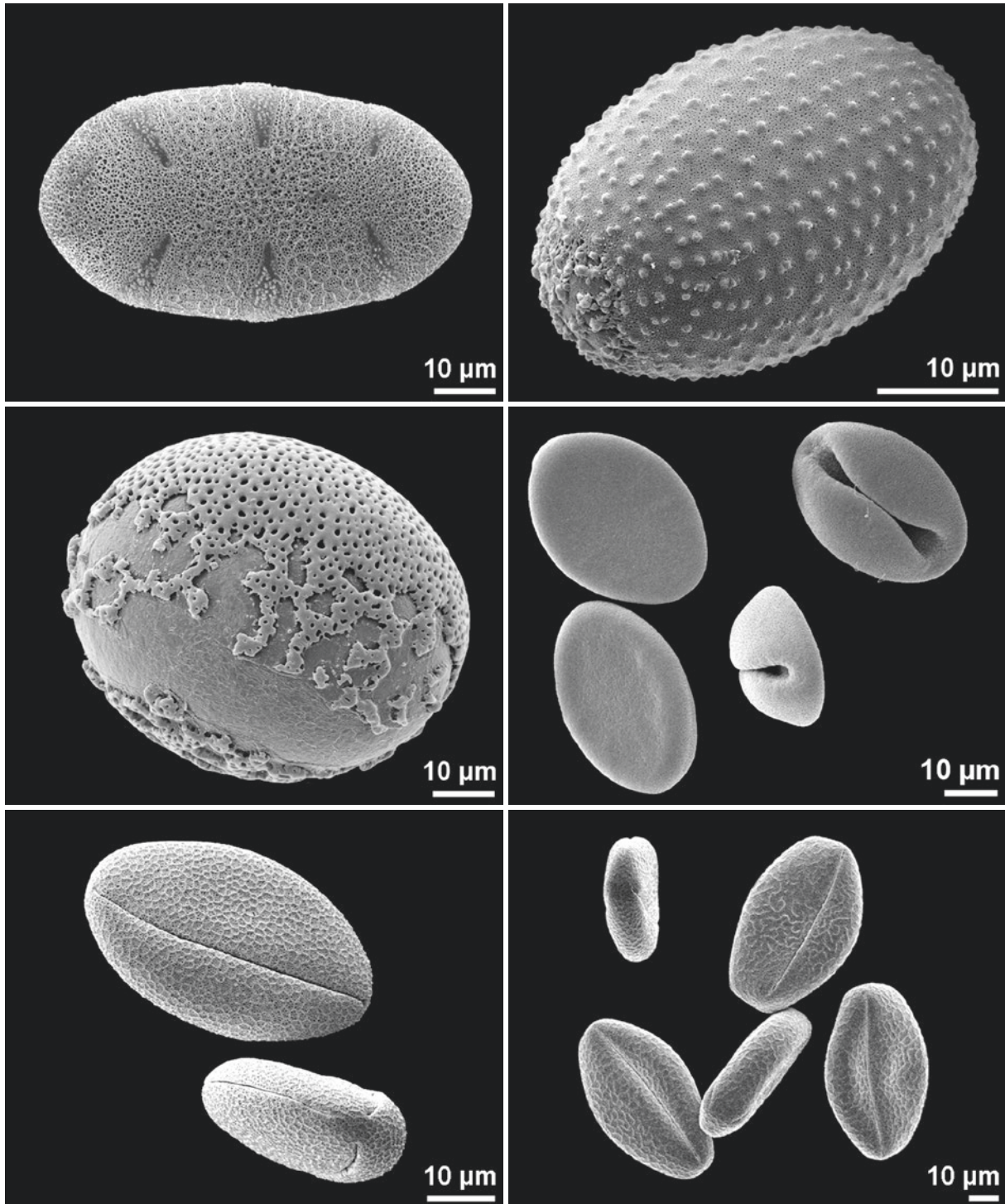
■ *Amorphophallus interruptus*, Araceae
 □ inaperturate, hydrated pollen

■ *Ambrosina bassi*, Araceae
 □ inaperturate, hydrated pollen

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

■ *Allium oleraceum*, Amaryllidaceae
 □ sulcate, distal polar view

■ *Aechmea dealbata*, Bromeliaceae
 □ diporate



■ *Salvia coccinea*, Lamiaceae
hexacolpate, polar view

■ *Billbergia porteana*, Bromeliaceae
sulcate, distal polar view

■ *Galeopsis tetrahit*, Lamiaceae
tricolpate, dry pollen

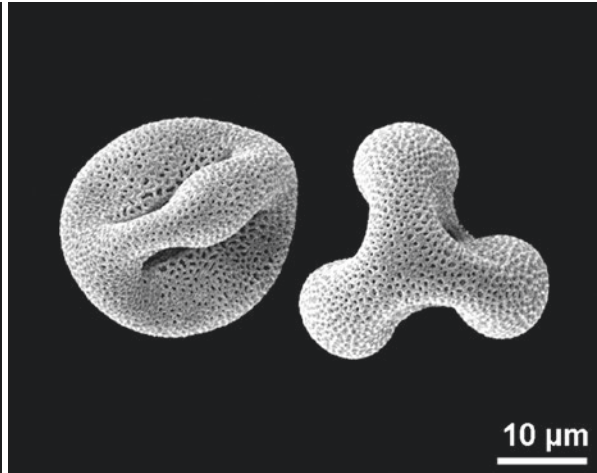
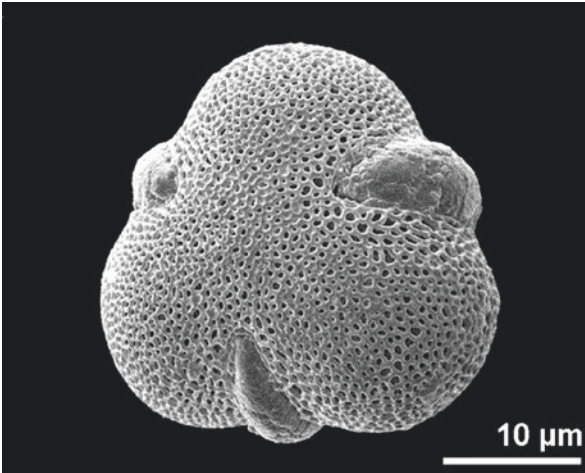
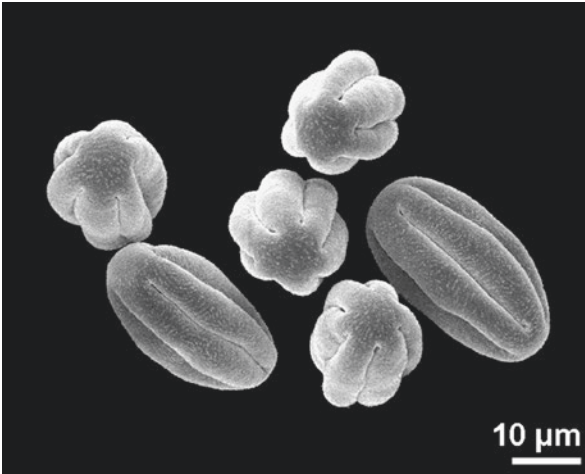
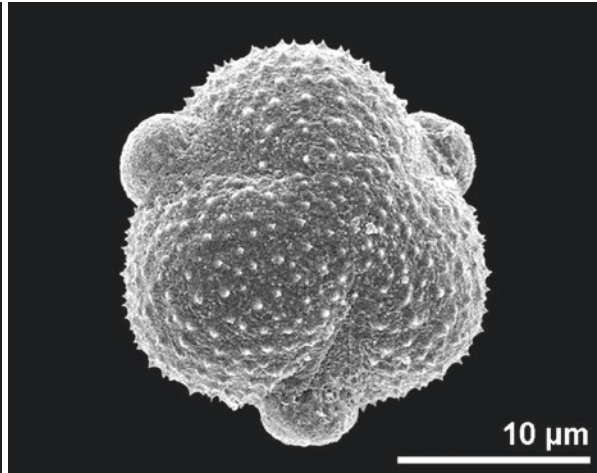
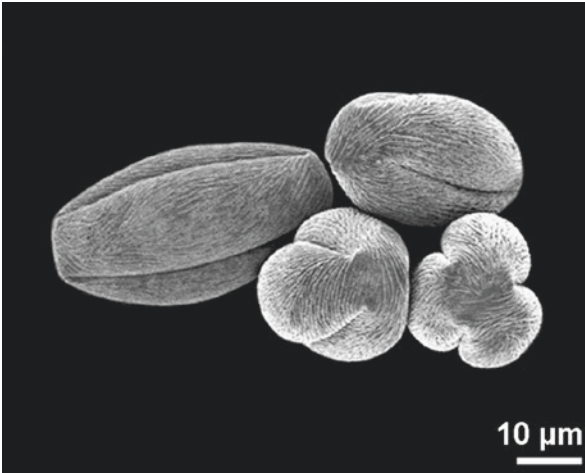
■ *Commelina erecta*, Commelinaceae
sulcate, proximal polar view

■ *Zamia loddigesii*, Zamiaceae
sulcate, dry pollen

■ *Physostegia virginiana*, Lamiaceae
tricolpate, dry pollen

outline lobate

outline in polar view of a pollen grain with bulged interapertural areas (mainly in dry pollen grains)



■ *Acer pseudoplatanus*, Sapindaceae
 ■ tricolpate, dry pollen

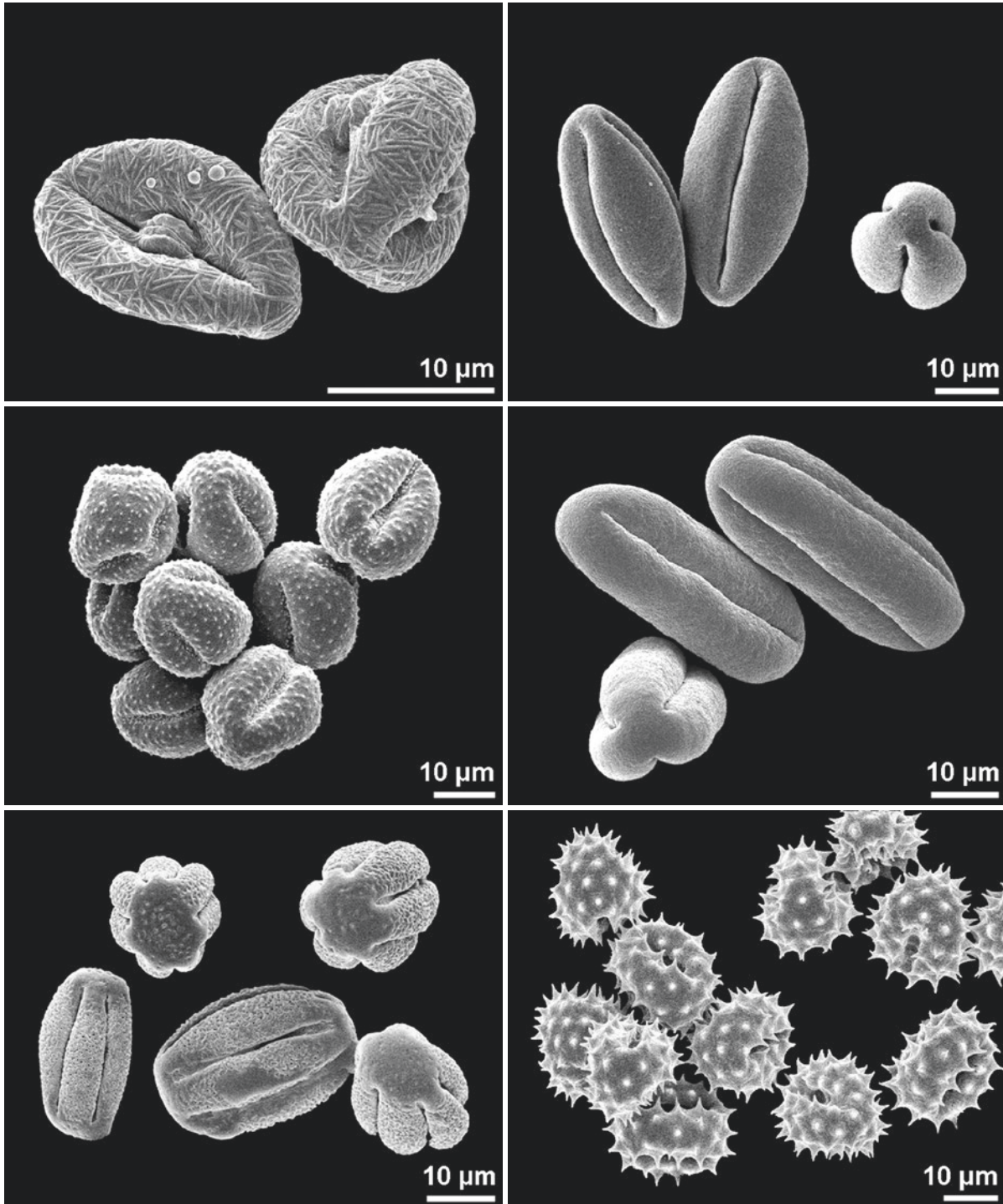
■ *Sangisorba officinalis*, Rosaceae
 ■ hexacolporate, dry pollen

■ *Gunnera tinctoria*, Gunneraceae
 ■ tricolpate, polar view

■ *Artemisia pontica*, Asteraceae
 ■ tricolporate, polar view

■ *Orthilia secunda*, Ericaceae
 ■ tricolporate, dry pollen

■ *Gunnera tinctoria*, Gunneraceae
 ■ dry pollen, equatorial (left) and polar view (right)



■ *Sedum rupestre*, Crassulaceae
tricolporate, dry pollen

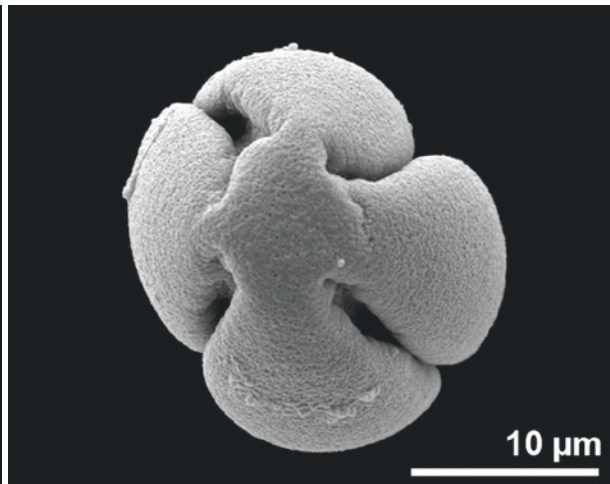
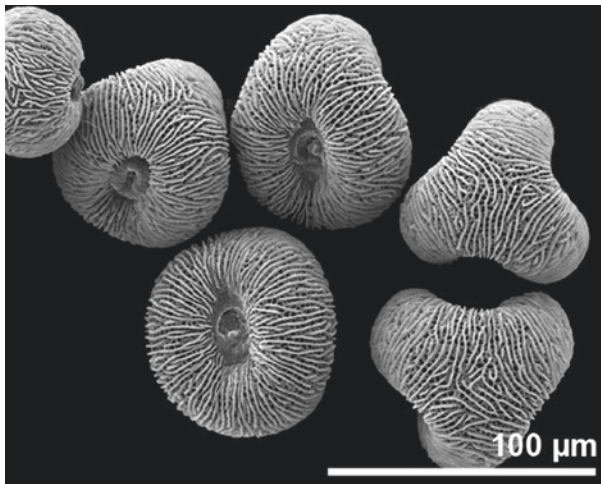
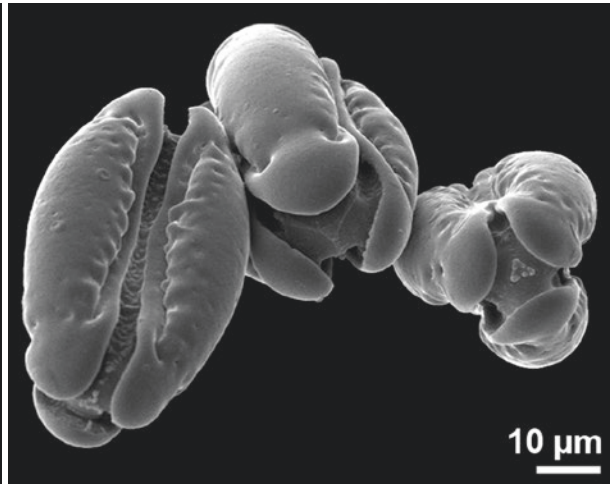
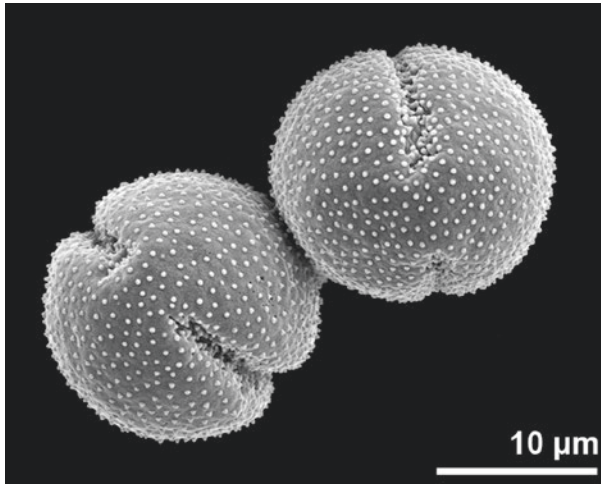
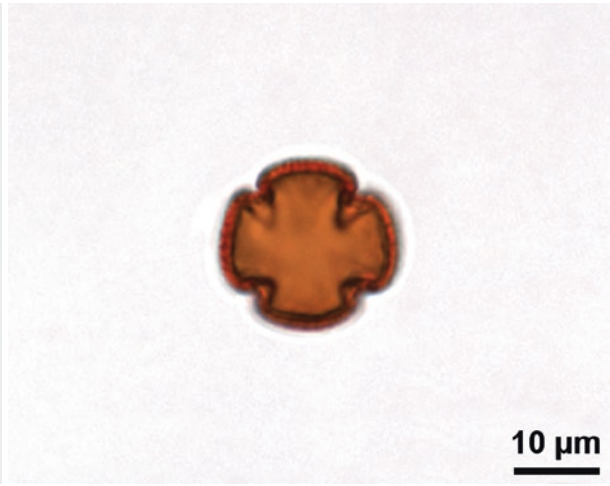
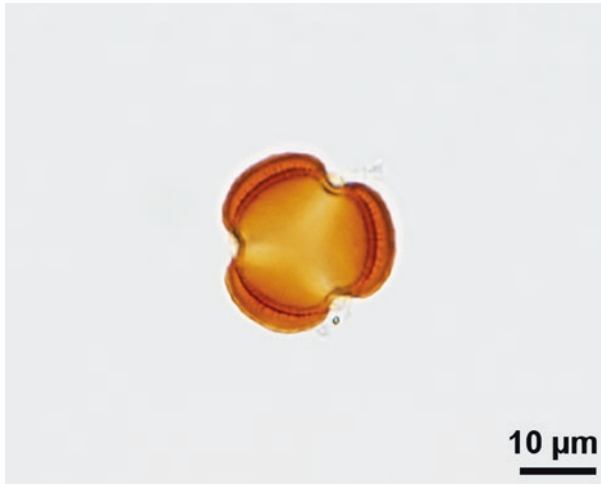
■ *Clematis heracleifolia*, Ranunculaceae
tricolpate, dry pollen

■ *Pinguicula ehlersiae*, Lentibulariaceae
stephanocolporate, dry pollen

■ *Viola alba*, Violaceae
tricolporate, dry pollen

■ *Sanicula europaea*, Apiaceae
tricolporate, dry pollen

■ *Bellis perennis*, Asteraceae
tricolporate, dry pollen



■ ■ *Artemisia* sp., Asteraceae
tricolpate, polar view

■ ■ *Nicotiana tabacum*, Solanaceae
tetracolpate, polar view

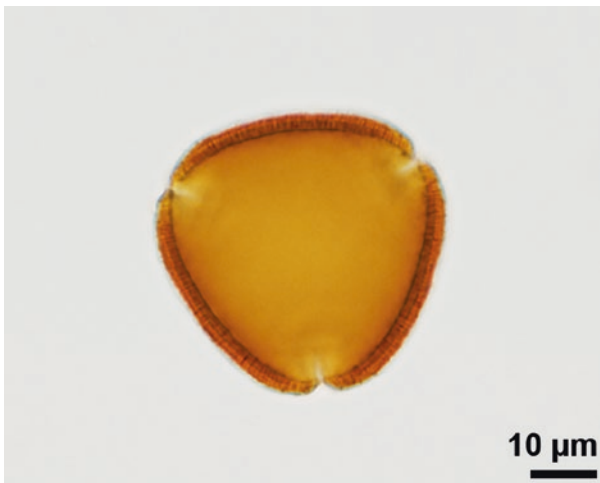
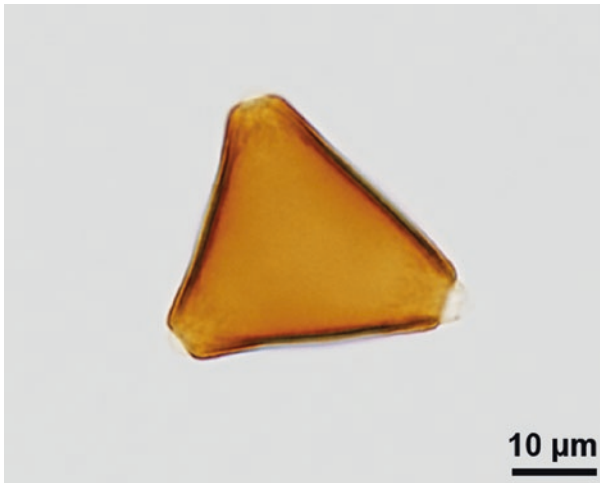
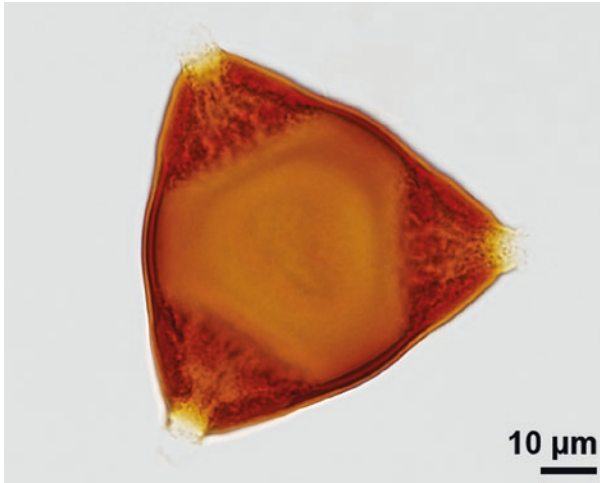
■ ■ *Hypecoum imberbe*, Papaveraceae
dicolpate, polar view

■ ■ *Barringtonia asiatica*, Lecythidaceae
tricolpate, dry pollen

■ ■ *Pelargonium punctatum*, Geraniaceae
tricolpate, dry pollen

■ ■ *Viola riviniana*, Violaceae
tetracolpate, dry pollen

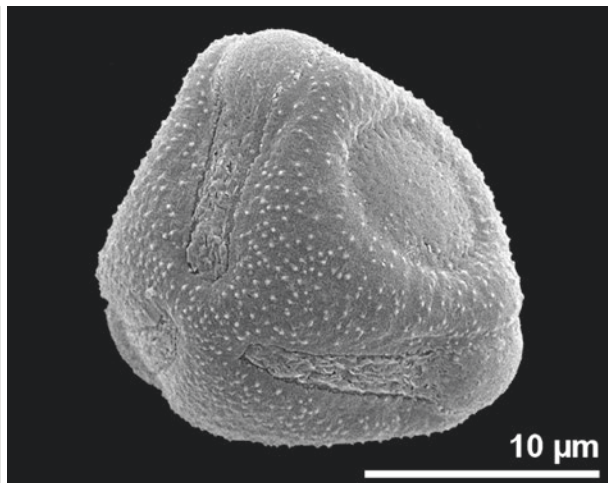
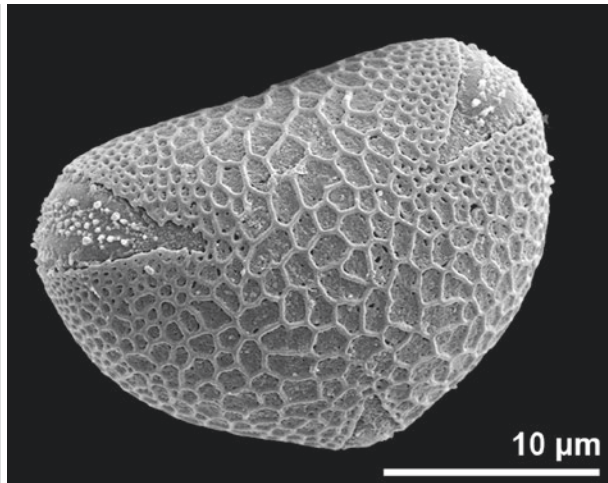
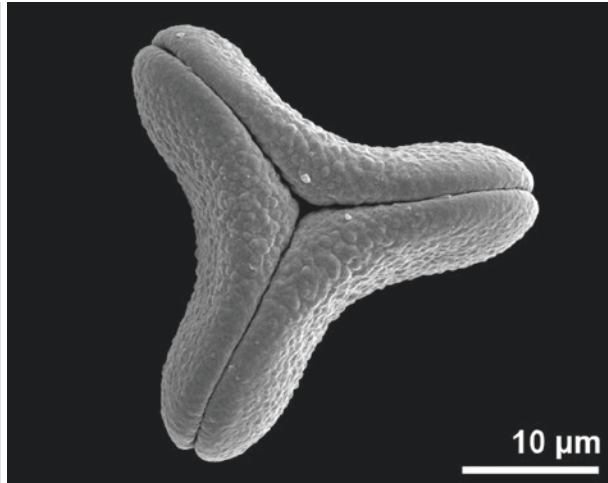
outline triangular



■ ■ ■ *Lopezia racemosa*, Onagraceae
triporate, polar view

■ ■ ■ *Macadamia ternifolia*, Proteaceae

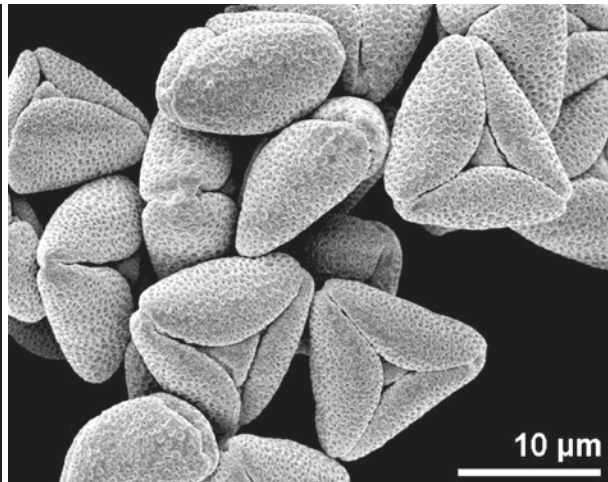
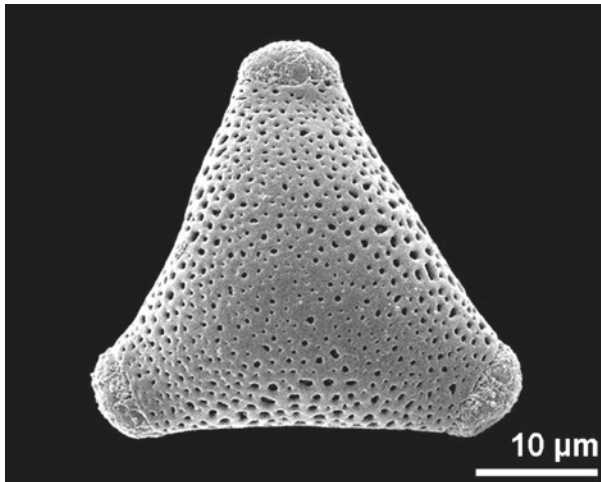
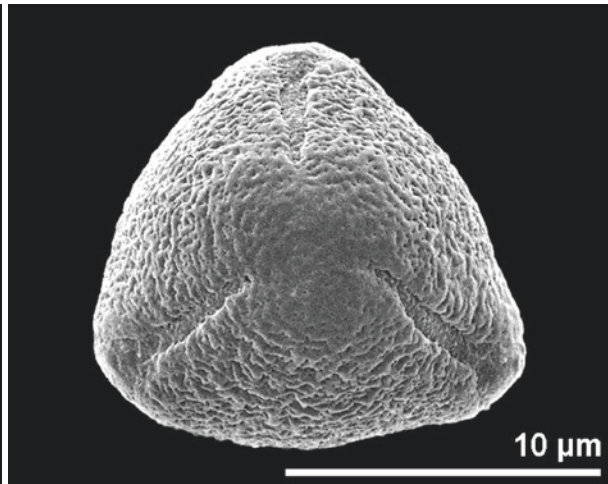
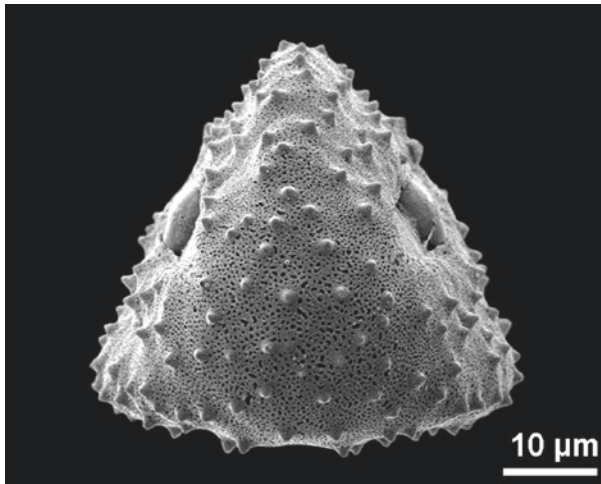
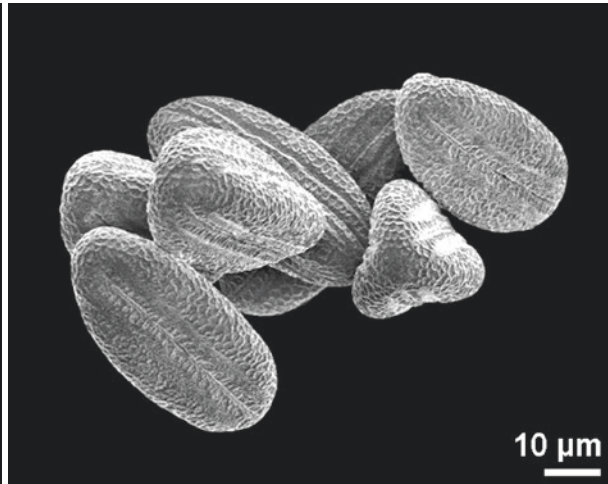
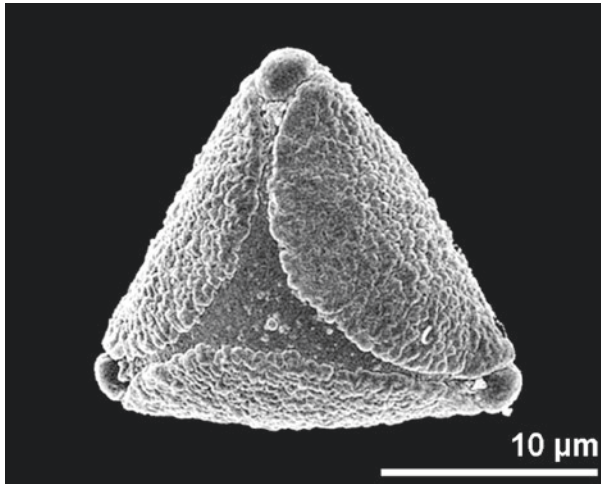
■ ■ ■ *Kolkwitzia amabilis*, Caprifoliaceae



■ ■ ■ *Loranthus europaeus*, Loranthaceae
syncolpate, polar view, dry pollen

■ ■ ■ *Tropaeolum emarginatum*, Tropaeolaceae
tricolpate, polar view

■ ■ ■ *Acicarpa tribuloides*, Calyceraceae
tricolpate, oblique polar view



■ ■ *Callistemon coccineus*, Myrtaceae
tricolporate, synaperturate, polar view

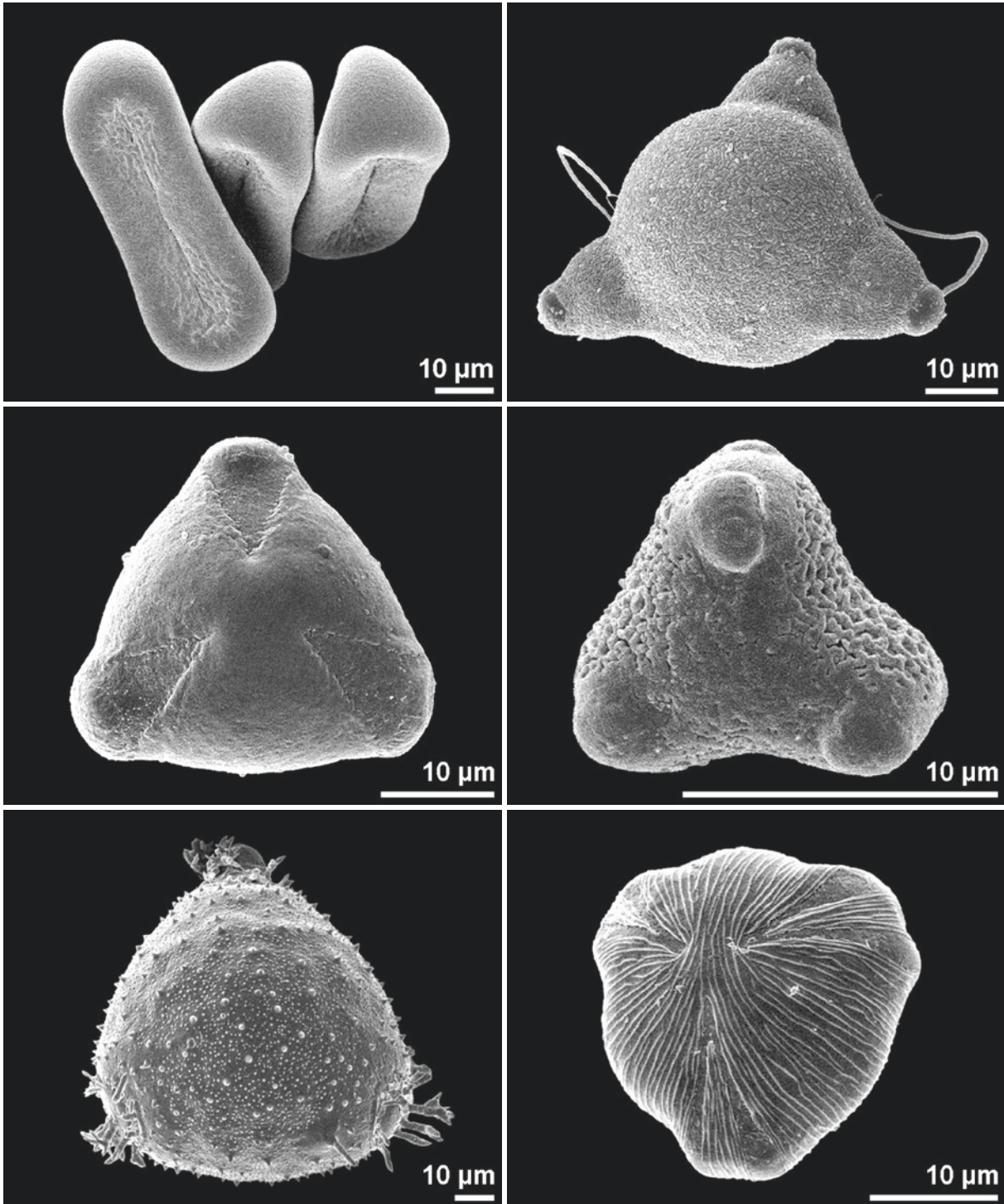
■ ■ *Echinops ritro*, Asteraceae
tricolporate, polar view

■ ■ *Paullinia tomentosa*, Sapindaceae
triporate, polar view

■ ■ *Hypoestes phyllostachya*, Acanthaceae
tricolporate, dry pollen

■ ■ *Bupleurum rotundifolium*, Apiaceae
tricolporate, polar view

■ ■ *Primula denticulata*, Primulaceae
tricolporate, synaperturate, dry pollen



■ ■ *Orlaya grandiflora*, Apiaceae
 ■ ■ tricolporate, dry pollen

■ ■ *Sempervivum globiferum*, Crassulaceae
 ■ ■ tricolporate, polar view

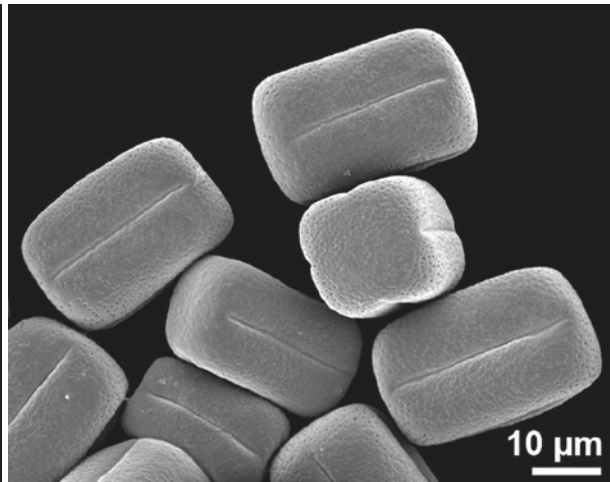
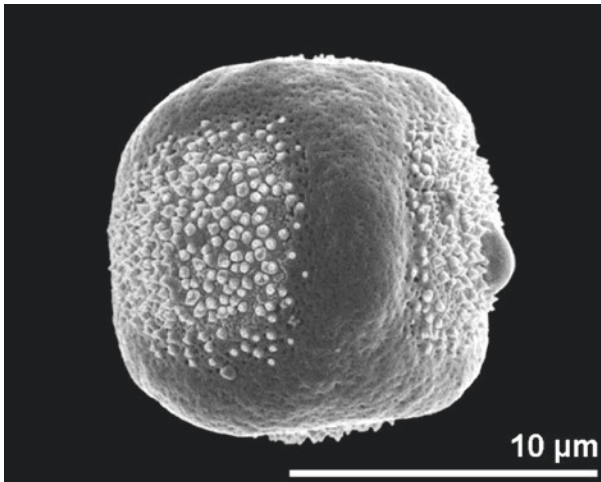
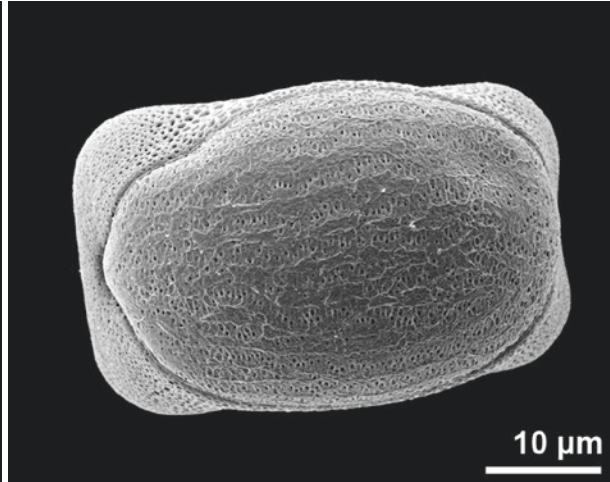
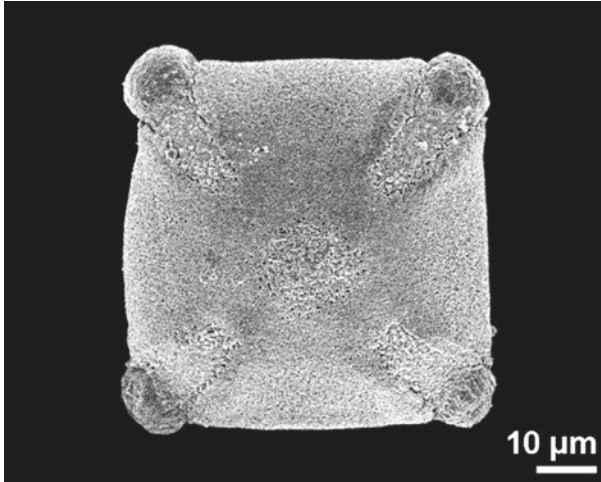
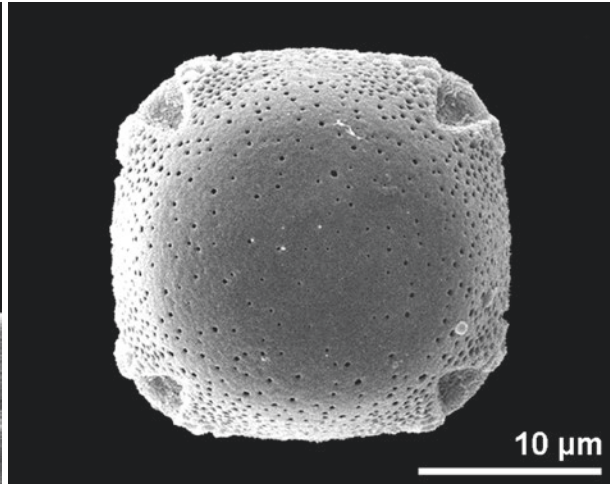
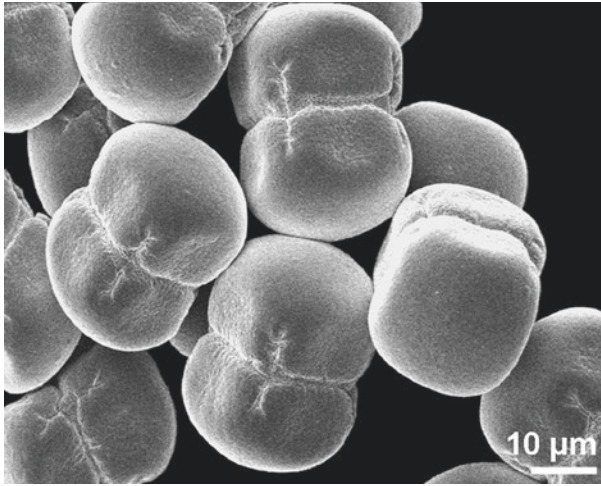
■ ■ *Dipsacus fullonum*, Caprifoliaceae
 ■ ■ triporate, polar view

■ ■ *Circaea lutetiana*, Onagraceae
 ■ ■ triporate, pollen with viscin threads, polar view

■ ■ *Cunonia capensis*, Cunoniaceae
 ■ ■ hexaporate, polar view

■ ■ *Potentilla inclinata*, Rosaceae
 ■ ■ tricolporate, polar view

outline quadrangular



■ ■ *Anchusa officinalis*, Boraginaceae
tetracolporate, dry pollen

■ ■ *Nonea pulla*, Boraginaceae
tetracolporate, polar view

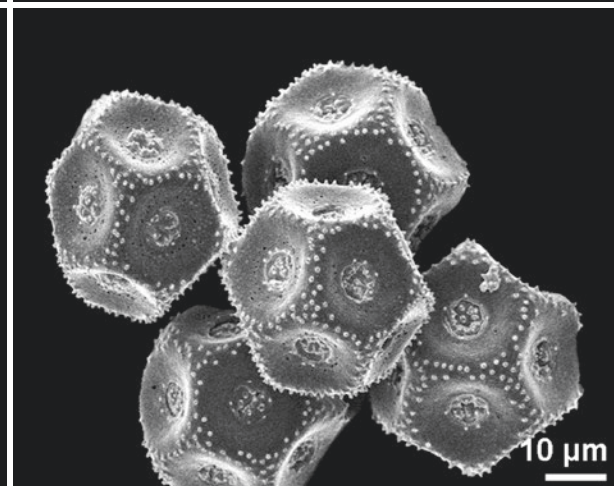
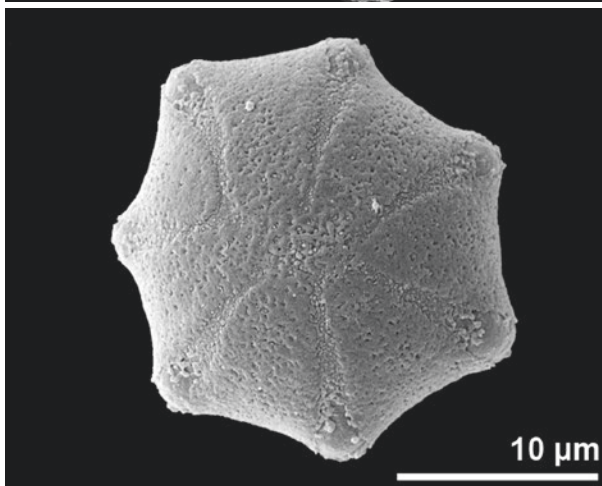
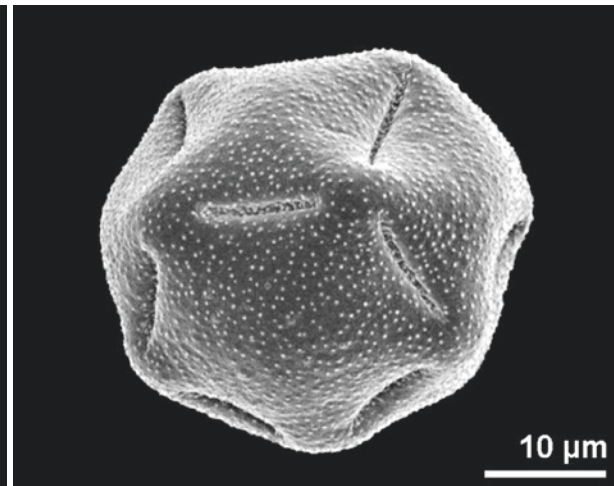
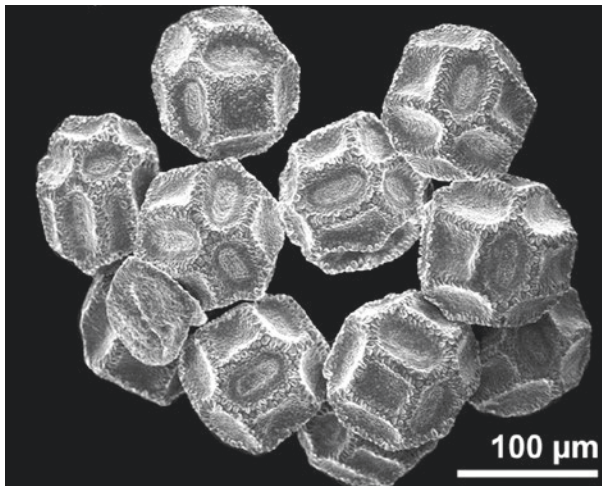
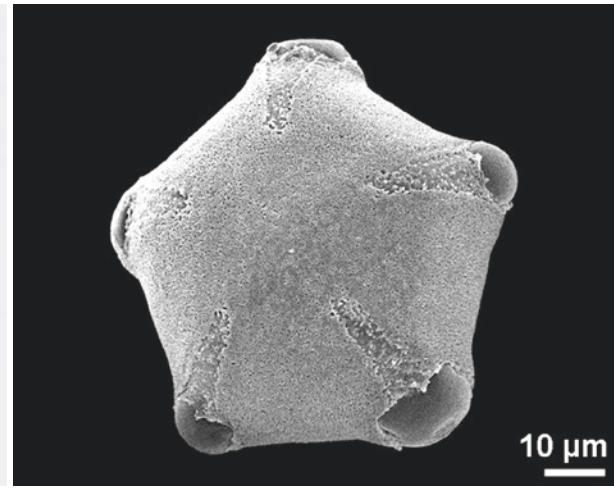
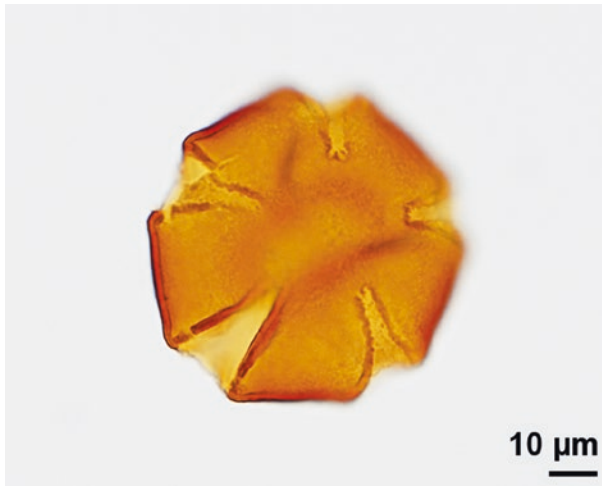
■ ■ *Viola tricolor*, Violaceae
tetracolporate, polar view

■ ■ *Eremurus robustus*, Xanthorrhoeaceae
sulcate, distal polar view

■ ■ *Herniaria glabra*, Caryophyllaceae
hexaporate

■ ■ *Sideritis romana*, Lamiaceae
tetracolporate, dry pollen

outline polygonal



■ *Viola arvensis*, Violaceae
 ■ pentacolpate, polar view

■ *Opuntia basilaris*, Cactaceae
 ■ pantocolpate, dry pollen

■ *Sarracenia alata*, Sarraceniaceae
 ■ stephanocolpate, polar view

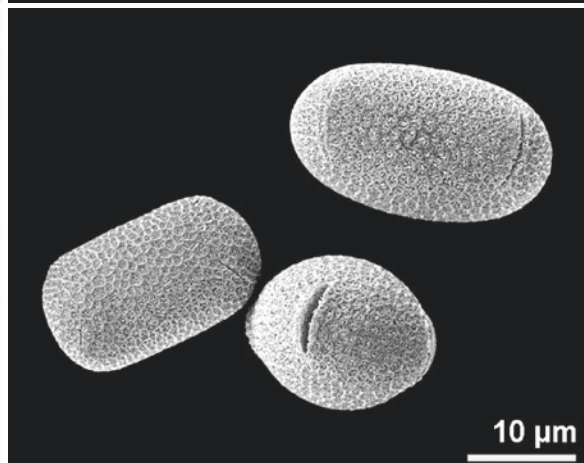
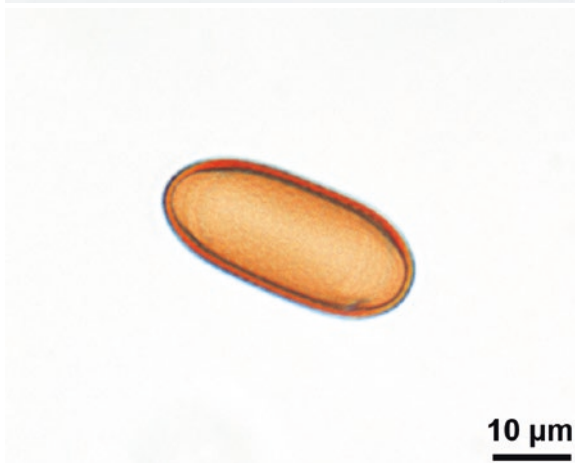
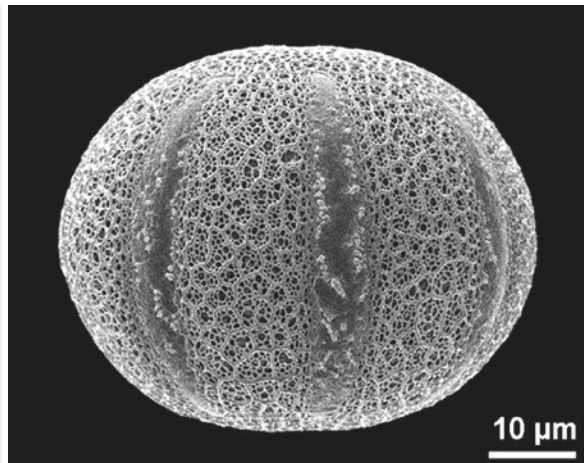
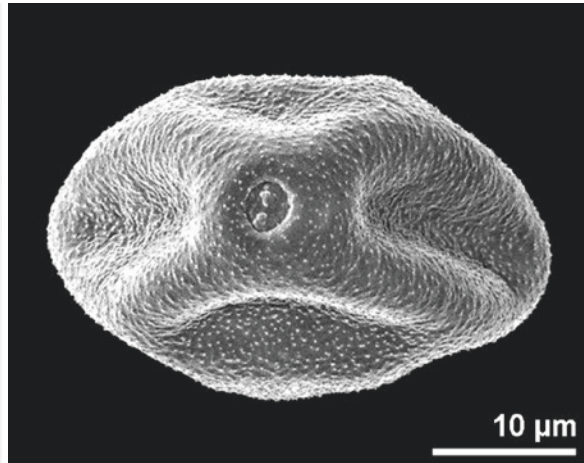
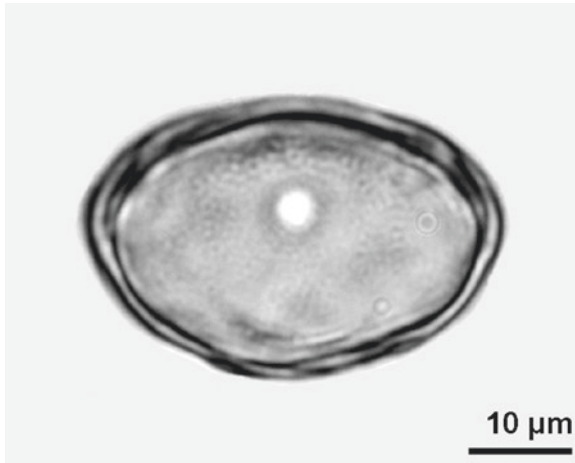
■ *Viola arvensis*, Violaceae
 ■ pentacolpate, polar view

■ *Talinum paniculatum*, Talinaceae
 ■ pantocolpate, dry pollen

■ *Stellaria holostea*, Caryophyllaceae
 ■ pantoporate, dry pollen

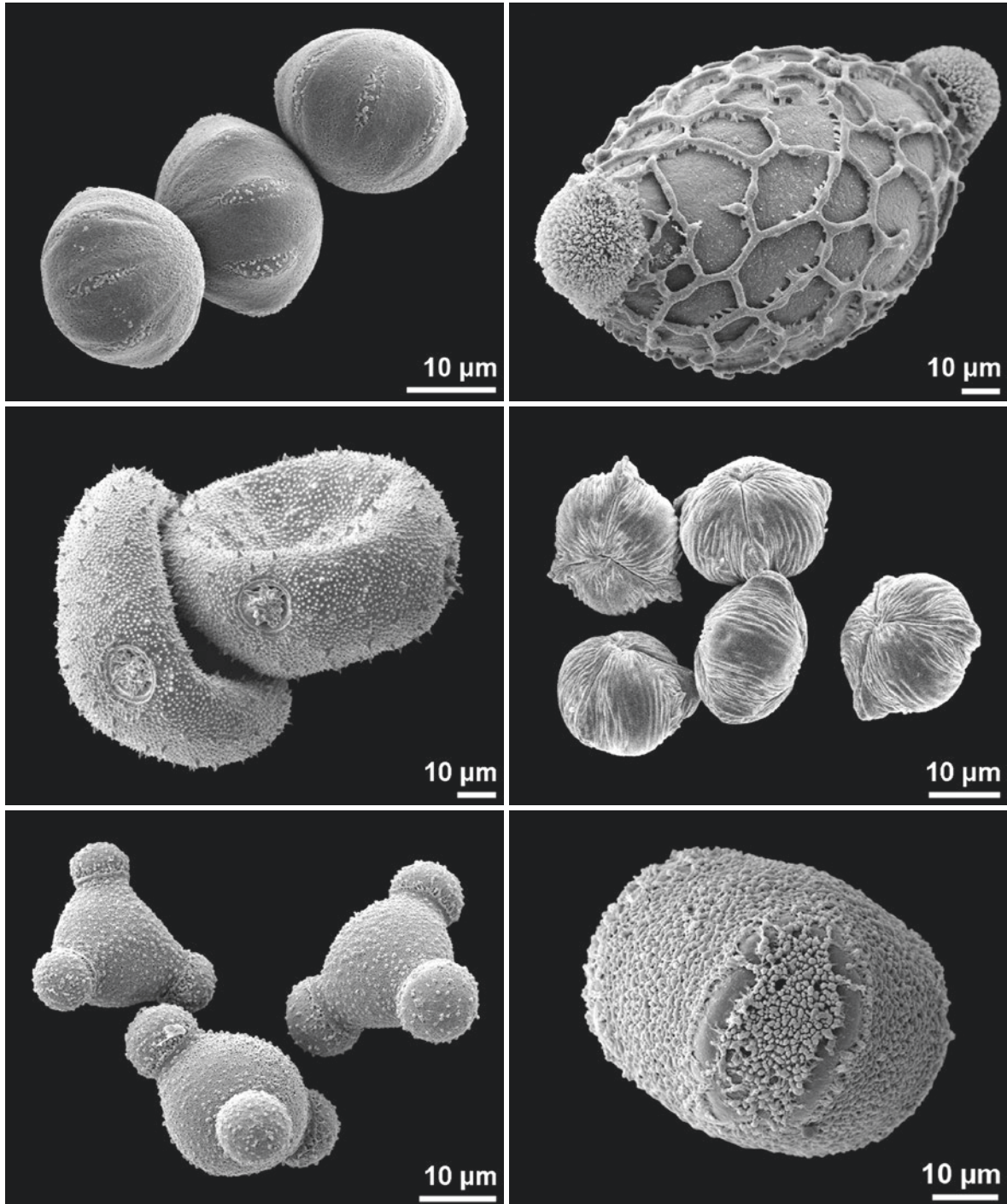
P/E-ratio, oblate

P/E-ratio refers to the length of the polar axis between the two poles compared to the equatorial diameter
 oblate: pollen grain with a polar axis shorter than the equatorial diameter



- ■ *Carya* sp., Juglandaceae
fossil, middle Miocene, Austria, triporate, equatorial view
- ■ *Plectranthus esculentus*, Lamiaceae
hexacolpate, equatorial view
- ■ *Impatiens* sp., Balsaminaceae
tetracolpate, equatorial view

- ■ *Corylus avellana*, Betulaceae
triporate, equatorial view, dry pollen
- ■ *Salvia argentea*, Lamiaceae
hexacolpate, equatorial view
- ■ *Impatiens glandulifera*, Balsaminaceae
tetracolpate



■ ■ *Sarracenia alata*, Sarraceniaceae
stephanocolporate

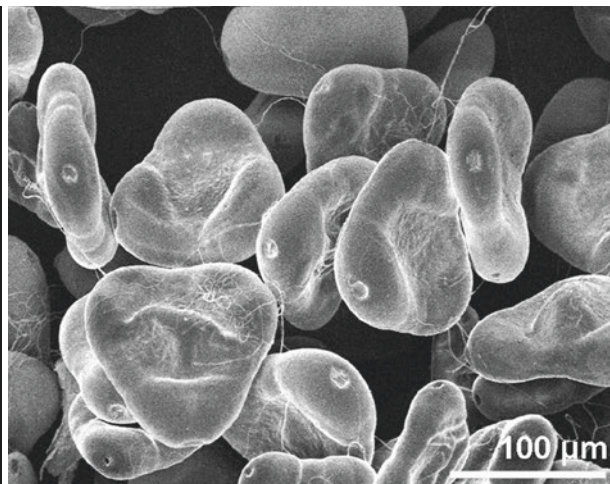
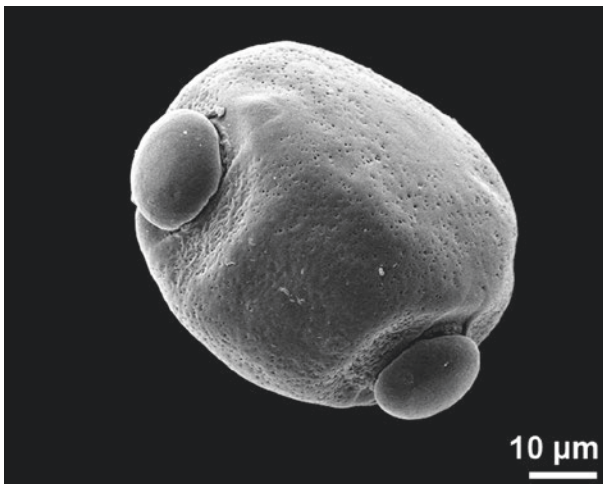
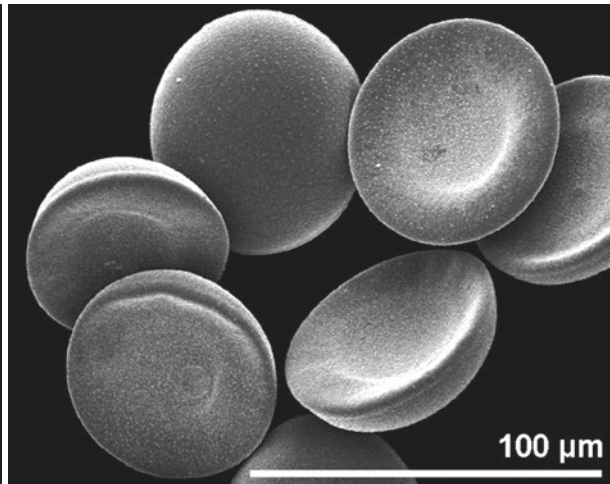
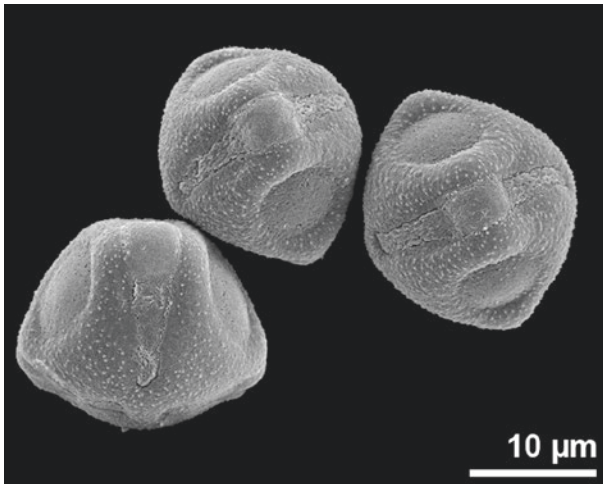
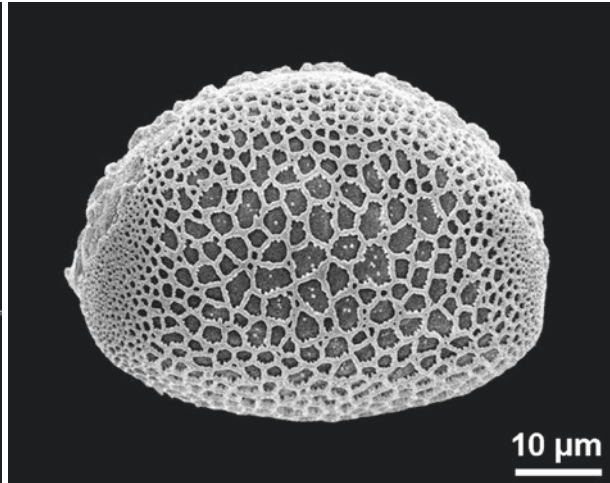
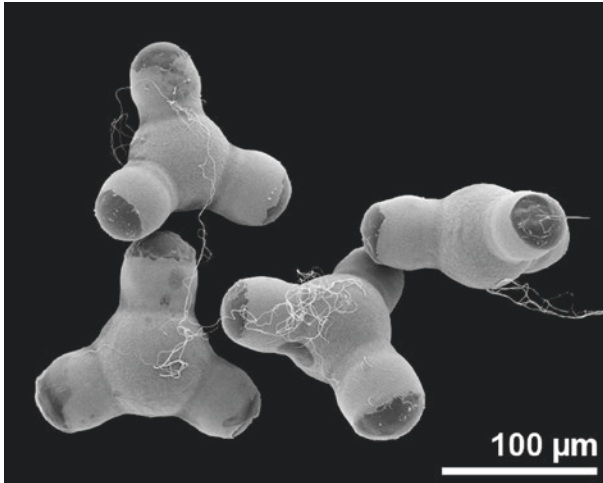
■ ■ *Knautia drymeia*, Caprifoliaceae
triporate, dry pollen

■ ■ *Hakea kippistiana*, Proteaceae
triporate

■ ■ *Hymenocallis tubiflora*, Amaryllidaceae
sulcate, proximal polar view

■ ■ *Cuphea procumbens*, Lythraceae
tricolporate, dry pollen

■ ■ *Roridula gorgonias*, Roridulaceae
tricolpate, equatorial view



■ *Clarkia unguiculata*, Onagraceae
triporate, pollen with viscin threads

■ *Acicarpha tribuloides*, Calyceraceae
tricolporate

■ *Amsonia ciliata*, Apocynaceae
tricolporate, oblique equatorial view

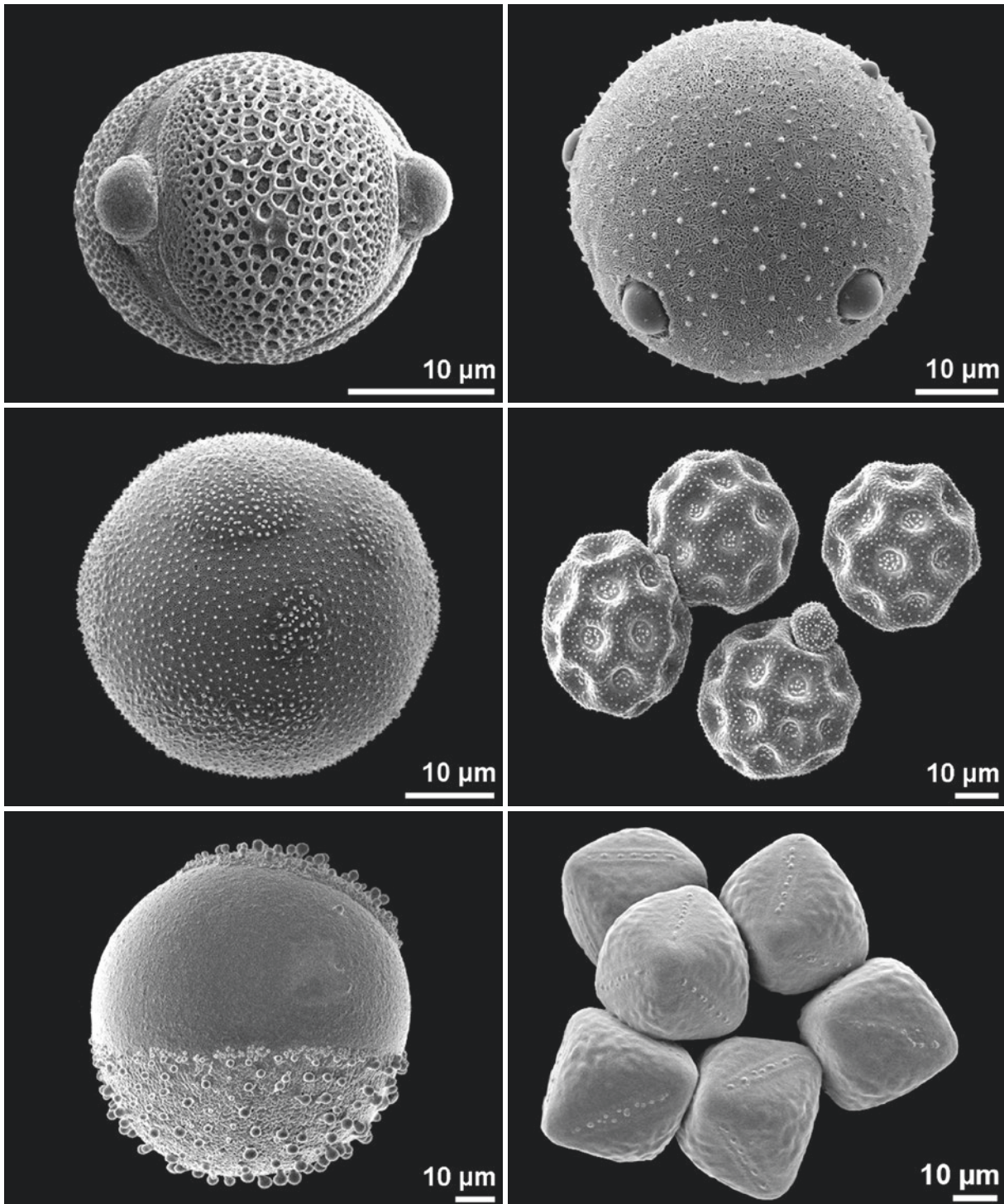
■ *Vriesea neoglutinosa*, Bromeliaceae
sulcate, equatorial view

■ *Heliconia* sp., Heliconiaceae
ulcerate, dry pollen

■ *Clarkia purpurea*, Onagraceae
triporate, dry pollen

P/E-ratio, isodiametric

isodiametric: pollen grain with a polar axis equal to the equatorial diameter



■ *Parnassia palustris*, Celastraceae
spheroidal, tricolporate, equatorial view

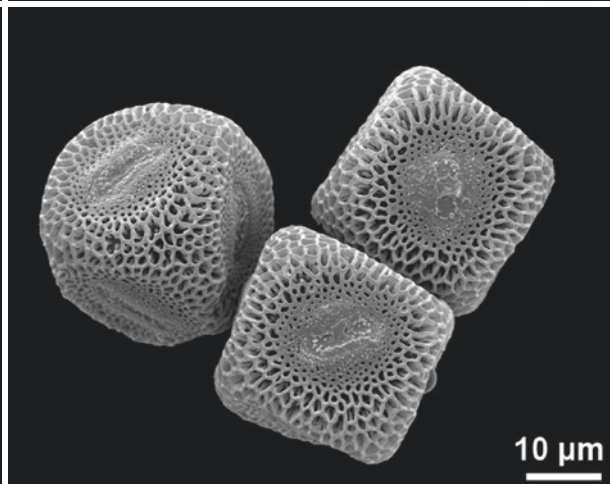
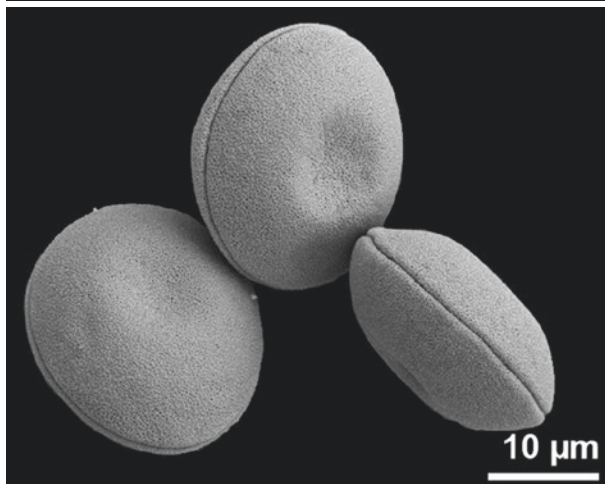
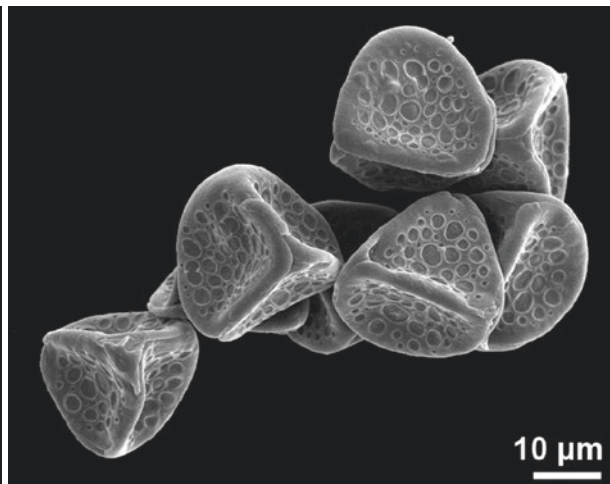
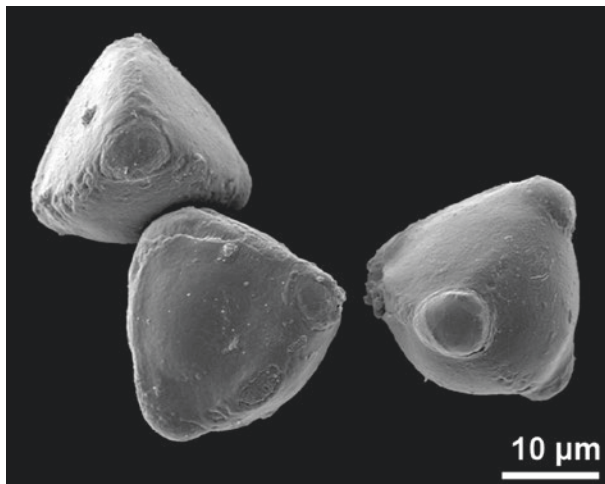
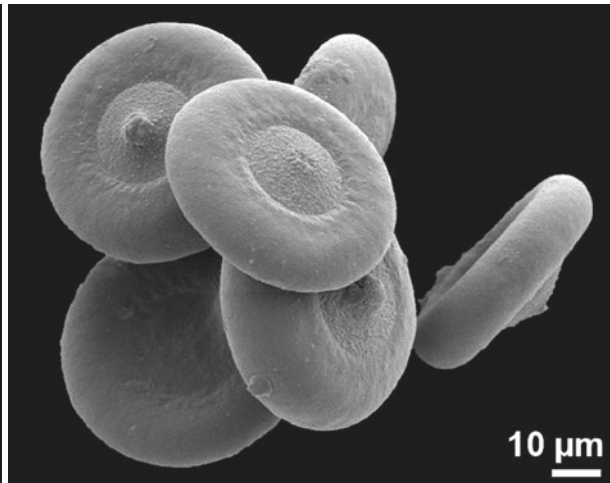
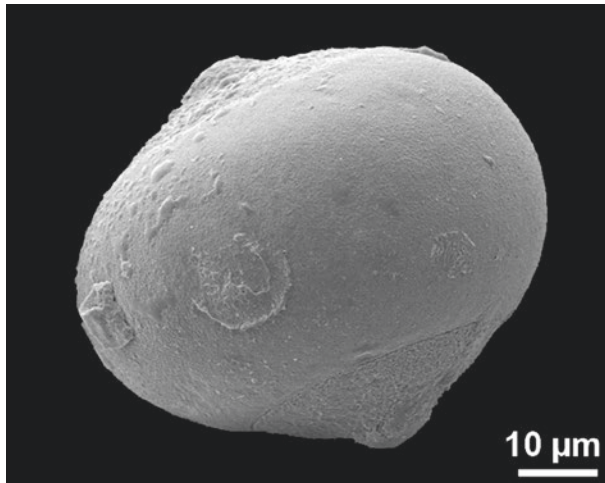
■ *Roemeria hybrida*, Papaveraceae
spheroidal, pantoporate

■ *Iris pumila*, Iridaceae
spheroidal, sulcate, distal polar view

■ *Campanula fenestrellata*, Campanulaceae
spheroidal, stephanoporate, oblique polar view

■ *Silene nutans*, Caryophyllaceae
polygonal, pantoporate, dry pollen

■ *Sarcocapnos enneaphylla*, Papaveraceae
hexacolpate



■ *Whitfieldia lateritia*, Acanthaceae
diporate

■ *Whitfieldia lateritia*, Acanthaceae
dry pollen

■ *Schoepfia schreberi*, Schoepfiaceae
tetraaperturate

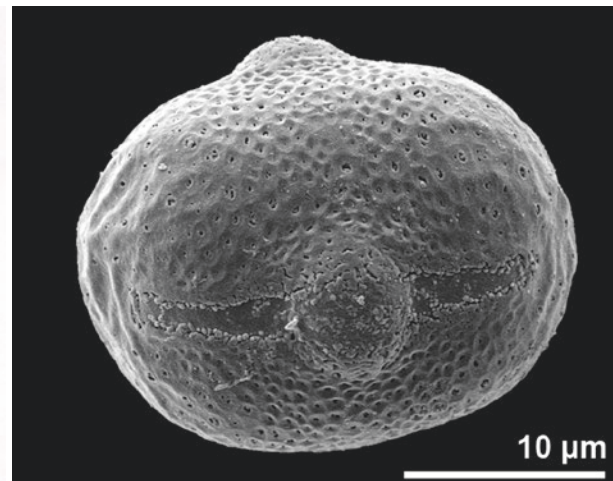
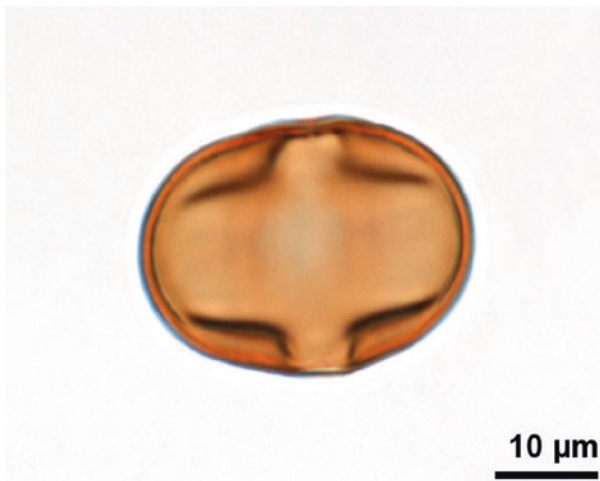
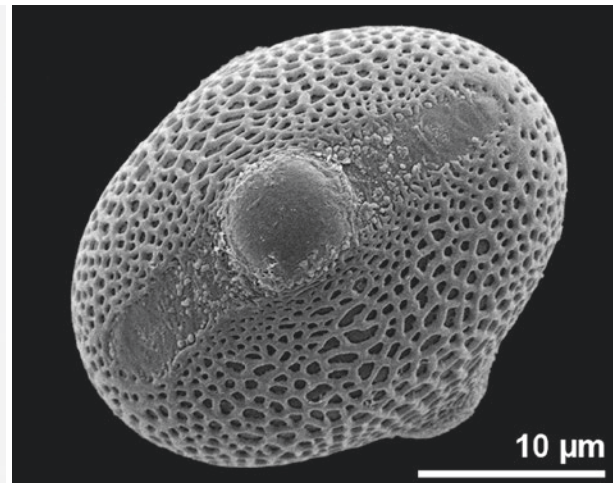
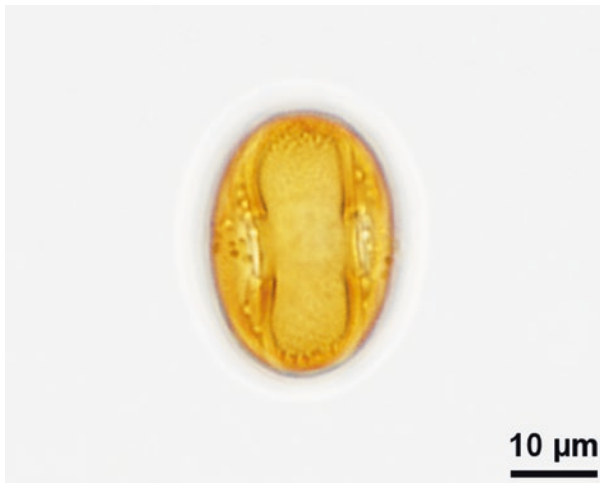
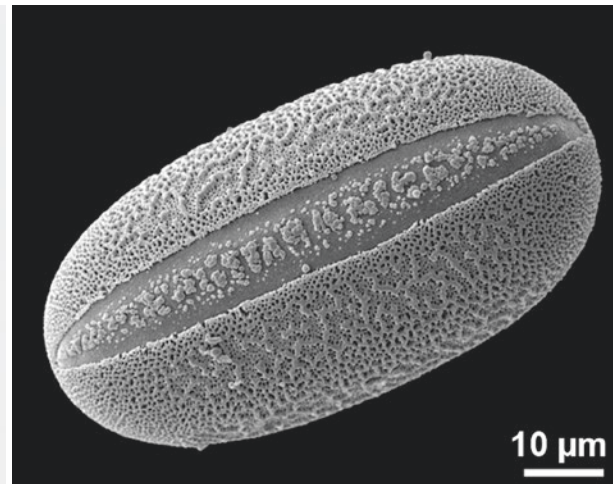
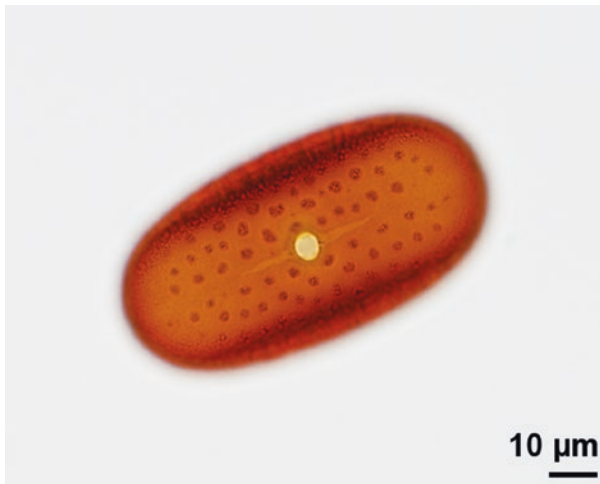
■ *Thesium arvense*, Santalaceae
triradiate colpi, dry pollen

■ *Pedicularis gyroflexa*, Orobanchaceae
ring-like aperture, dry pollen

■ *Basella alba*, Basellaceae
hexacolpate

P/E-ratio, prolate

prolate: pollen grain with a polar axis longer than the equatorial diameter



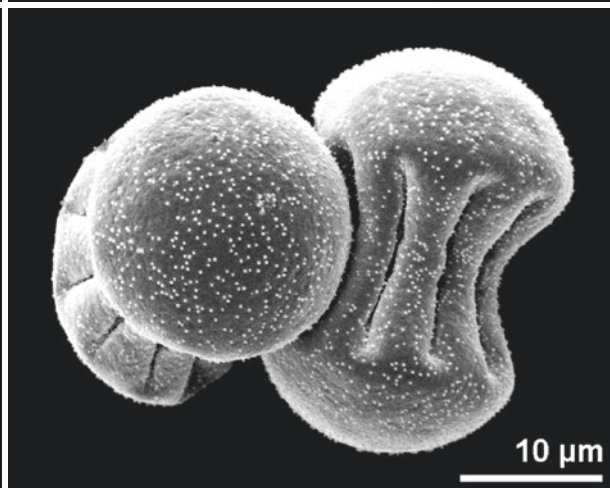
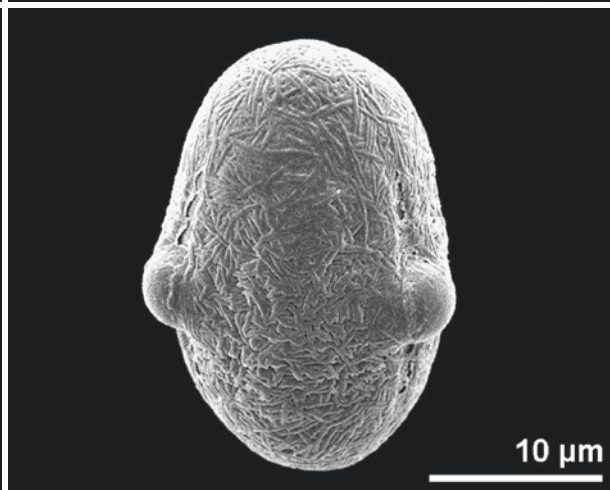
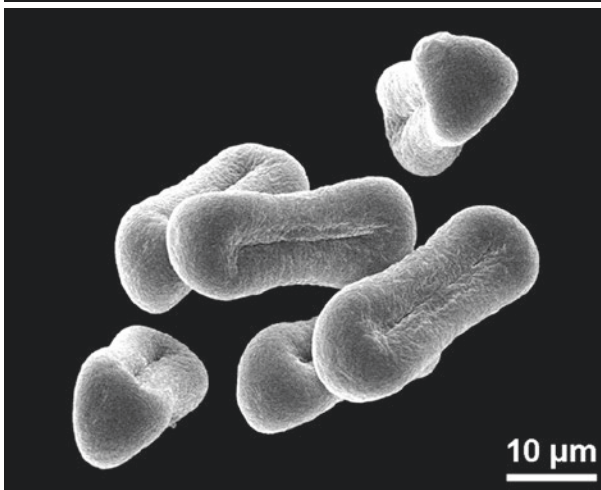
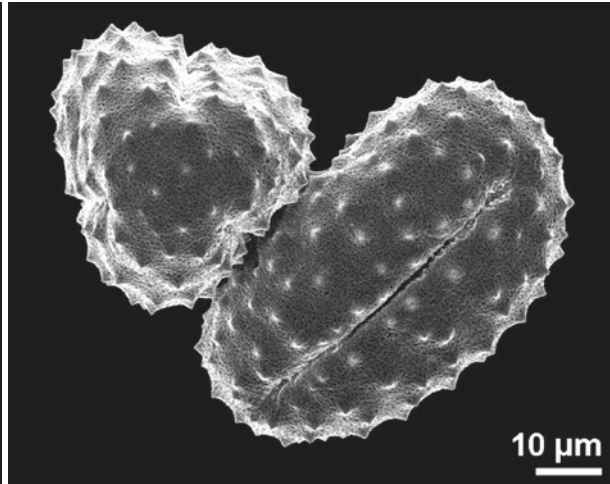
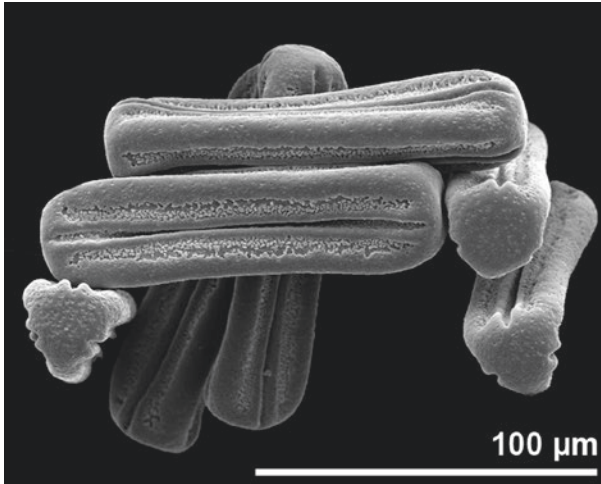
■ *Justicia carnea*, Acanthaceae
dicolporate, equatorial view

■ *Aphelandra arborea*, Acanthaceae
tricolporate, equatorial view

■ *Lysimachia lichiangensis*, Primulaceae
tricolporate, equatorial view

■ *Colutea arborescens*, Fabaceae
tricolporate, equatorial view

■ *Oxytropis jacquinii*, Fabaceae
tricolporate, equatorial view



■ *Crossandra flava*, Acanthaceae
tricolpate, dry pollen

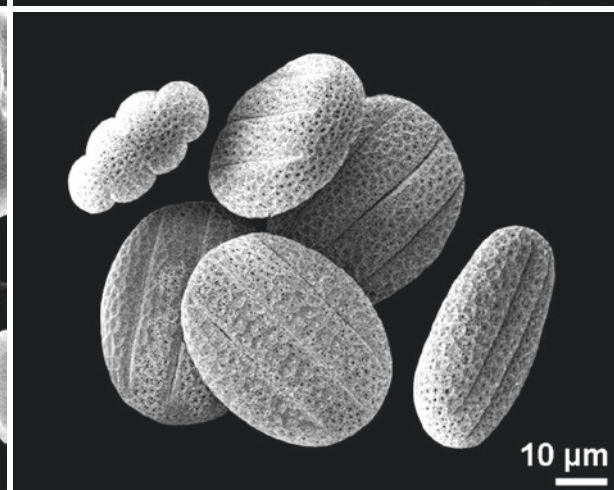
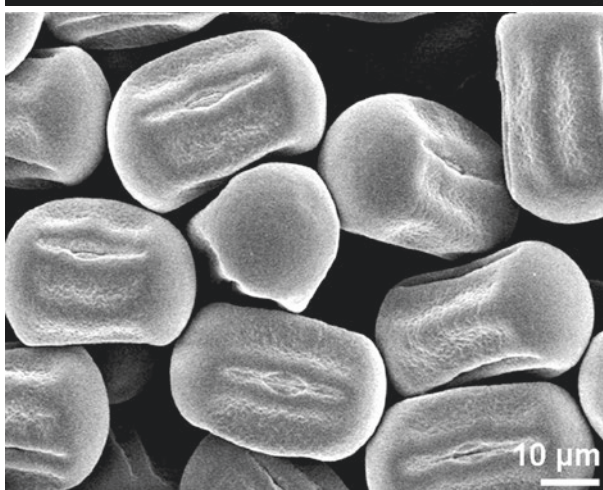
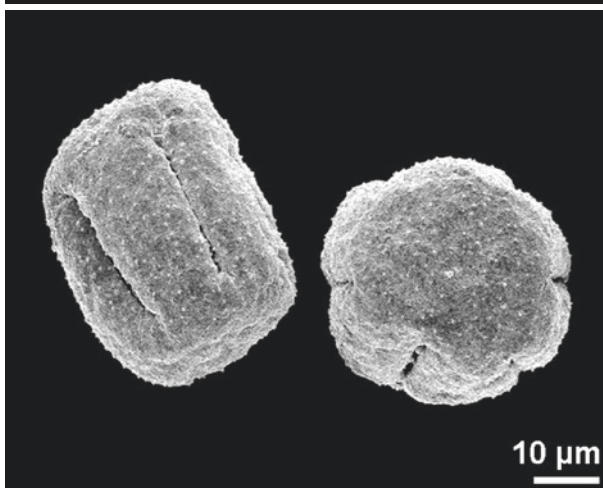
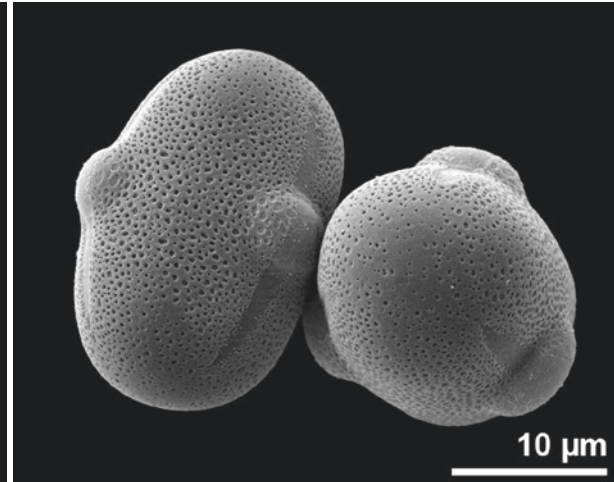
■ *Torilis arvensis*, Apiaceae
tricolporate, dry pollen

■ *Astragalus onobrychis*, Fabaceae
tricolporate, equatorial view

■ *Jurinea mollis*, Asteraceae
tricolporate, dry pollen

■ *Peucedanum cervaria*, Apiaceae
tricolporate, equatorial view

■ *Symphytum officinale*, Boraginaceae
stephanocolporate, dry pollen



■ *Buglossoides purpurocaerulea*, Boraginaceae
tetracolpate, equatorial view

■ *Platycodon grandiflorus*, Campanulaceae
stephanocolpate, dry pollen

■ *Lathyrus tuberosus*, Fabaceae
tricolpate, dry pollen

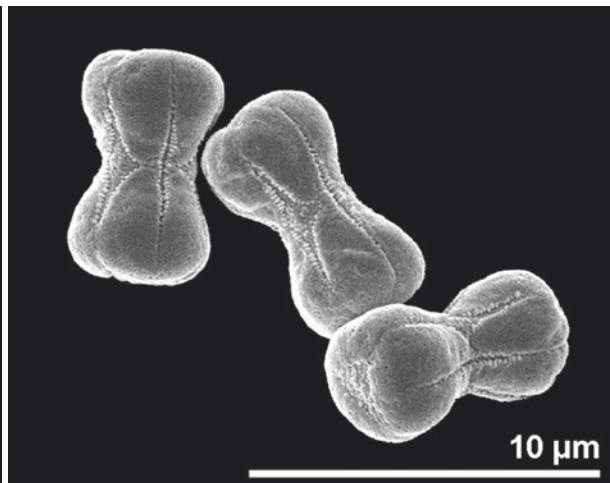
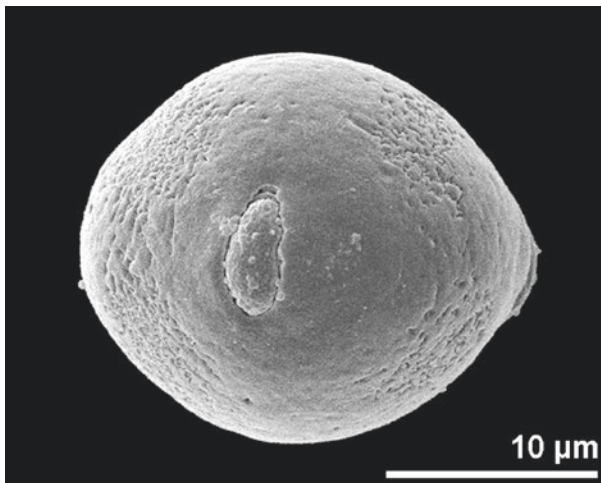
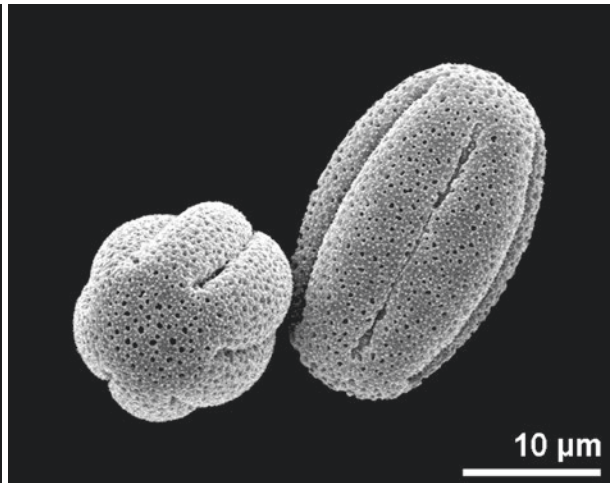
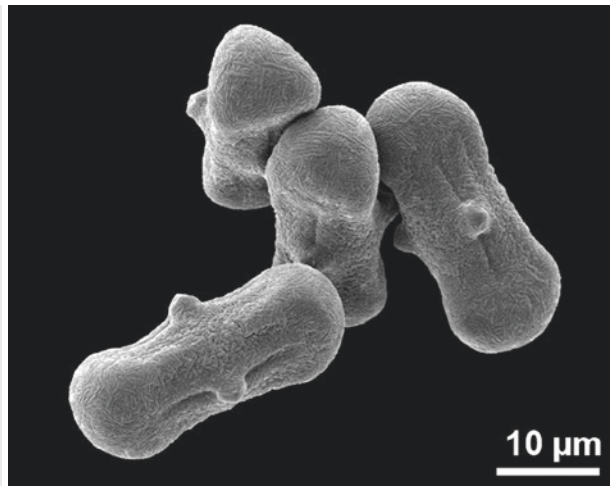
■ *Vitaliana primuliflora*, Primulaceae
tricolpate

■ *Stenandrium guineense*, Acanthaceae
tricolpate, equatorial view

■ *Salvia sclarea*, Lamiaceae
hexacolpate, dry pollen

isopolar

pollen grain with identical proximal and distal faces



■ Apiaceae
■ equatorial view

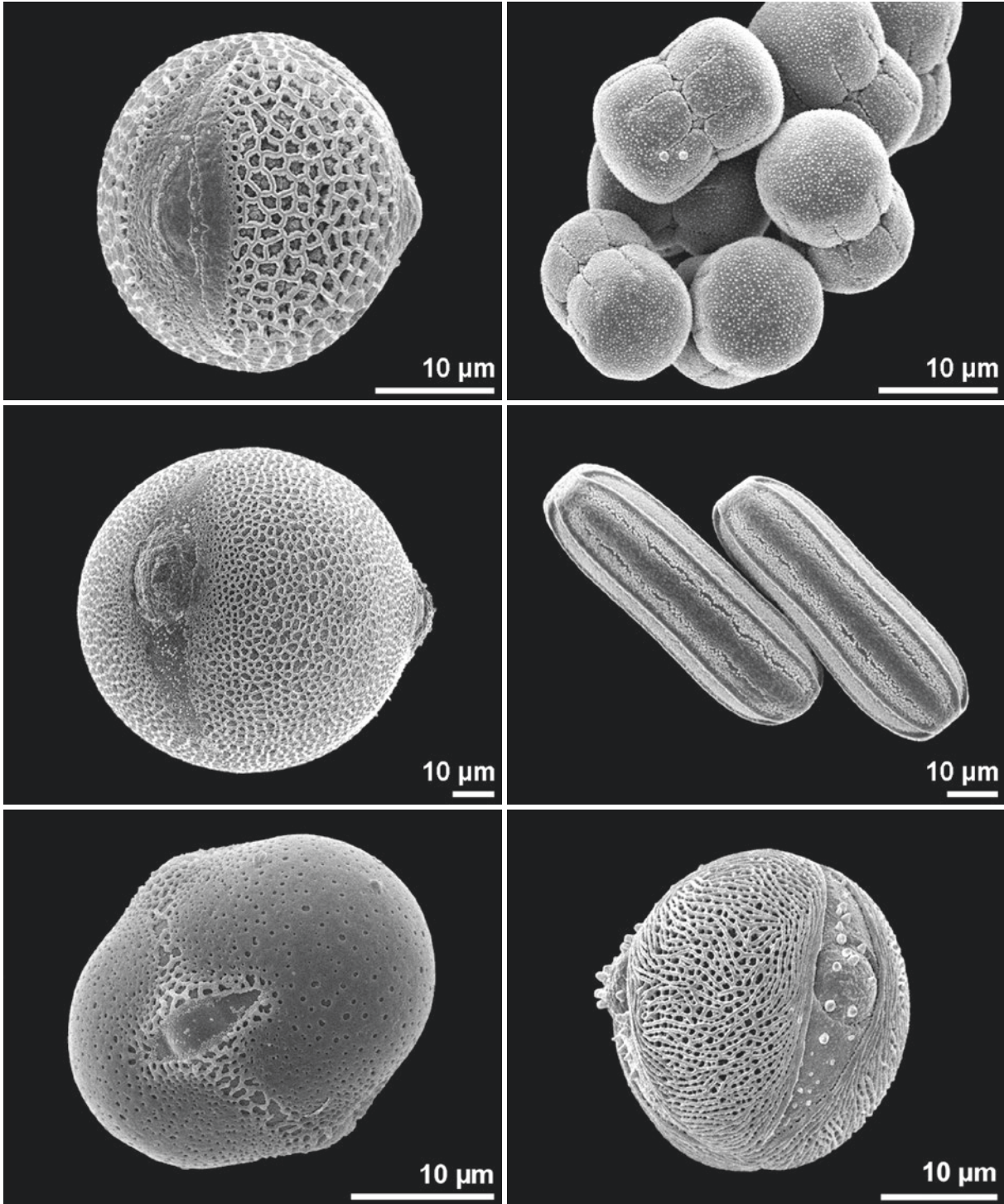
■ *Columnnea magnifica*, Gesneriaceae
■ equatorial view

■ *Monotropia hypopitys*, Ericaceae
■ equatorial view

■ *Bifora radians*, Apiaceae

■ *Asperula tinctoria*, Rubiaceae
■ dry pollen

■ *Myosotis scorpioides*, Boraginaceae
■ dry pollen



■ ■ *Viburnum tinus*, Adoxaceae
equatorial view

■ ■ *Luffa cylindrica*, Cucurbitaceae
equatorial view

■ ■ *Pulmonaria angustifolia*, Boraginaceae
equatorial view

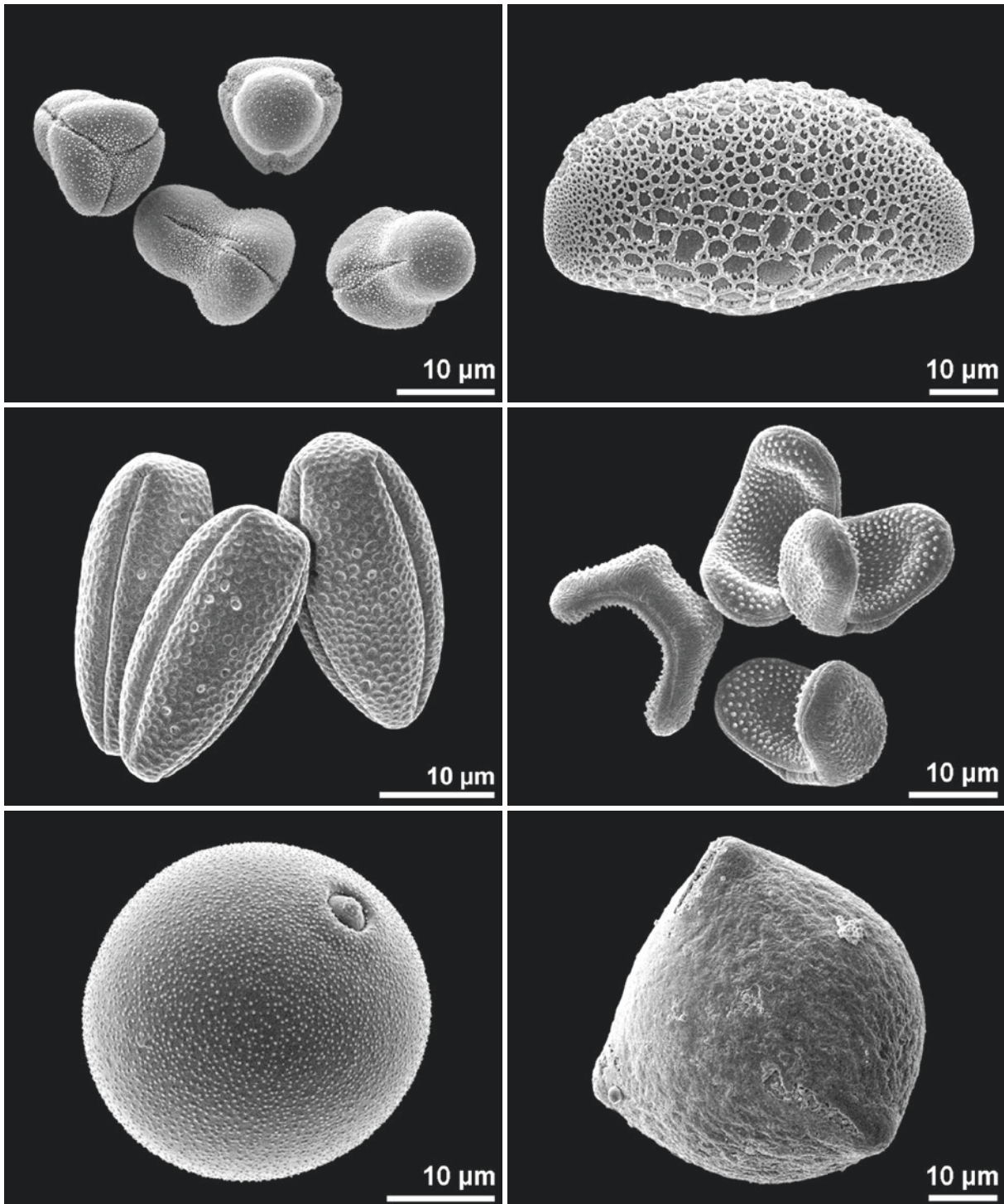
■ ■ *Cerithe minor*, Boraginaceae
dry pollen

■ ■ *Crossandra flava*, Acanthaceae
equatorial view

■ ■ *Aesculus flava*, Sapindaceae
equatorial view

heteropolar

pollen grain with different proximal and distal faces



■ ■ ■ *Onosma visianii*, Boraginaceae
dry pollen

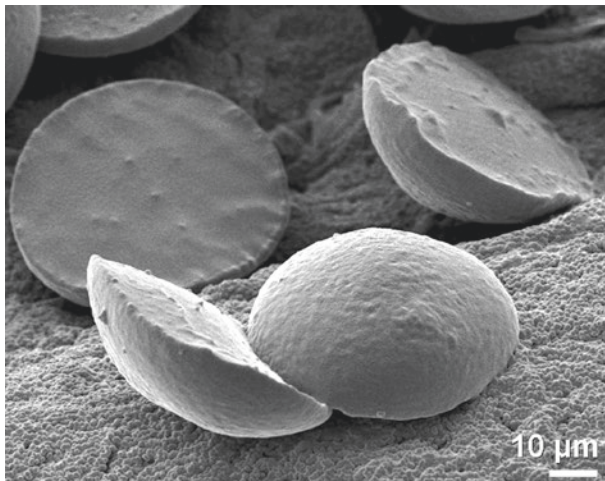
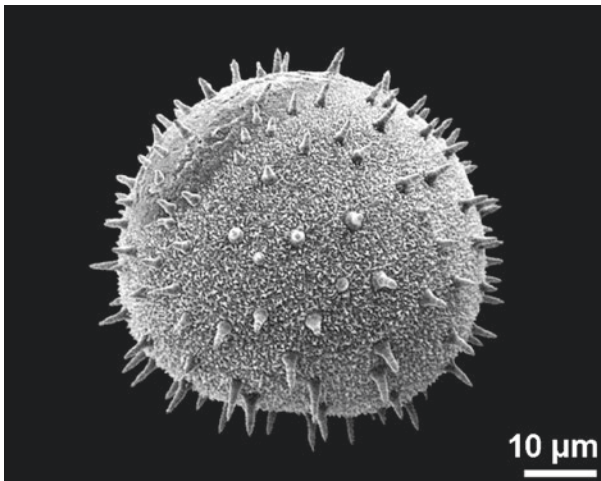
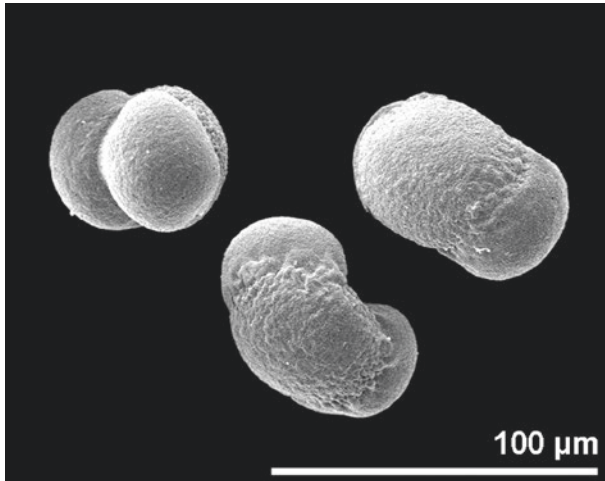
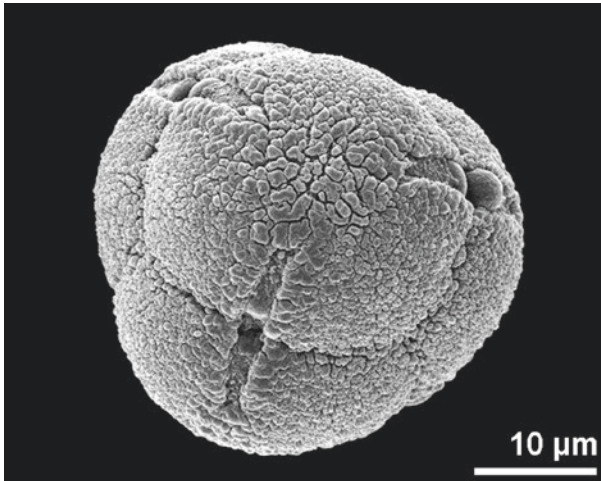
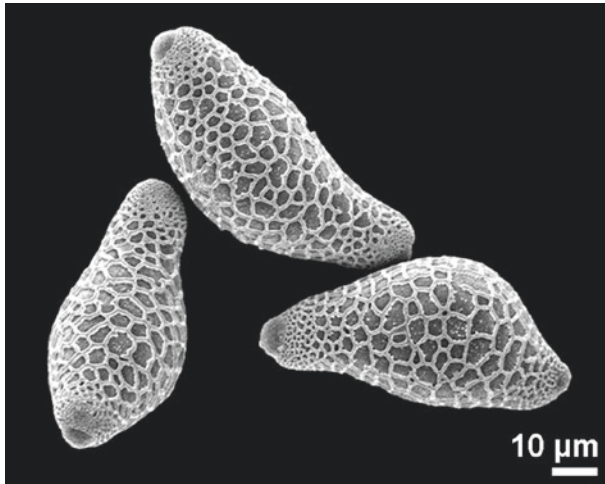
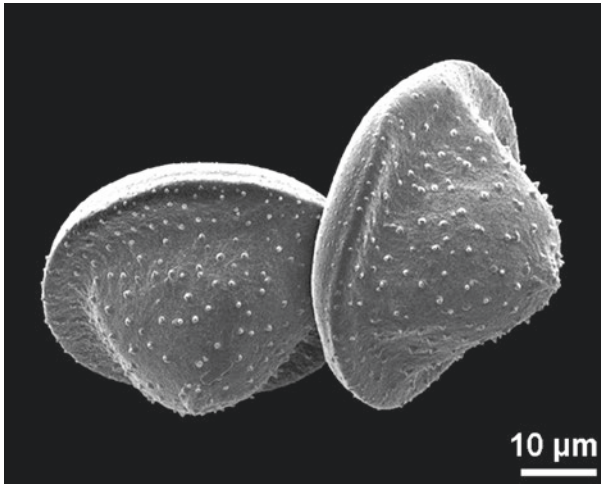
■ ■ ■ *Billbergia seidelii*, Bromeliaceae
equatorial view

■ ■ ■ *Chaenorhinum minus*, Plantaginaceae
dry pollen

■ ■ ■ *Limnanthes douglasii*, Limnanthaceae
dry pollen

■ ■ ■ *Sesleria albicans*, Poaceae
oblique view

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



■ ■ *Heliconia* sp., Heliconiaceae
dry pollen

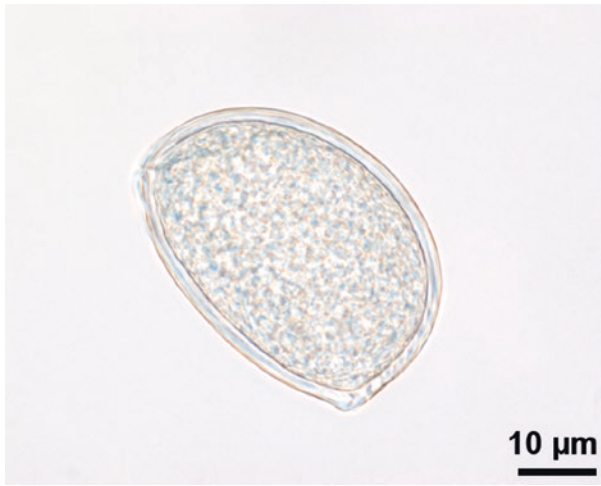
■ ■ *Erica arborea*, Ericaceae
tetrad

■ ■ *Nuphar lutea*, Nymphaeaceae
equatorial view

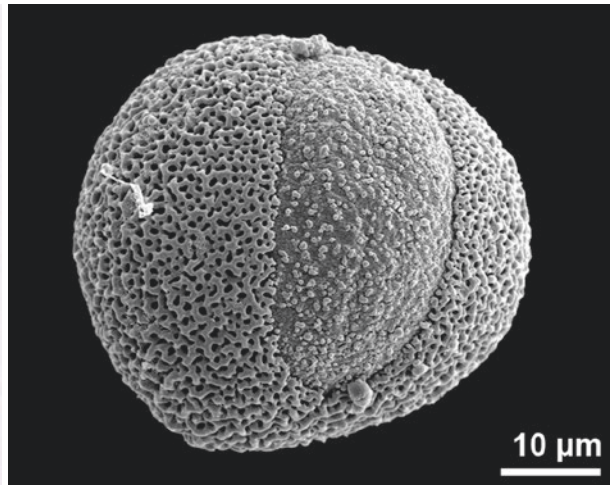
■ ■ *Quesnelia augusto-coburgii*, Bromeliaceae

■ ■ *Pinus strobus*, Pinaceae
saccate

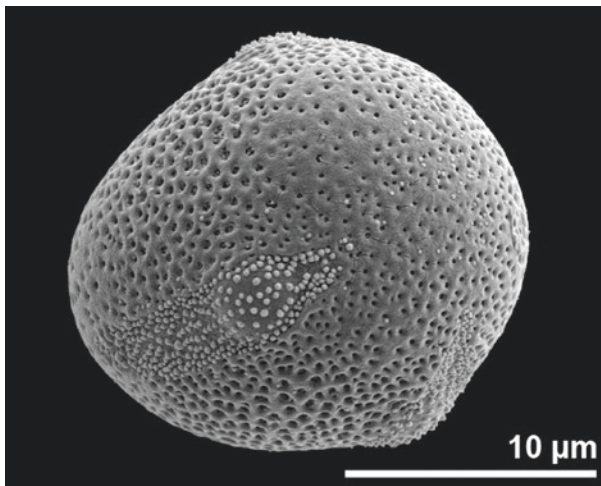
■ ■ *Sansevieria parva*, Asparagaceae
dry pollen



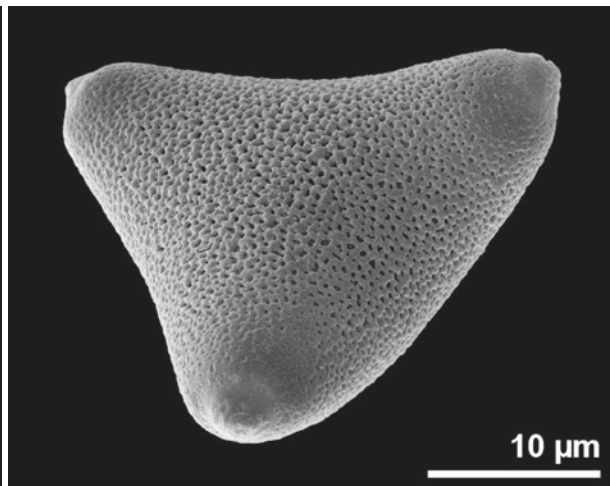
10 μm



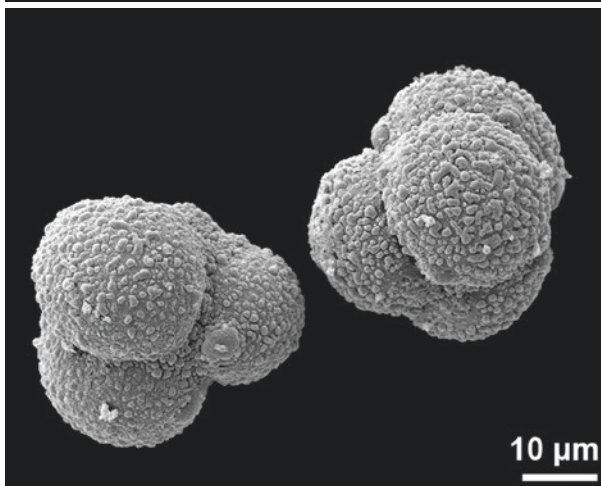
10 μm



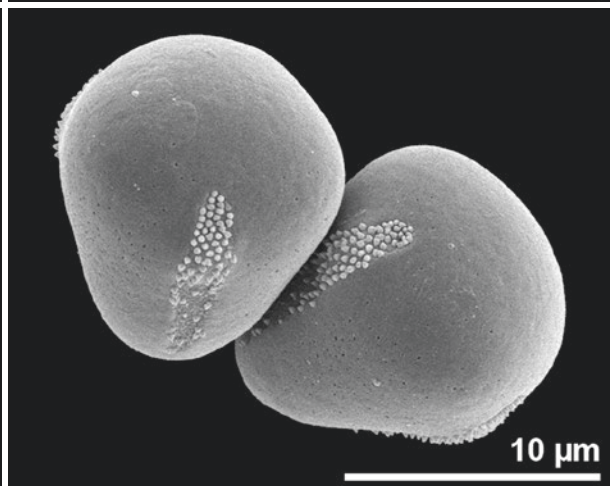
10 μm



10 μm



10 μm



10 μm

■ ■ *Amorphophallus yunnanensis*, Araceae
hydrated, equatorial view

■ ■ *Echium italicum*, Boraginaceae
oblique view

■ ■ *Calluna vulgaris*, Ericaceae
tetrads

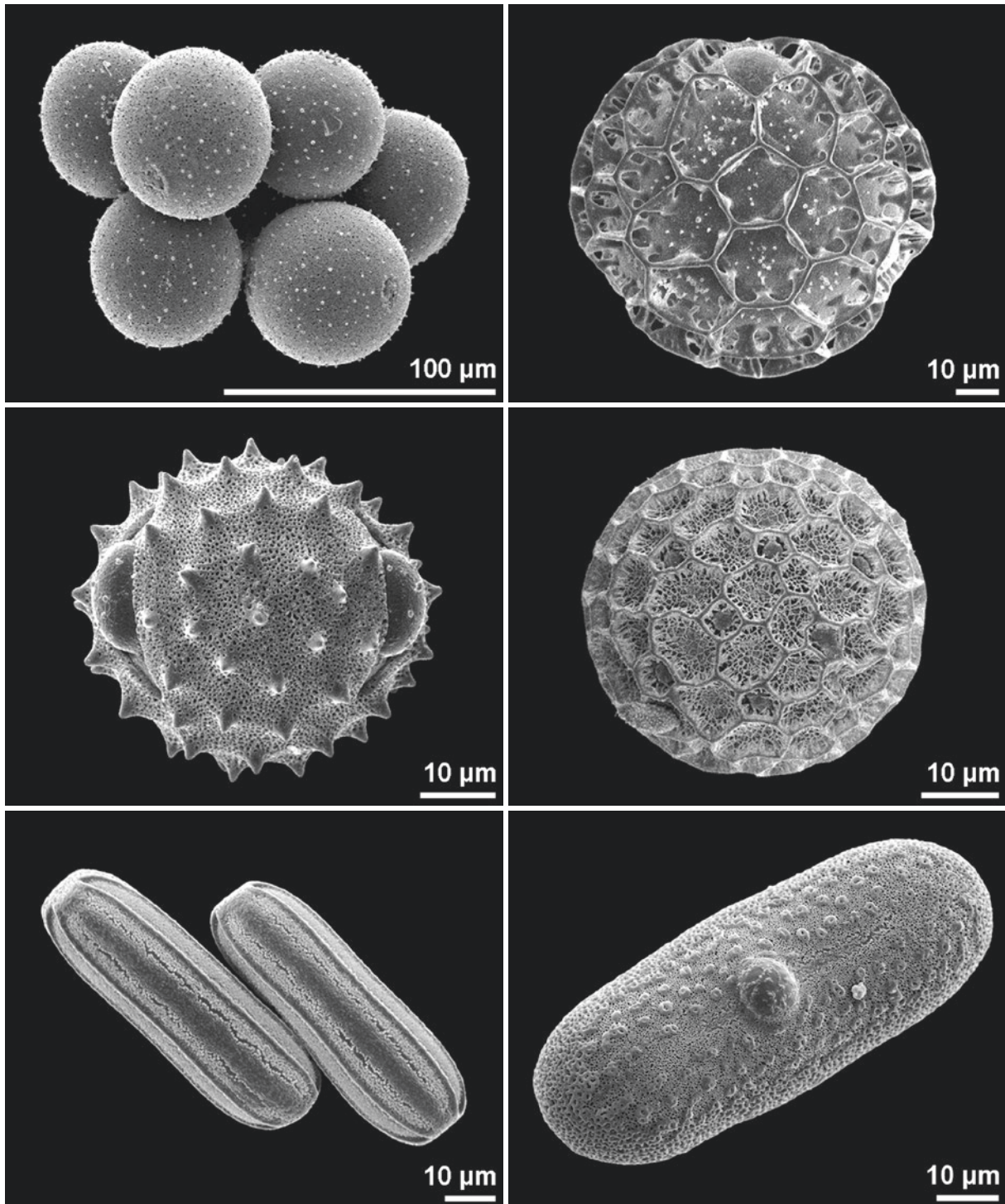
■ ■ *Austrobaileya scandens*, Austrobaileyaceae
distal polar view

■ ■ *Adenanthos sericeus*, Proteaceae
polar view

■ ■ *Alkanna corcyrensis*, Boraginaceae

shape

3-dimensional form of a pollen grain in relation to the P/E-ratio



■ ■ *Adansonia gregorii*, Malvaceae
spheroidal

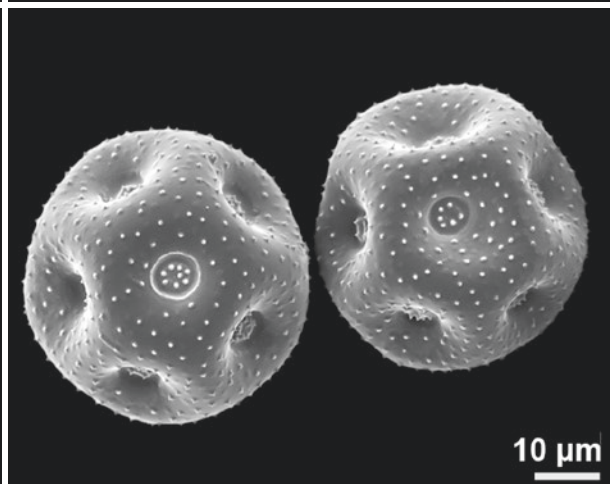
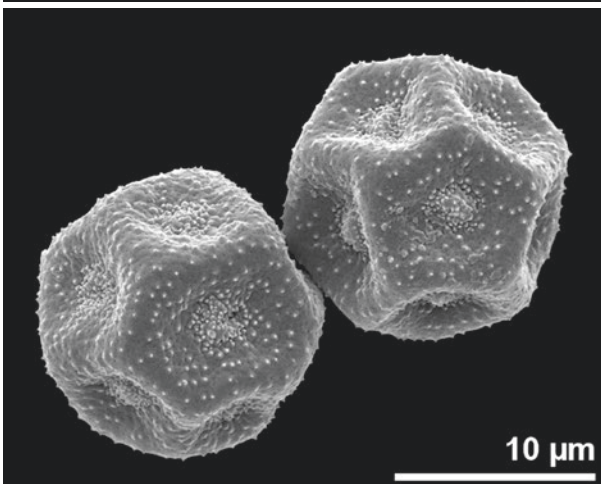
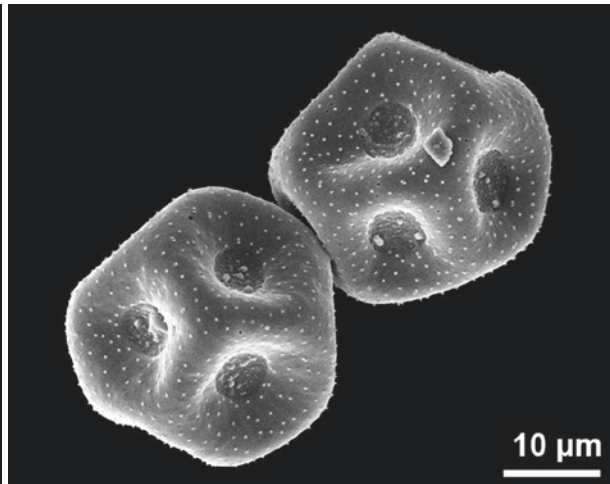
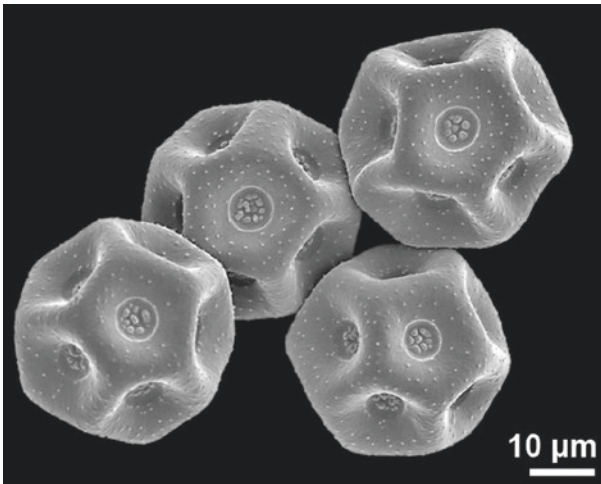
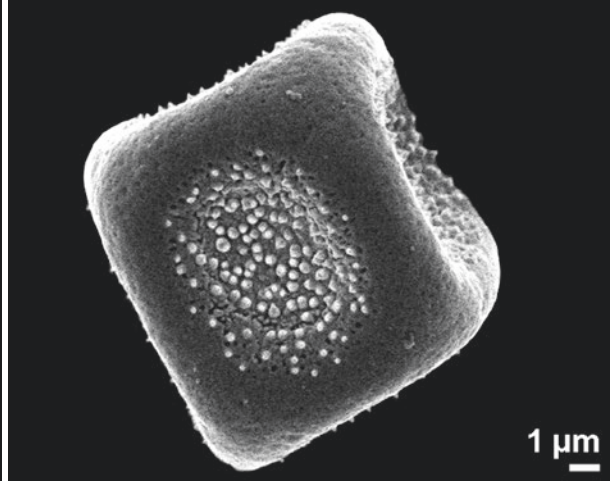
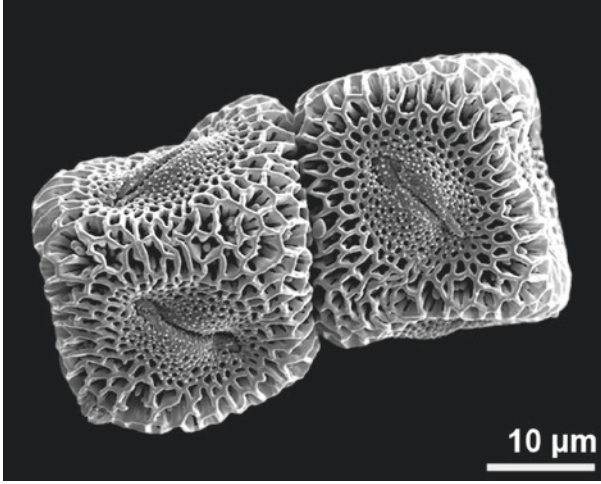
■ ■ *Cirsium oleraceum*, Asteraceae
spheroidal, equatorial view

■ ■ *Crossandra flava*, Acanthaceae
cylindric, equatorial view

■ ■ *Ruellia macrantha*, Acanthaceae
spheroidal, polar view

■ ■ *Phlox paniculata*, Polemoniaceae
spheroidal

■ ■ *Justicia carnea*, Acanthaceae
cylindric, equatorial view



■ ■ *Basella alba*, Basellaceae
cubical, dry pollen

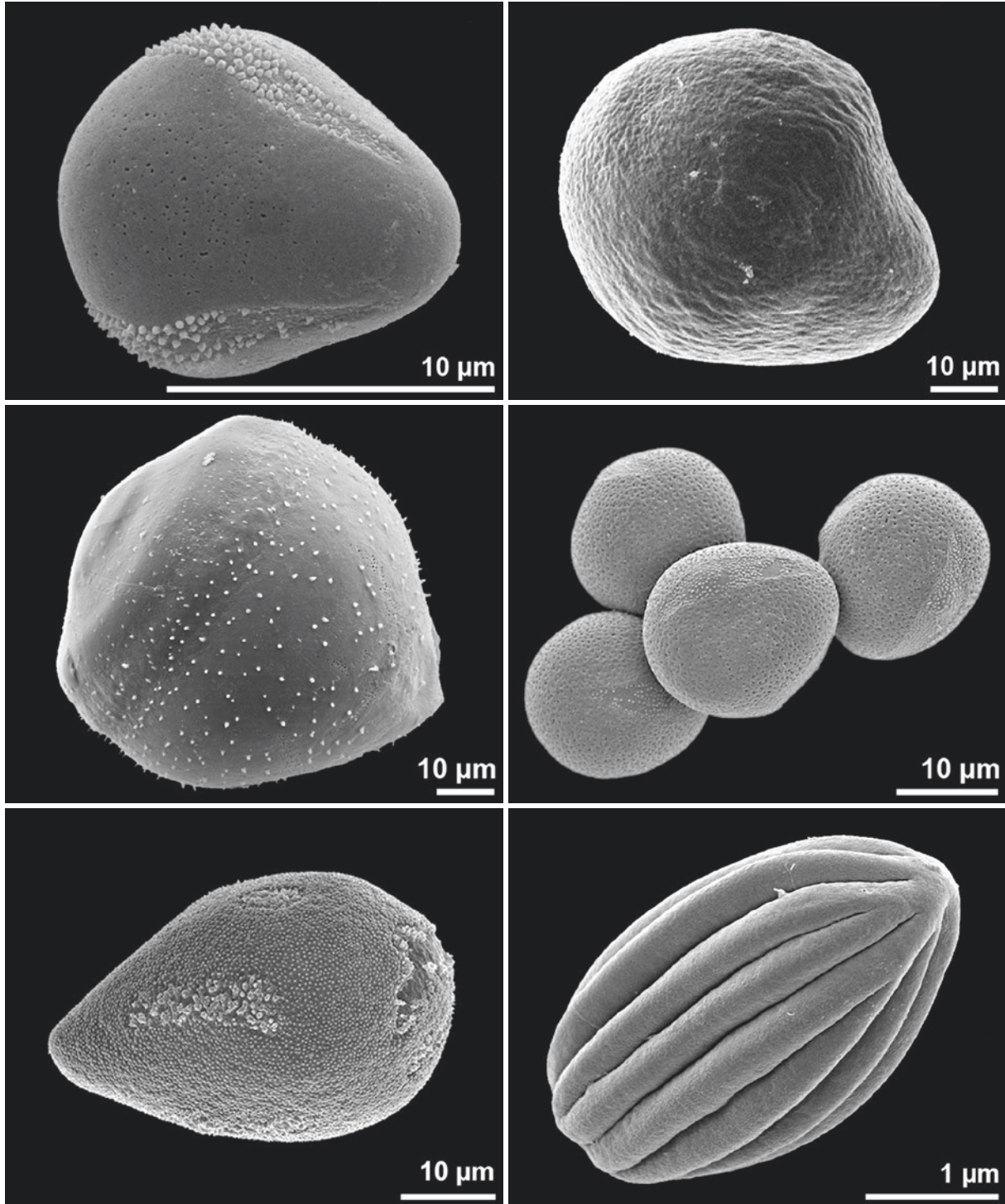
■ ■ *Cerastium dubium*, Caryophyllaceae
polygonal, dry pollen

■ ■ *Paronychia polygonifolia*, Caryophyllaceae
polygonal, dry pollen

■ ■ *Herniaria glabra*, Caryophyllaceae
cubical, dry pollen

■ ■ *Eremogone procera*, Caryophyllaceae
polygonal, dry pollen

■ ■ *Paronychia polygonifolia*, Caryophyllaceae
polygonal, dry pollen



■ ■ *Alkanna corcyrensis*, Boraginaceae
pear-shaped, equatorial view

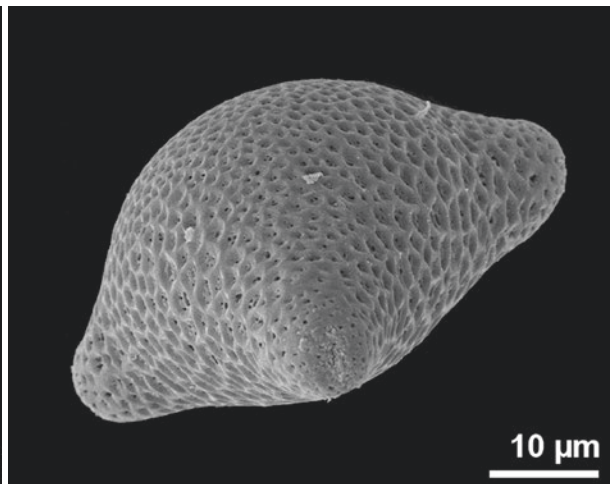
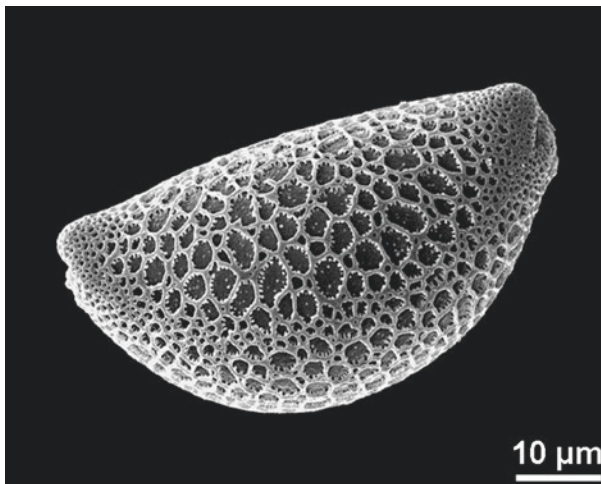
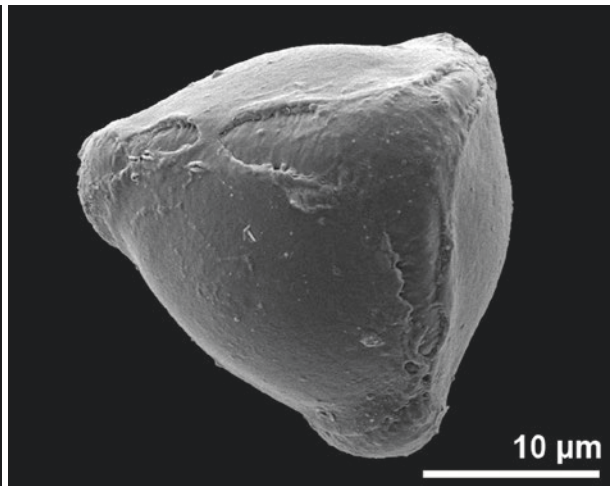
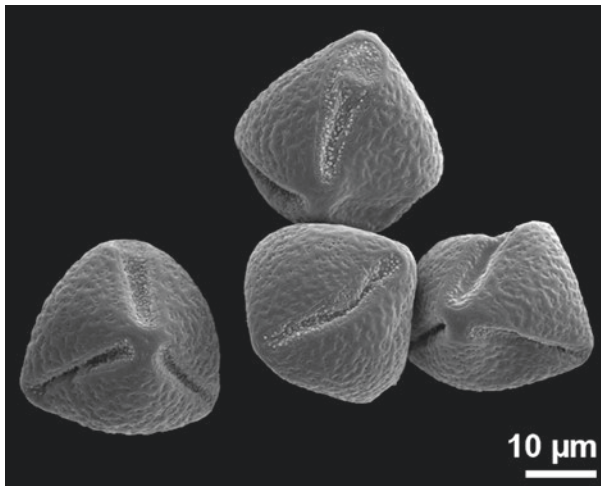
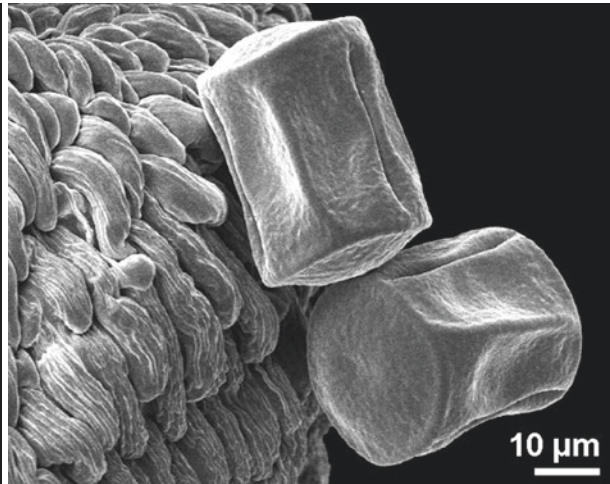
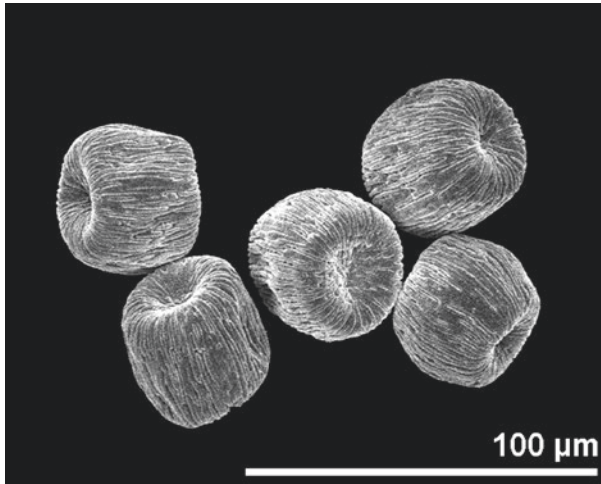
■ ■ *Heliconia rostrata*, Heliconiaceae
pear-shaped, equatorial view

■ ■ *Cyperus longus*, Cyperaceae
pear-shaped, equatorial view, pseudomonad

■ ■ *Montrichardia arborescens*, Araceae
pear-shaped, equatorial view

■ ■ *Echium plantagineum*, Boraginaceae
pear-shaped

■ ■ *Ephedra foeminea*, Ephedraceae
spindle-shaped, dry pollen



■ ■ *Brugmansia suaveolens*, Solanaceae
barrel-shaped, dry pollen

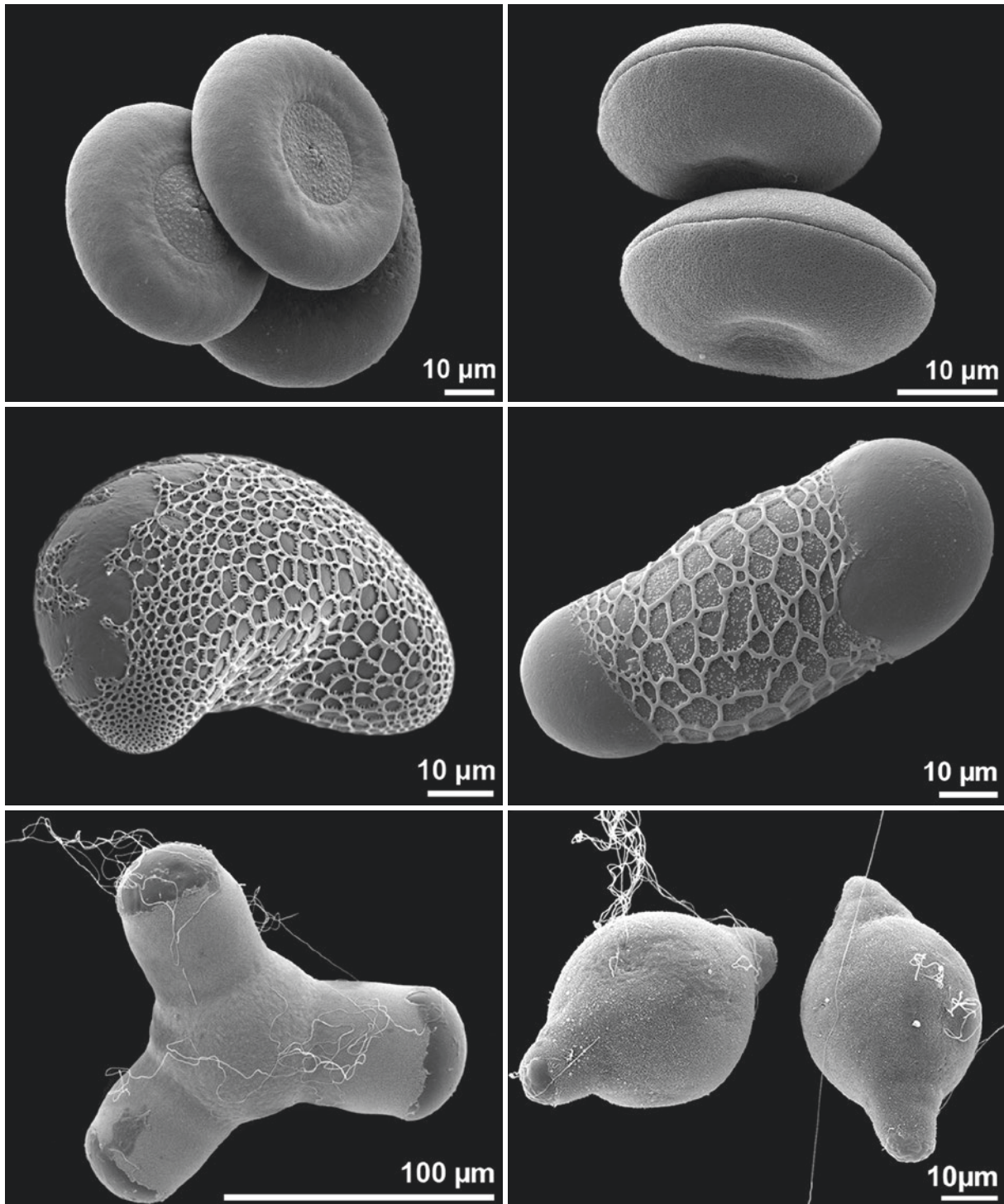
■ ■ *Corydalis cheilanthifolia*, Papaveraceae
triangular pyramid, dry pollen

■ ■ *Aechmea drakeana*, Bromeliaceae
wedge-shaped

■ ■ *Anthyllis vulneraria*, Fabaceae
barrel-shaped, dry pollen

■ ■ *Schoepfia schreberi*, Schoepfiaceae
triangular pyramid

■ ■ *Cardiospermum halicacabum*, Sapindaceae
convex triangular



■ *Whitfieldia lateritia*, Acanthaceae
 ■ disc-shaped, dry pollen

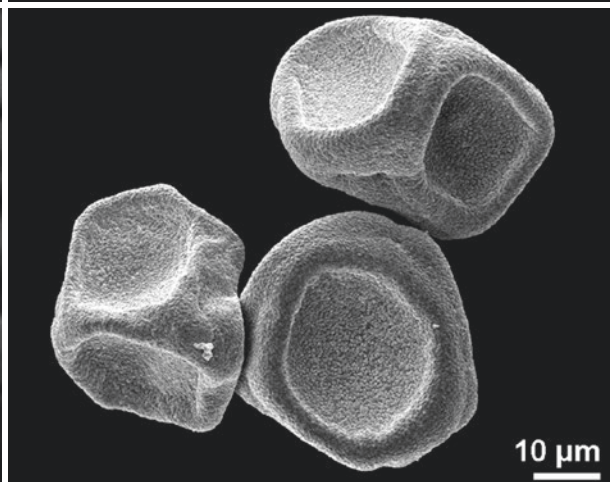
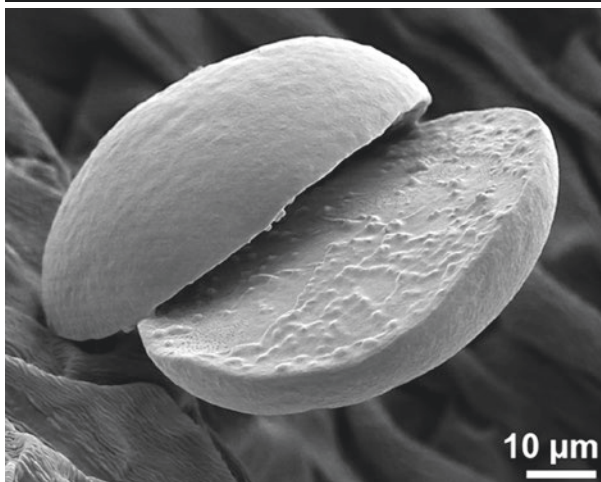
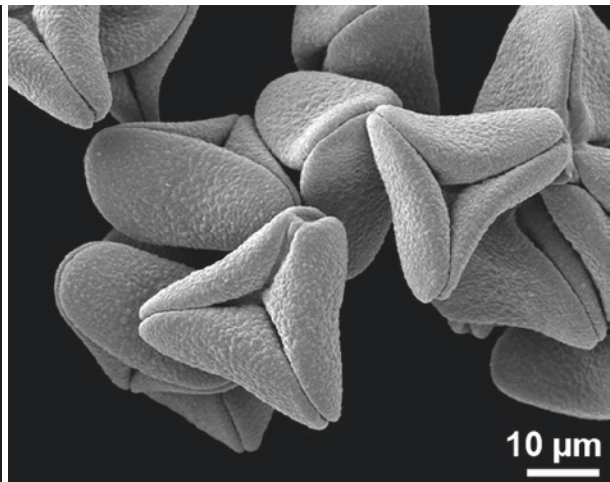
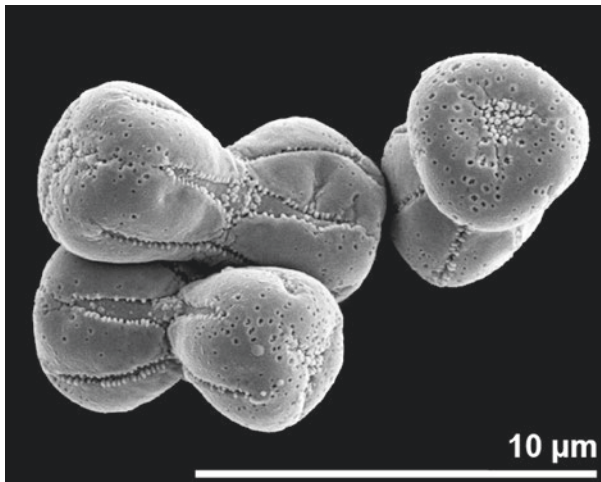
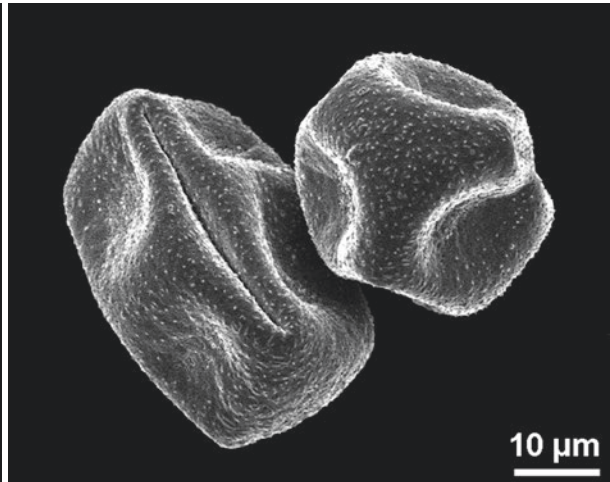
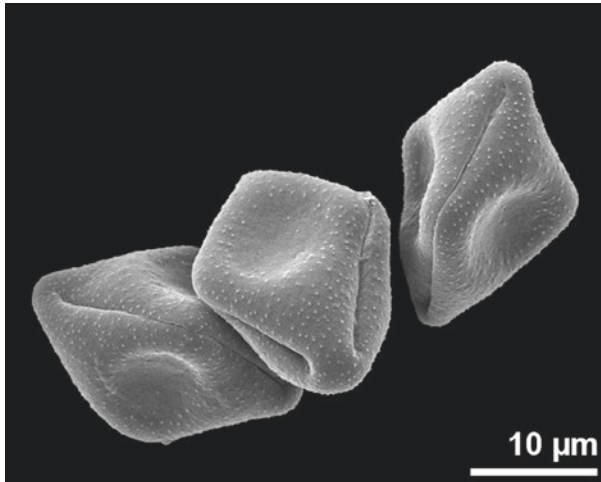
■ *Billbergia pyramidalis*, Bromeliaceae
 ■ bean-shaped

■ *Clarkia unguiculata*, Onagraceae
 ■ triangular star

■ *Pedicularis portenschlagii*, Orobanchaceae
 ■ disc-shaped, dry pollen

■ *Quesnelia imbricata*, Bromeliaceae
 ■ cylindric

■ *Fuchsia paniculata*, Onagraceae
 ■ lemon-shaped



■ ■ *Acicarpha tribuloides*, Calyceraceae
triangular dipyrnid, dry pollen

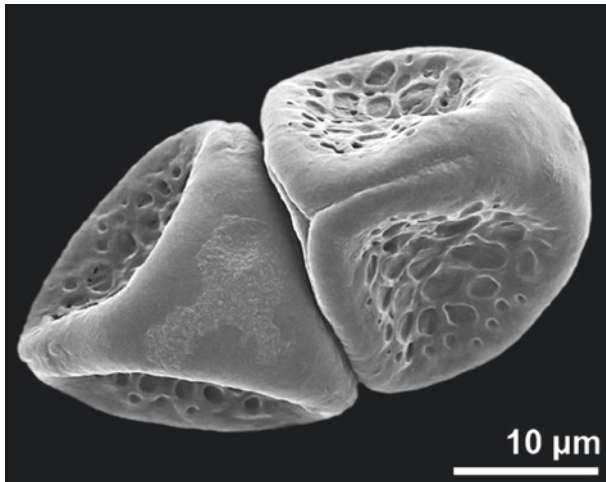
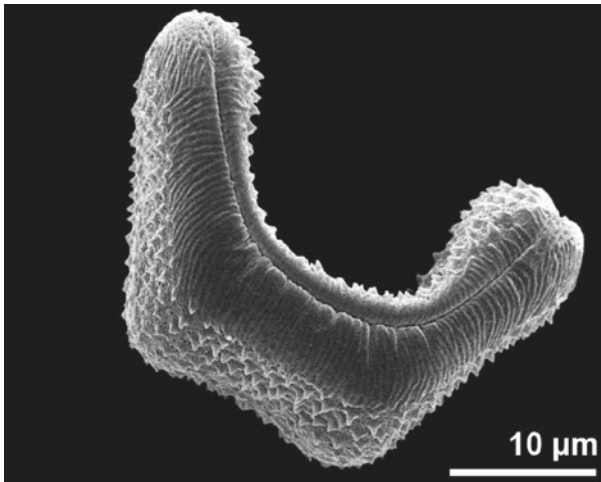
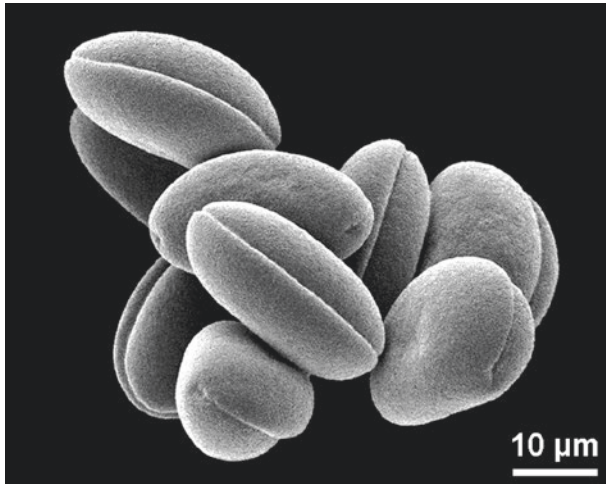
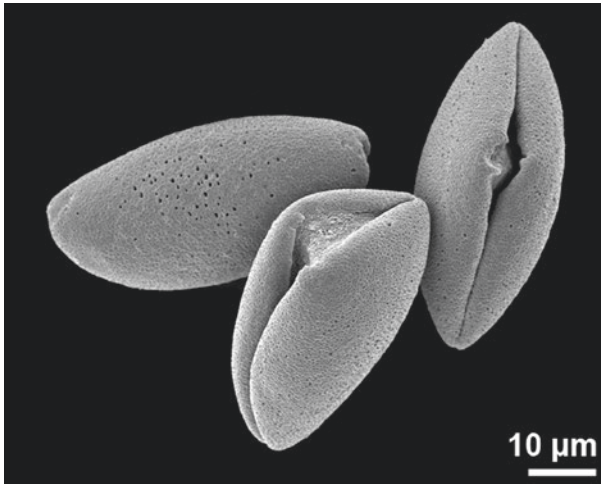
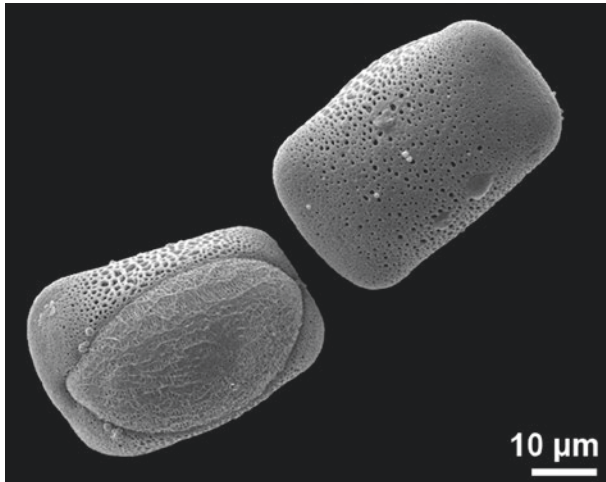
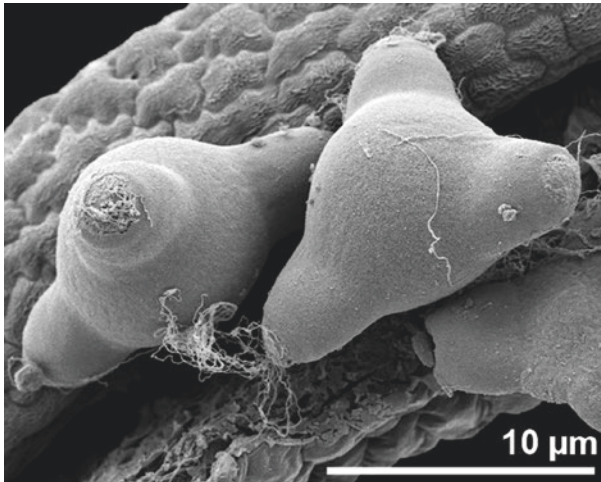
■ ■ *Nicandra physalodes*, Solanaceae
dry pollen

■ ■ *Myosotis alpestris*, Boraginaceae
dumbbell-shaped, dry pollen

■ ■ *Loranthus europaeus*, Loranthaceae
dry pollen

■ ■ *Sansevieria suffruticosa*, Asparagaceae
cup-shaped, dry pollen

■ ■ *Juncus jacquinii*, Juncaceae
tetrad, monads cup-shaped, dry pollen



■ ■ *Gaura lindheimeri*, Onagraceae

■ ■ *Hyacinthoides italica*, Asparagaceae
boat-shaped, dry pollen

■ ■ *Limnanthes douglasii*, Limnanthaceae
U-shaped, dry pollen

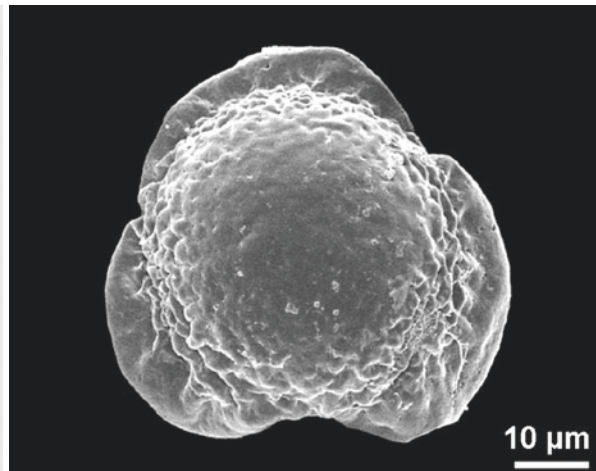
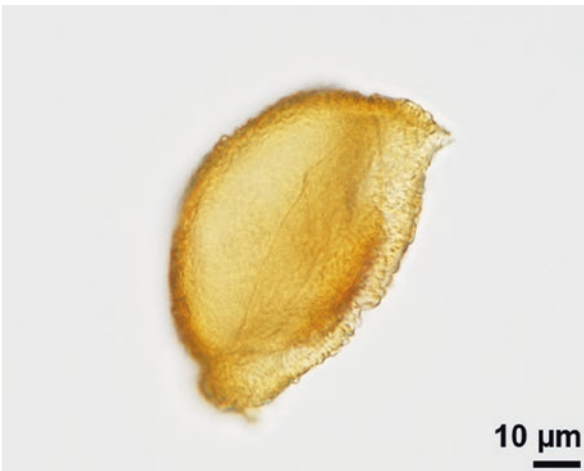
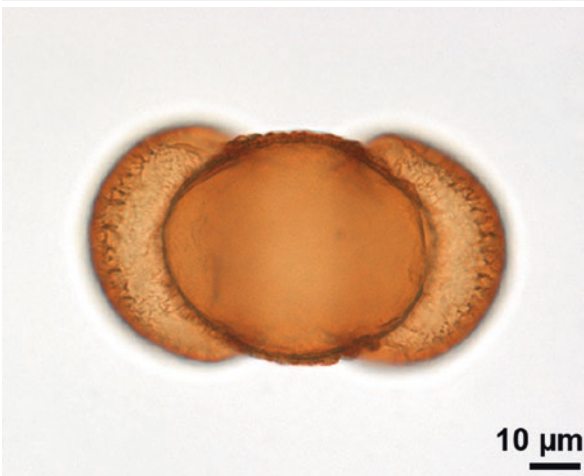
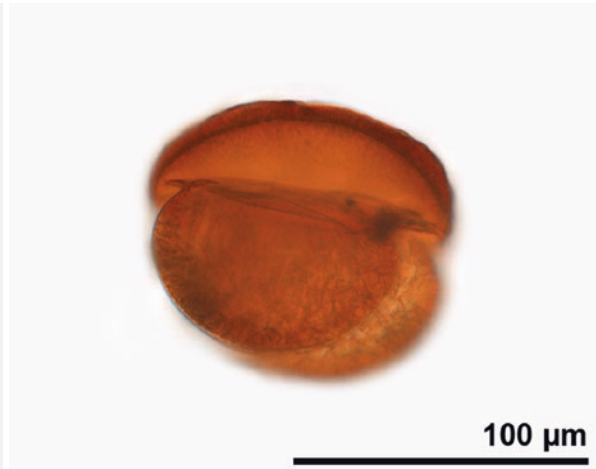
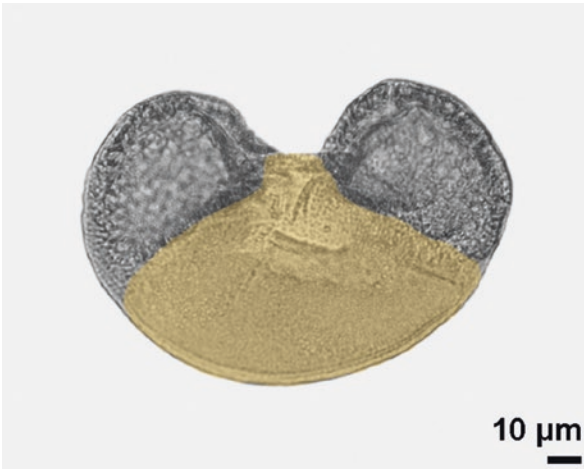
■ ■ *Eremurus robustus*, Xanthorrhoeaceae
rounded cuboid

■ ■ *Galanthus nivalis*, Amaryllidaceae
boat-shaped, dry pollen

■ ■ *Thesium dollineri*, Santalaceae
convex triangular pyramid, dry pollen

saccus/saccate, corpus

saccus: exinous expansion forming an air sac
 corpus: body of a saccate pollen grain



■ ■ *Picea* sp., Pinaceae
 fossil, Miocene, China, corpus colored, equatorial view

■ ■ *Pinus cembra*, Pinaceae
 proximal polar view

■ ■ *Tsuga canadensis*, Pinaceae
 equatorial view

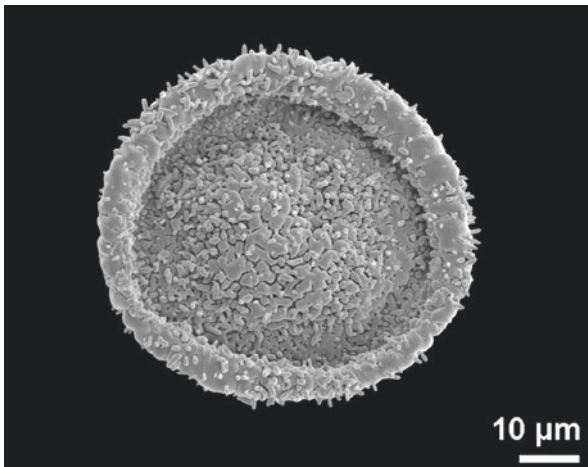
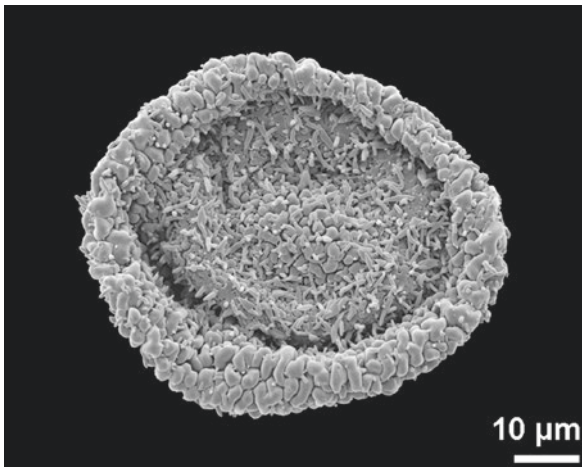
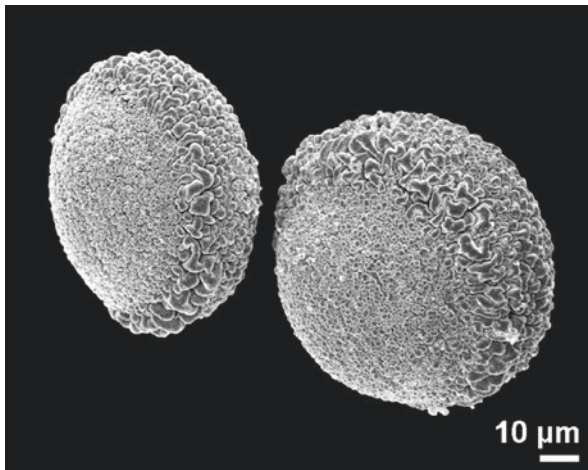
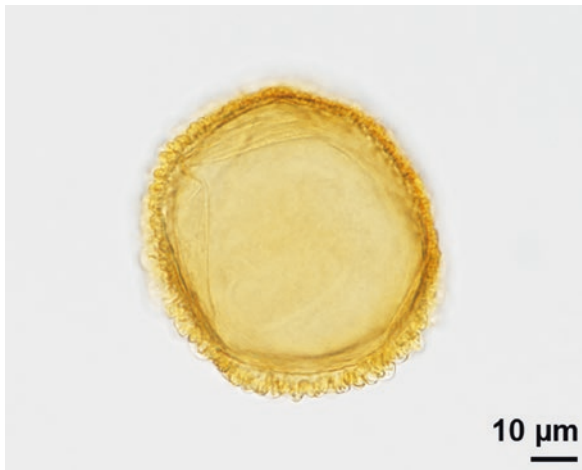
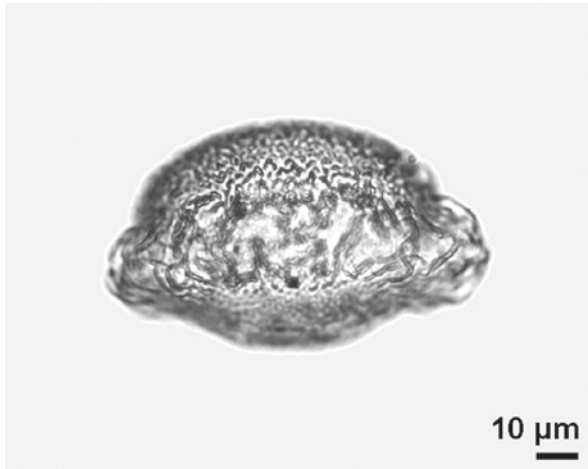
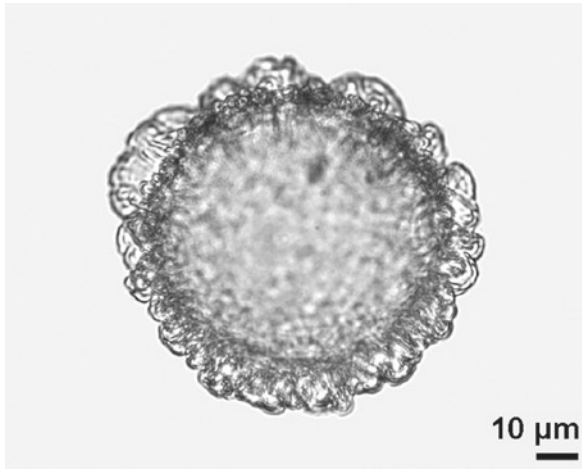
■ ■ *Abies cephalonica*, Pinaceae
 equatorial view

■ ■ *Picea* sp., Pinaceae
 equatorial view

■ ■ *Dacrycarpus dacrydioides*, Podocarpaceae
 trisaccate, proximal polar view

saccus, monosaccate

monosaccate: pollen grain with a single saccus



■ *Tsuga* sp., Pinaceae
fossil, middle Miocene, Austria, polar view

■ *Tsuga canadensis*, Pinaceae
polar view

■ *Tsuga* sp., Pinaceae
fossil, Miocene, China, polar view

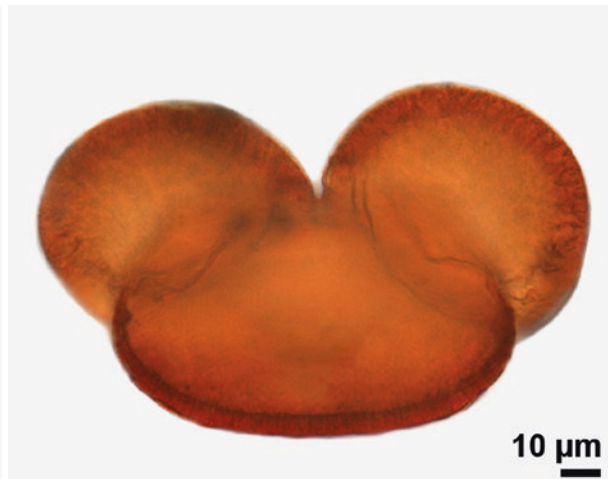
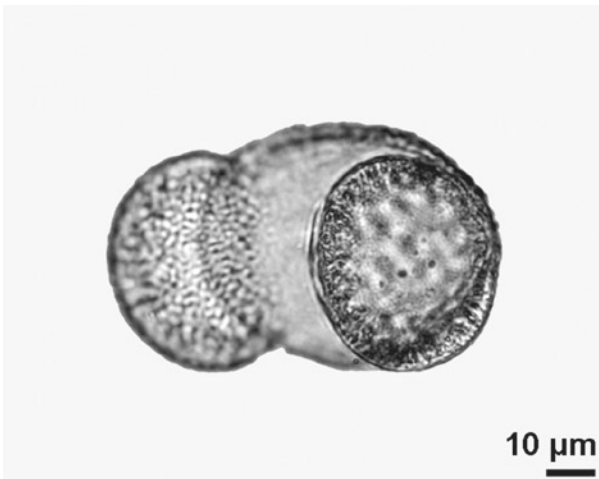
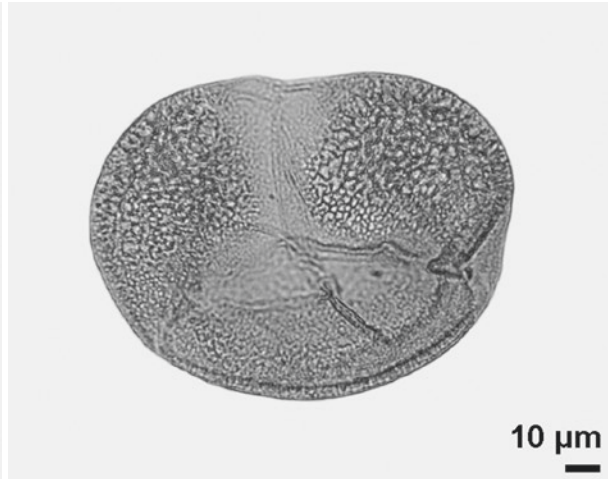
■ *Tsuga* sp., Pinaceae
fossil, middle Miocene, Austria, equatorial view

■ *Tsuga canadensis*, Pinaceae
equatorial view

■ *Tsuga* sp., Pinaceae
fossil, Miocene, China, polar view

saccus, bisaccate

bisaccate: pollen grain with two sacci



■ *Picea* sp., Pinaceae
fossil, Miocene, China, equatorial view

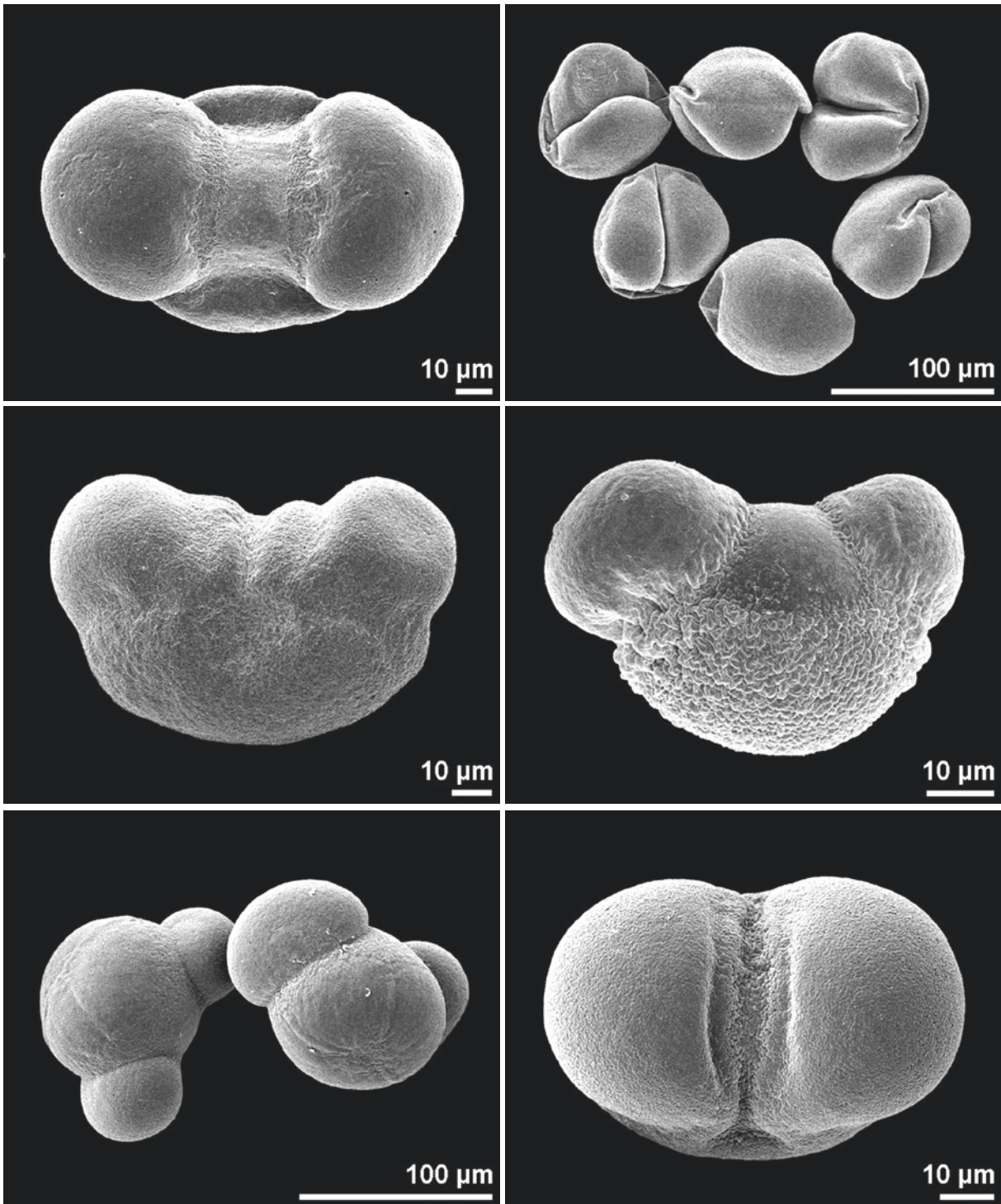
■ *Picea* sp., Pinaceae
fossil, Miocene, China, distal polar view

■ *Pinus* sp., Pinaceae
fossil, Miocene, China, oblique view

■ *Picea* sp., Pinaceae
fossil, Miocene, China, equatorial view

■ *Pinus* sp., Pinaceae
fossil, Miocene, China, distal polar view

■ *Abies cephalonica*, Pinaceae
equatorial view



■ ■ *Abies cephalonica*, Pinaceae
distal polar view

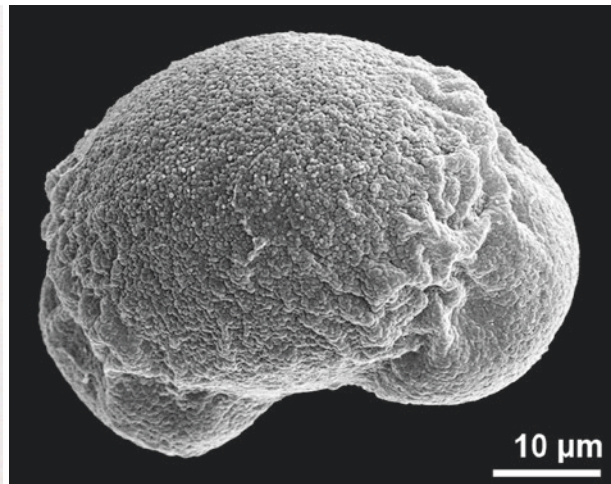
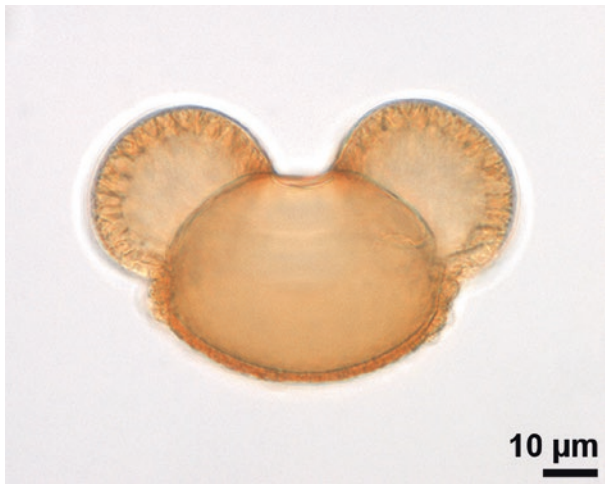
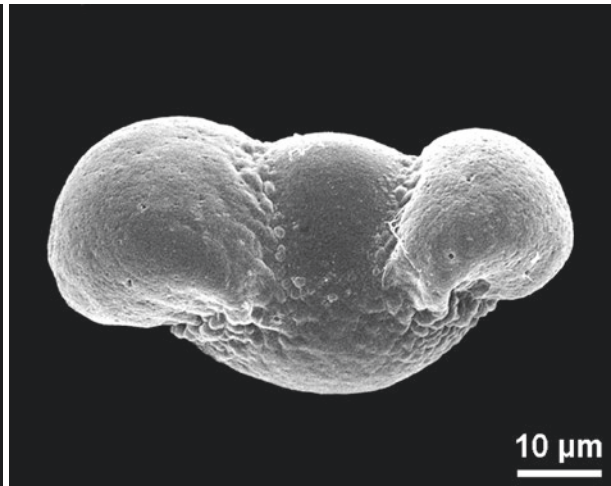
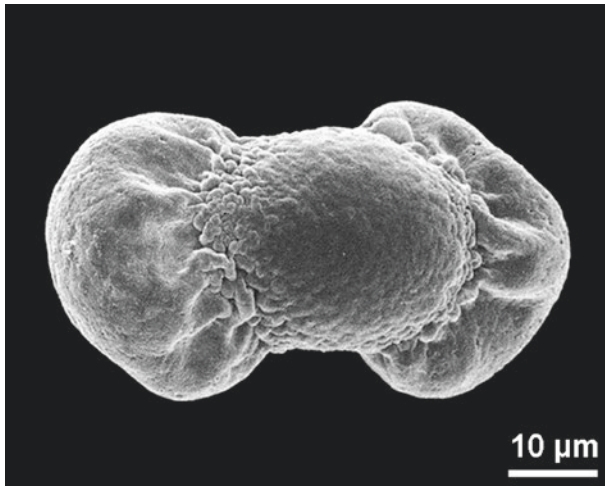
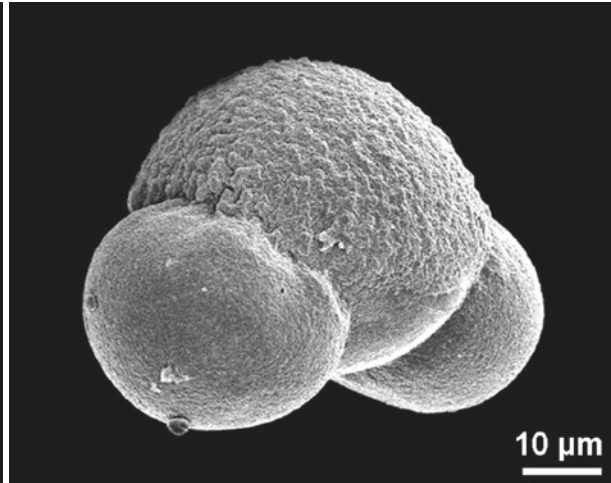
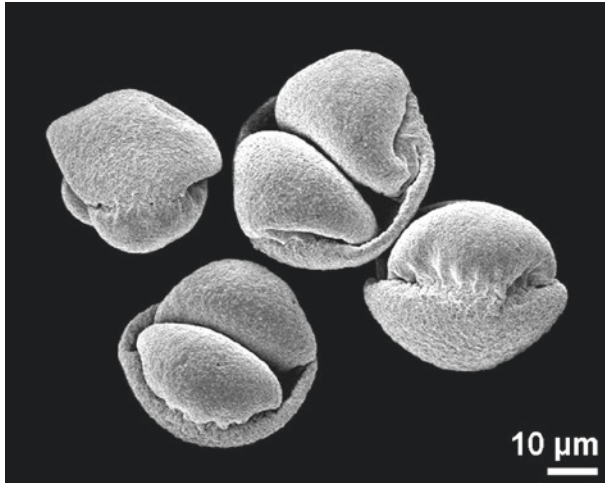
■ ■ *Picea abies*, Pinaceae
equatorial view

■ ■ *Abies nordmanniana*, Pinaceae

■ ■ *Picea abies*, Pinaceae
dry pollen

■ ■ *Pinus mugo*, Pinaceae
equatorial view

■ ■ *Picea pungens*, Pinaceae
distal polar view



■ ■ *Pinus heldreichii*, Pinaceae
dry pollen

■ ■ *Pinus nigra*, Pinaceae
equatorial view

■ ■ *Podocarpus* sp., Podocarpaceae
proximal polar view

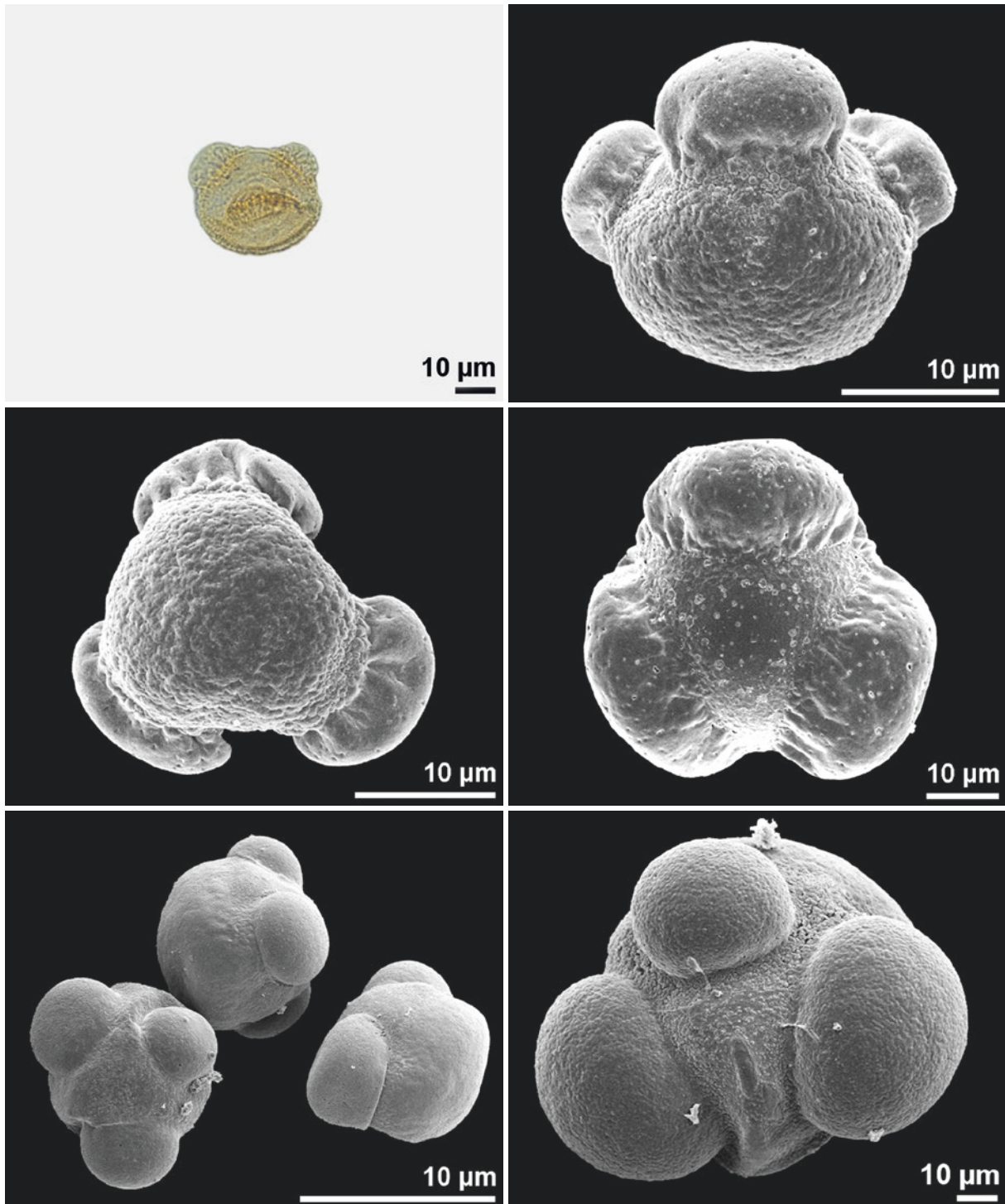
■ ■ *Podocarpus* sp., Podocarpaceae
equatorial view

■ ■ *Pinus mugo*, Pinaceae
equatorial view

■ ■ *Pinus contorta*, Pinaceae
oblique proximal polar view

saccus, trisaccate

trisaccate: pollen grain with three sacci



■ ■ Podocarpaceae
fossil, early Miocene, South-Africa, oblique view

■ ■ *Pherosphaera hookeriana*, Podocarpaceae
proximal polar view

■ ■ *Abies concolor*, Pinaceae

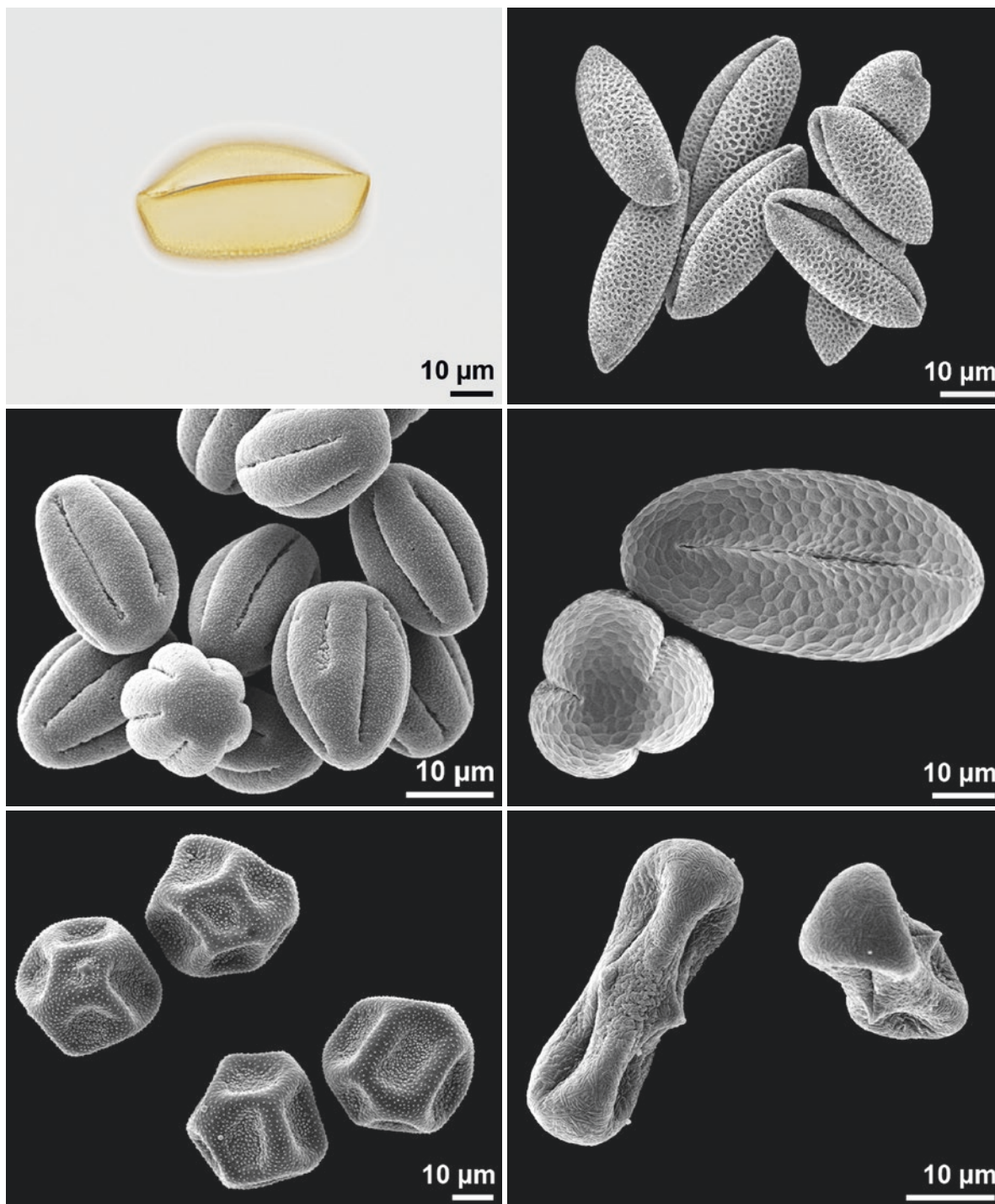
■ ■ *Pherosphaera hookeriana*, Podocarpaceae
equatorial view

■ ■ *Dacrycarpus dacrydioides*, Podocarpaceae
distal polar view

■ ■ *Abies concolor*, Pinaceae
distal polar view

infoldings, apertures sunken

infoldings (dry pollen): consequence of harmomegathy in dry condition



■ ■ *Fritillaria pontica*, Liliaceae
■ ■ sulcate

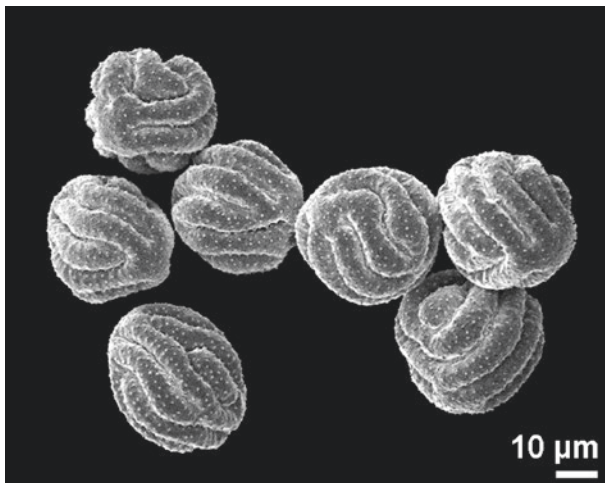
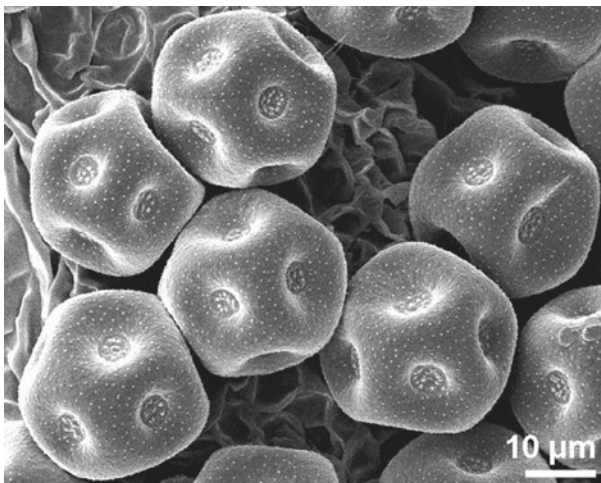
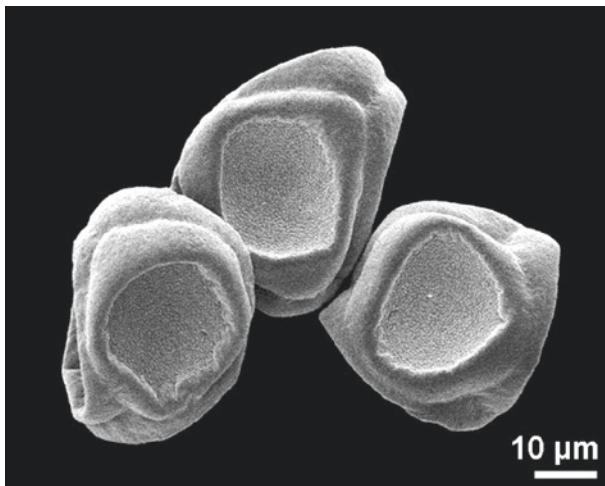
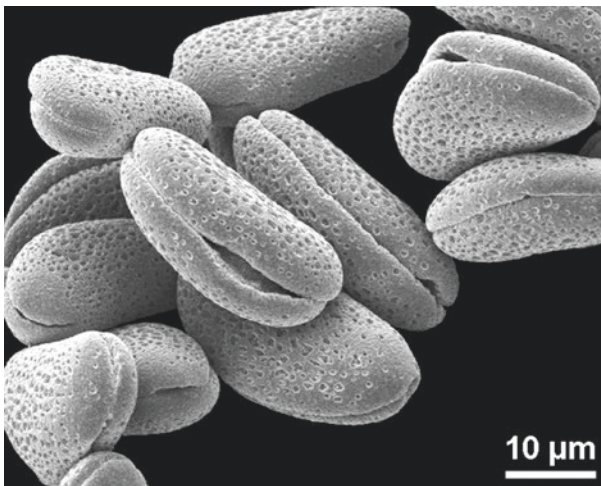
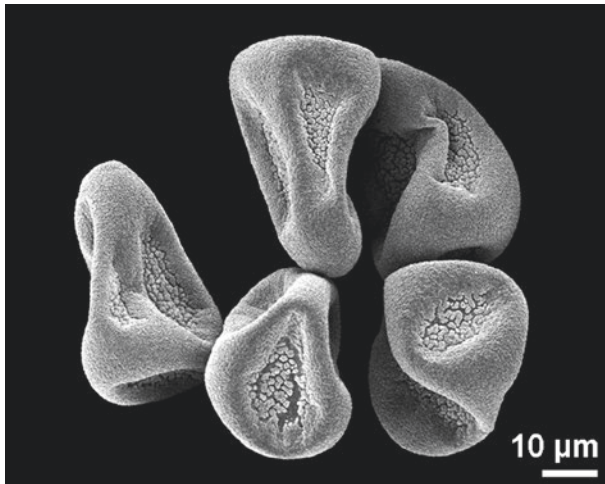
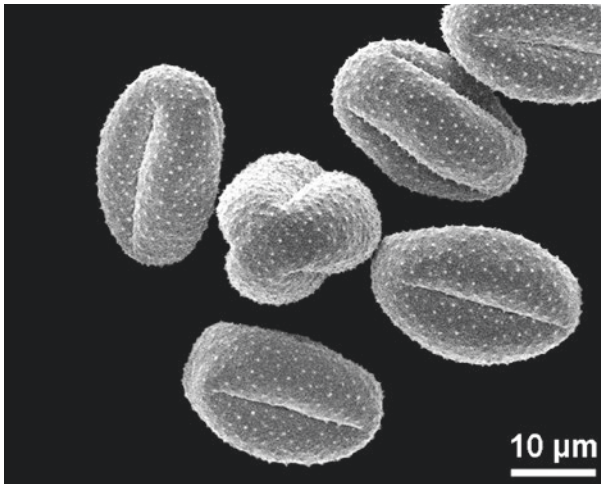
■ ■ *Galium odoratum*, Rubiaceae
■ ■ colpate

■ ■ *Roemeria hybrida*, Papaveraceae
■ ■ pantoporate

■ ■ *Veratrum album*, Melanthiaceae
■ ■ sulcate

■ ■ *Sparmannia africana*, Tiliaceae
■ ■ colpate

■ ■ *Bifora radians*, Apiaceae
■ ■ tricolpate



■ ■ *Artemisia pontica*, Asteraceae
colpate

■ ■ *Lachenalia aloides*, Asparagaceae
sulcate

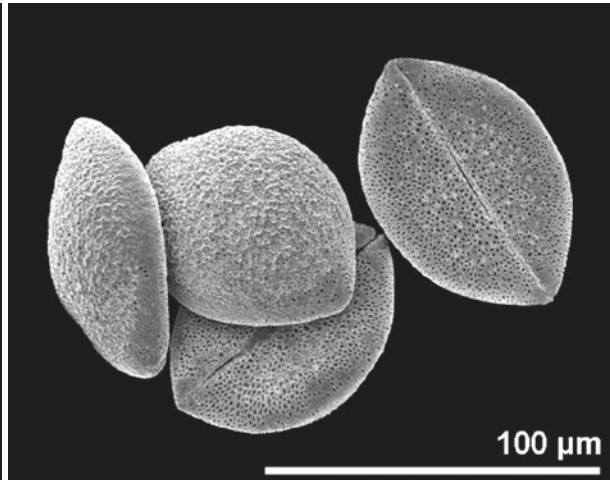
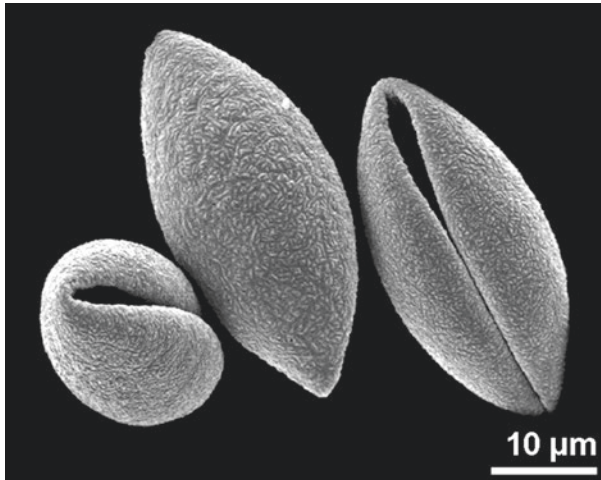
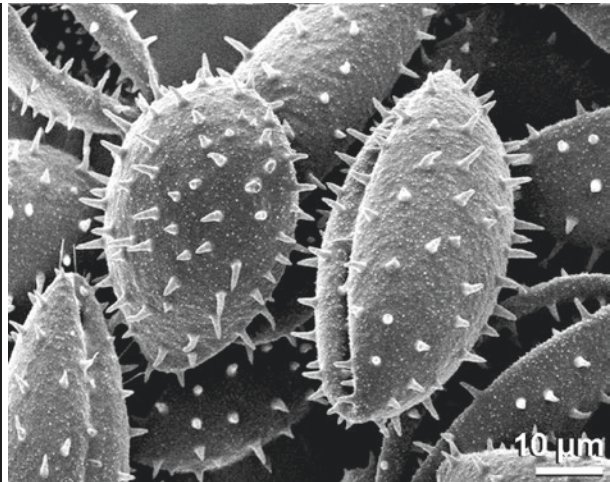
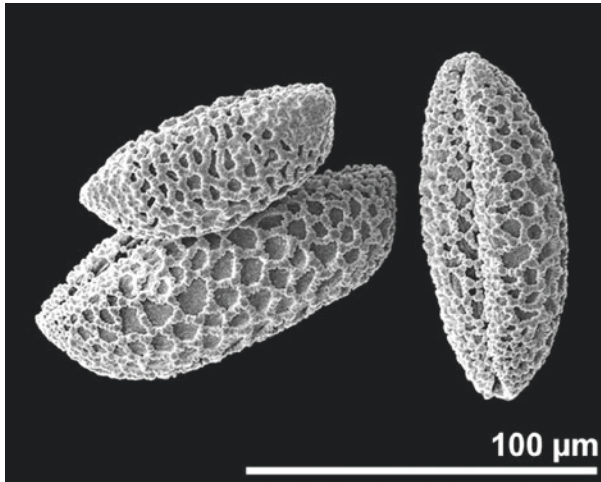
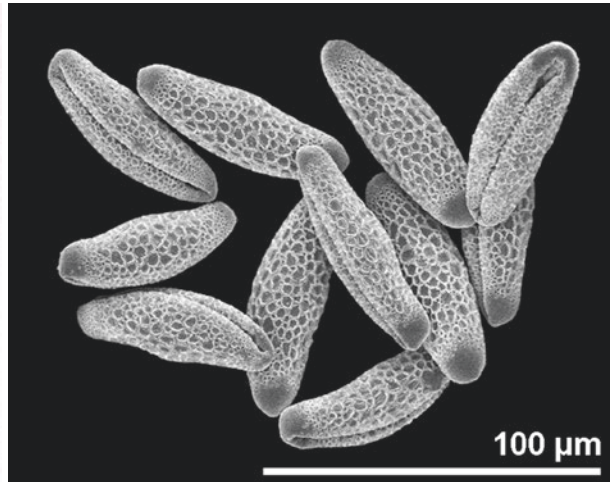
■ ■ *Moehringia muscosa*, Caryophyllaceae
pantoporate

■ ■ *Carex alba*, Cyperaceae
pseudomonads, poroidate

■ ■ *Luzula sylvatica*, Juncaceae
tetrads, ulcerate

■ ■ *Anemone hortensis*, Ranunculaceae
spiraperturate

infoldings, boat-shaped



■ ■ *Dracontium asperum*, Araceae
sulcate

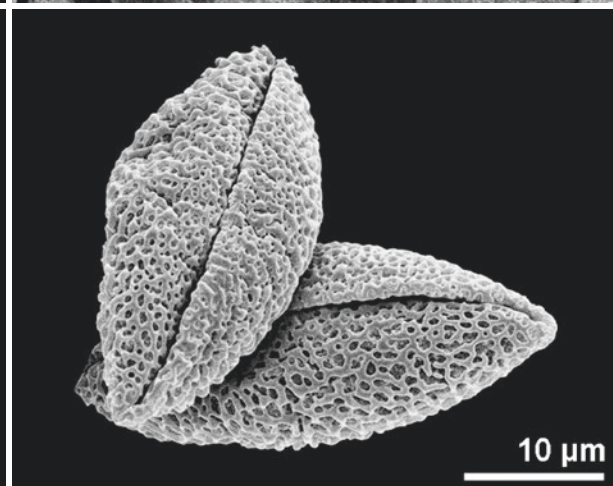
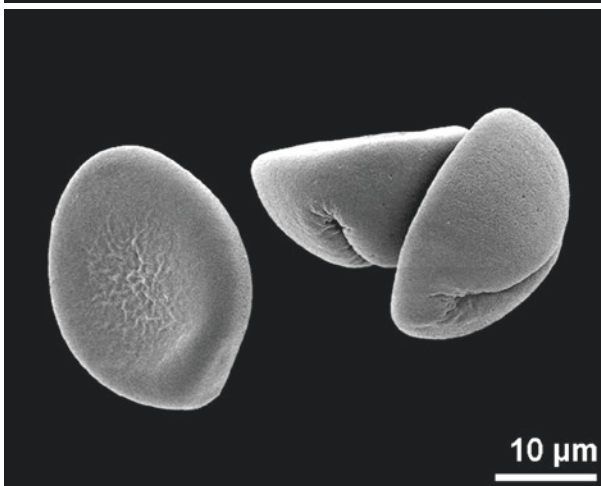
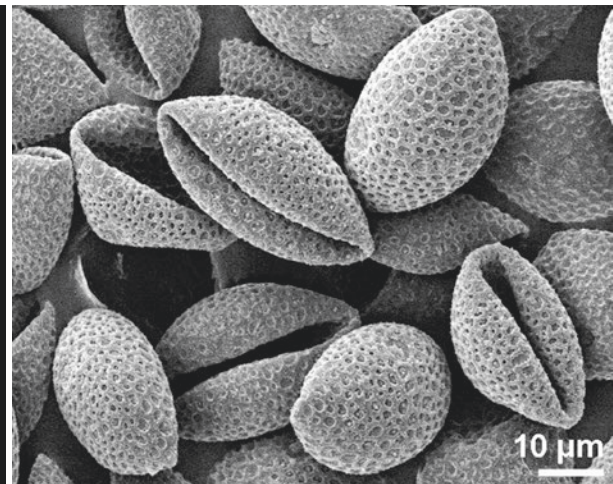
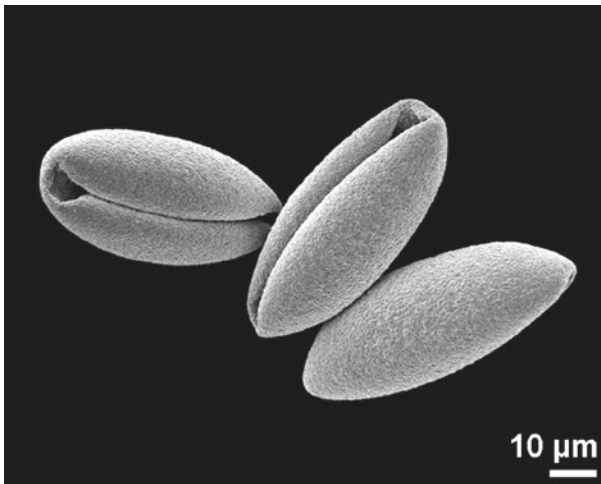
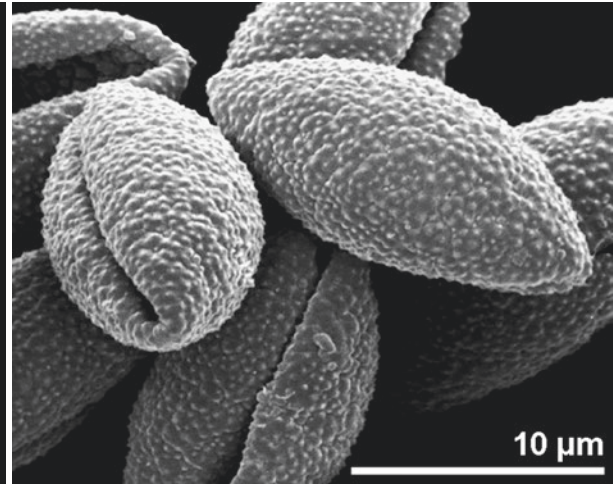
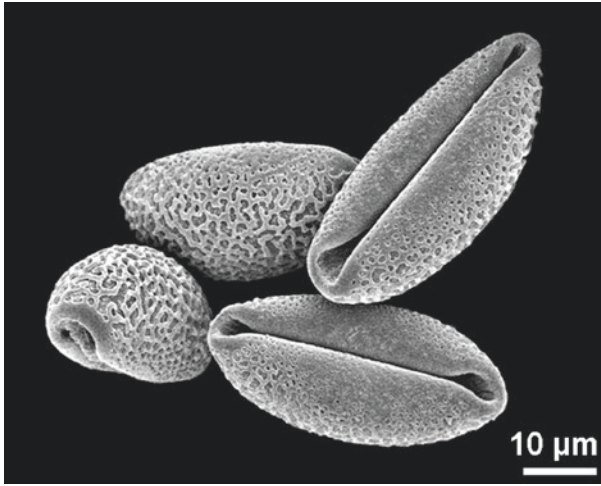
■ ■ *Lilium candidum*, Liliaceae
sulcate

■ ■ *Ginkgo biloba*, Ginkgoaceae
sulcate

■ ■ *Billbergia seidelii*, Bromeliaceae
sulcate

■ ■ *Nuphar lutea*, Nymphaeaceae
sulcate

■ ■ *Asphodeline lutea*, Xanthorrhoeaceae
sulcate



■ *Lysichiton americanus*, Araceae
■ sulcate

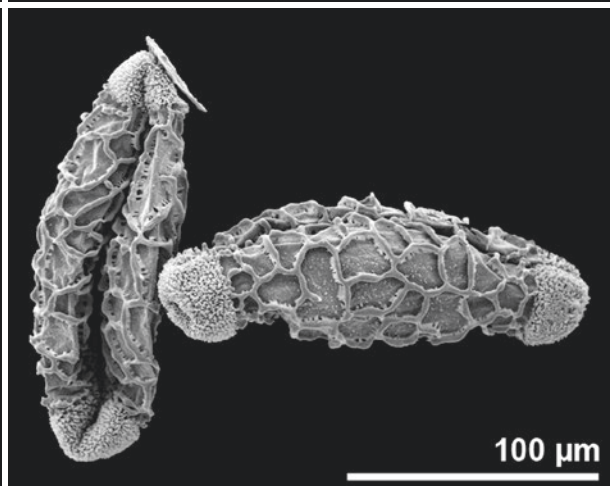
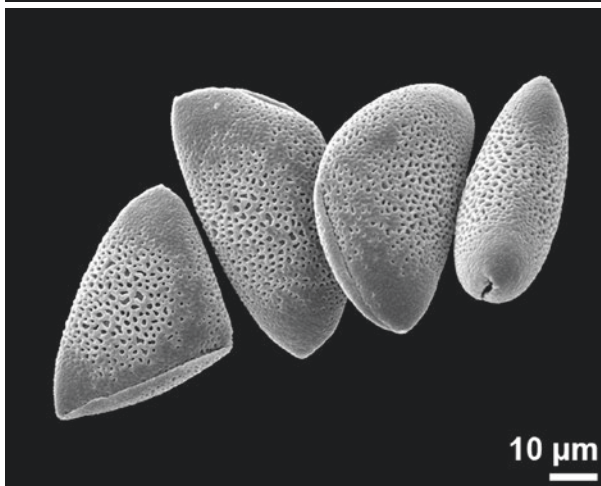
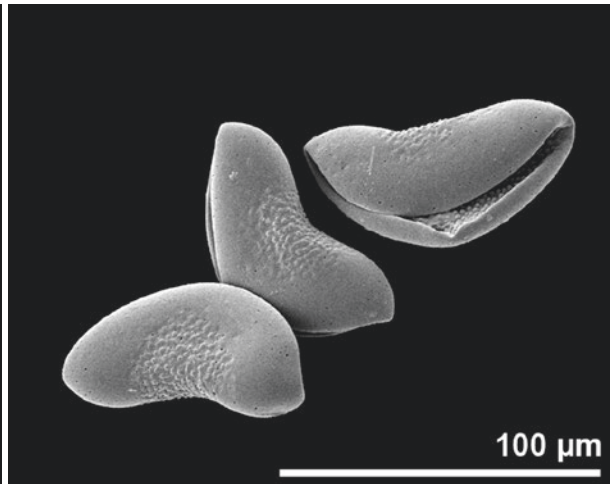
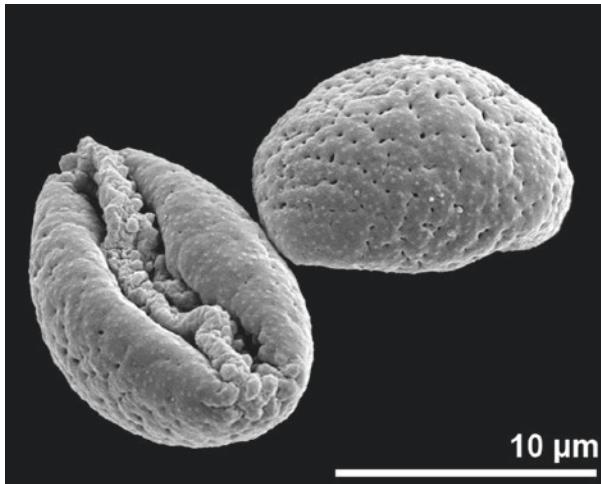
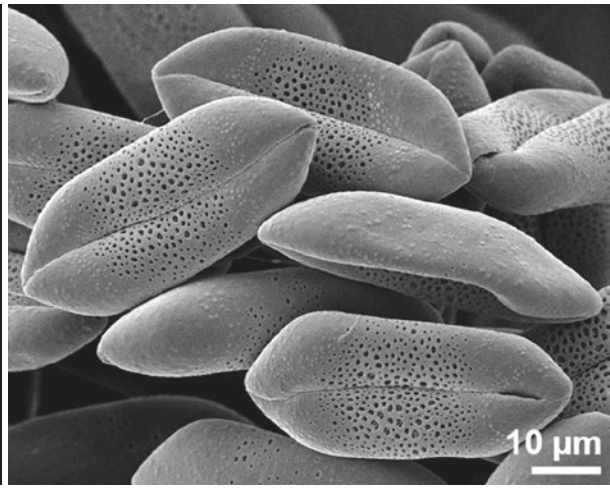
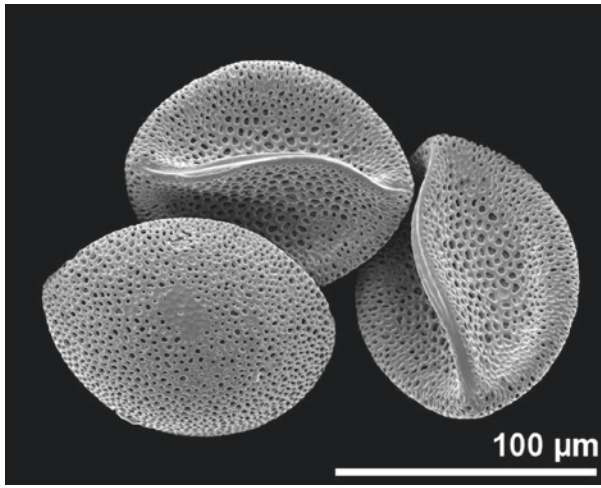
■ *Gagea lutea*, Liliaceae
■ sulcate

■ *Dioon edule*, Zamiaceae
■ sulcate

■ *Piper nigrum*, Piperaceae
■ sulcate

■ *Sparganium erectum*, Typhaceae
■ ulcerate

■ *Symplocarpus foetidus*, Araceae
■ sulcate



■ ■ *Asphodelus fistulosus*, Xanthorrhoeaceae
sulcate

■ ■ *Eremurus thiodanthus*, Xanthorrhoeaceae
sulcate

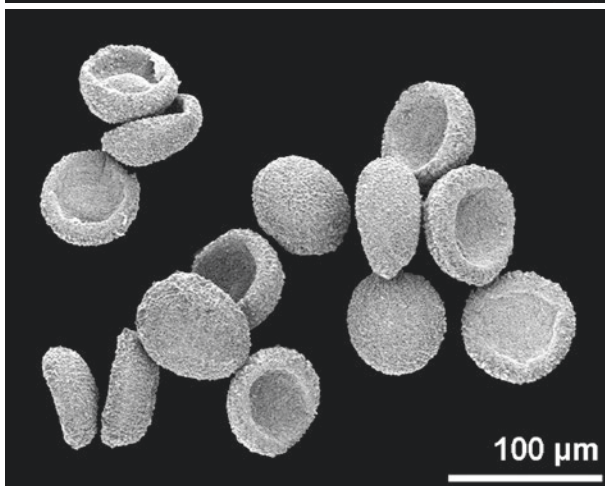
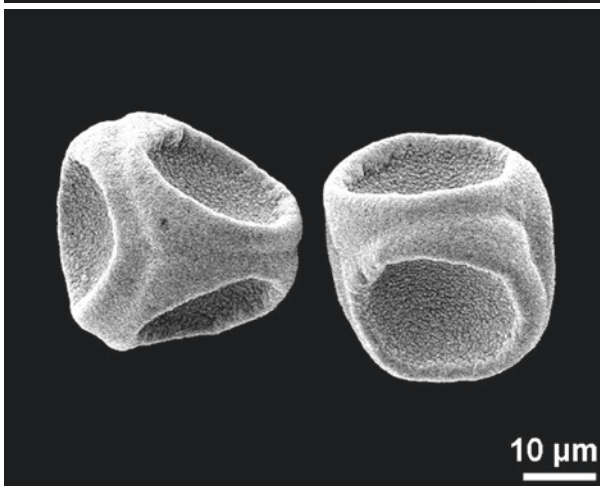
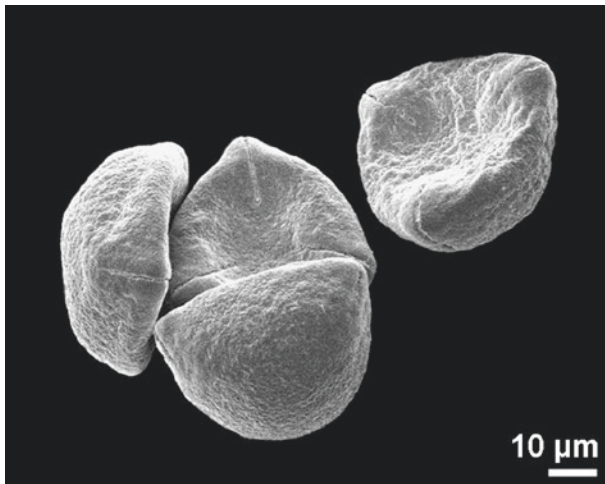
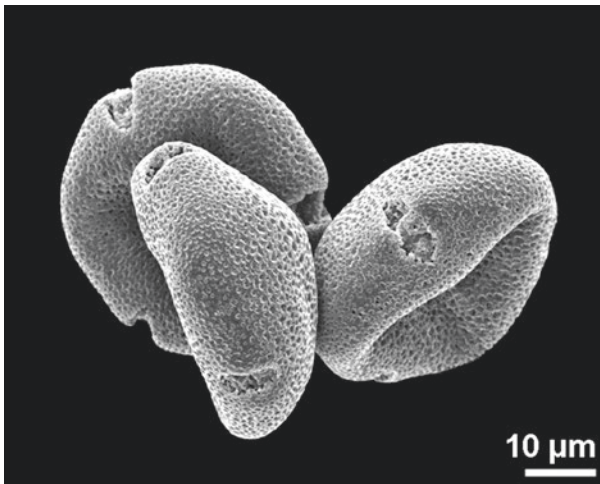
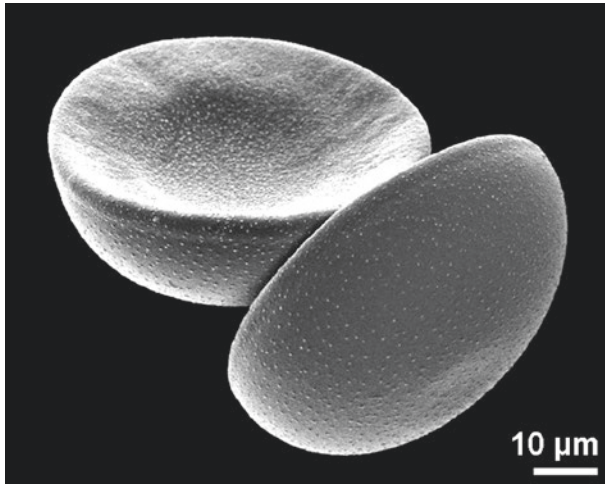
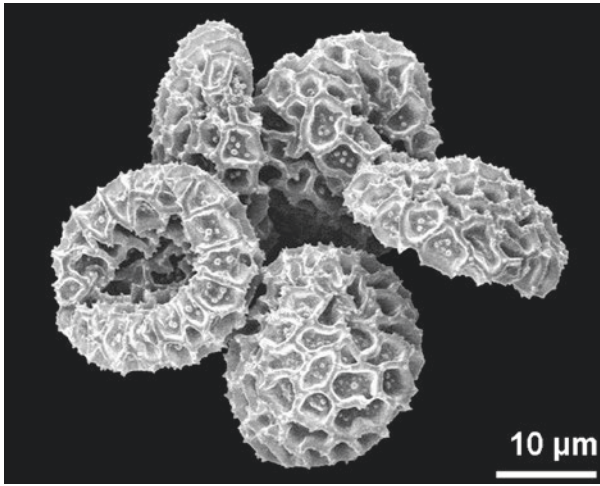
■ ■ *Piper auritum*, Piperaceae
sulcate

■ ■ *Wachendorfia thyrsiflora*, Haemodoraceae
sulcate

■ ■ *Haemanthus coccineus*, Amaryllidaceae
sulcate

■ ■ *Hymenocallis tubiflora*, Amaryllidaceae
sulcate

infoldings, cup-shaped



■ ■ ■ *Bougainvillea* sp., Nyctaginaceae
colpate

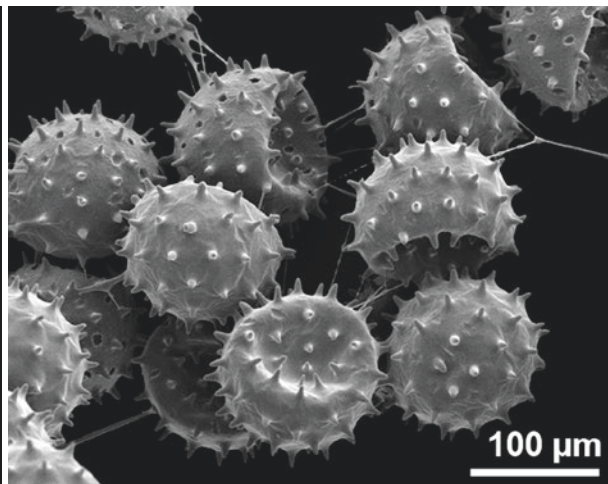
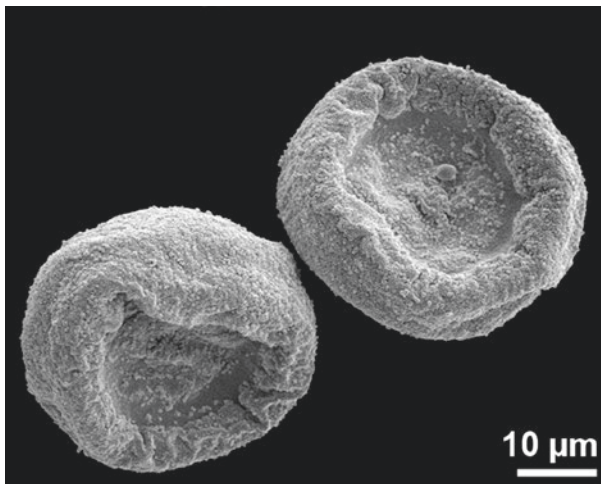
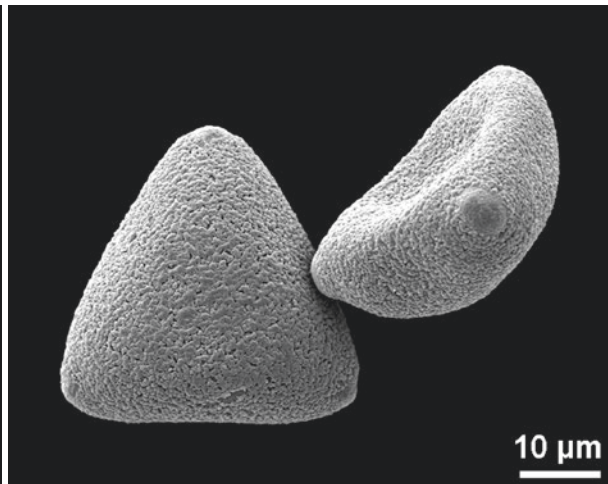
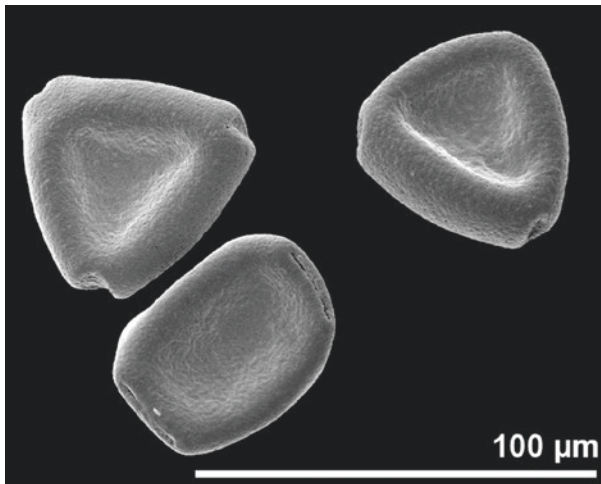
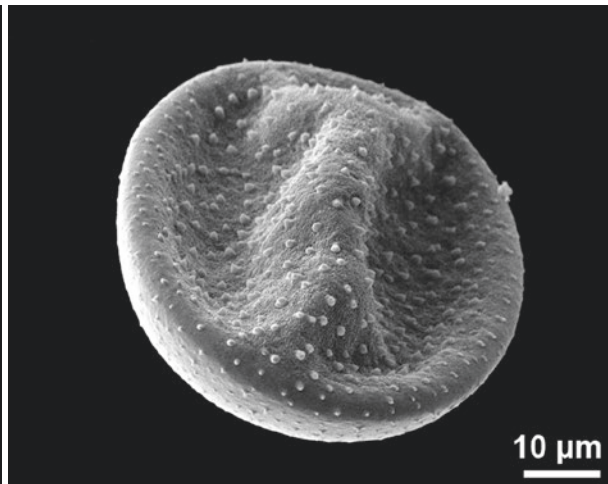
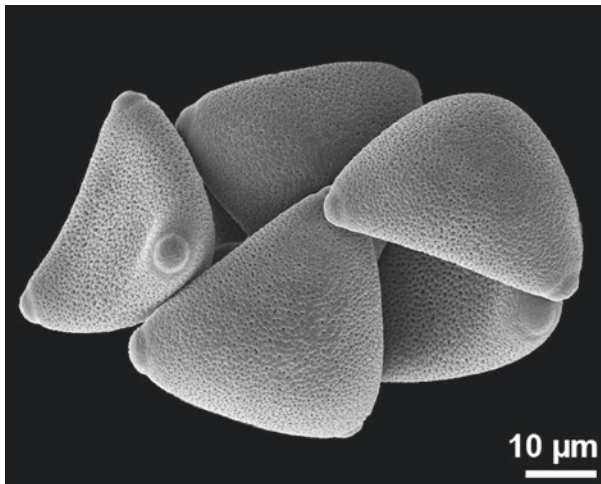
■ ■ ■ *Tilia euchlora*, Malvaceae
colporate

■ ■ ■ *Luzula campestris*, Juncaceae
tetrads, ulcerate

■ ■ ■ *Heliconia* sp., Heliconiaceae
ulcerate

■ ■ ■ *Elaeagnus angustifolia*, Elaeagnaceae
colporate

■ ■ ■ *Tsuga canadensis*, Pinaceae
leptoma



■ ■ ■ *Adenanthos sericeus*, Proteaceae
porate

■ ■ ■ *Heliconia stricta*, Heliconiaceae
ulcerate

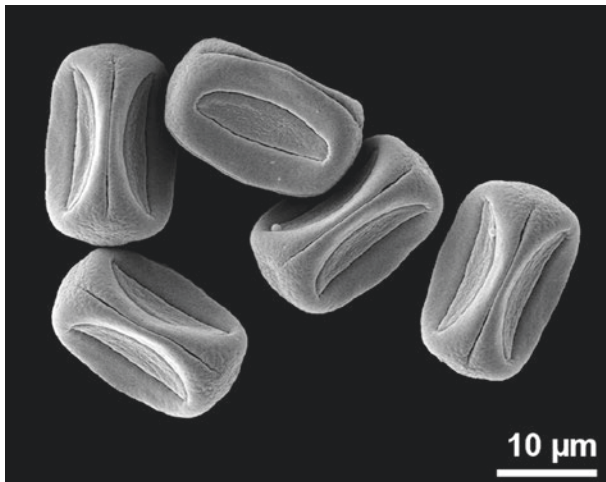
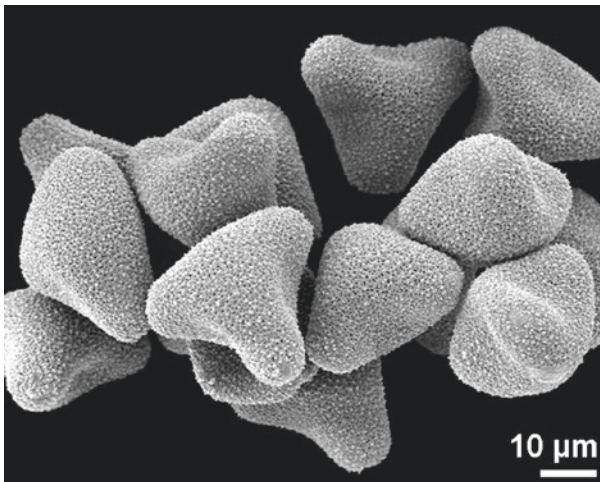
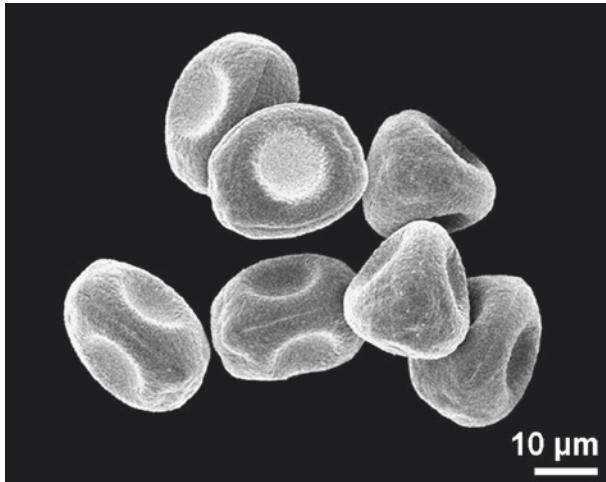
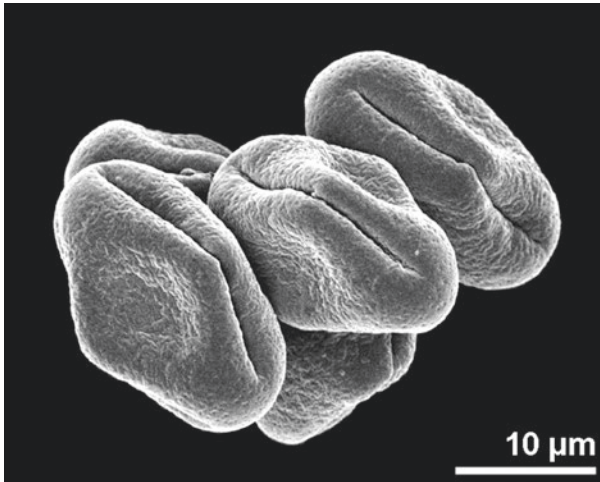
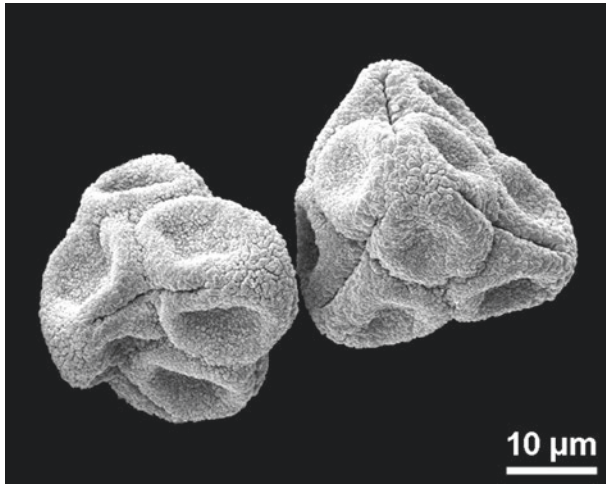
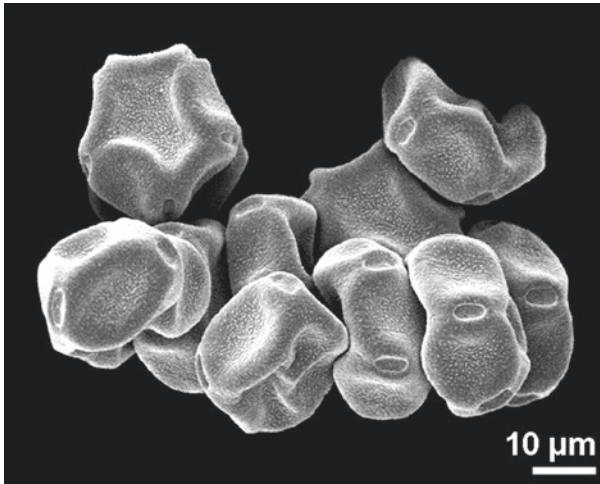
■ ■ ■ *Petrea volubilis*, Verbenaceae
brevicolpate

■ ■ ■ *Leucadendron brunioides*, Proteaceae
porate

■ ■ ■ *Cunninghamia lanceolata*, Cupressaceae
leptoma

■ ■ ■ *Hibiscus schizopetalus*, Malvaceae
porate

infoldings, interapertural area sunken



■ ■ ■ *Alnus glutinosa*, Betulaceae
porate

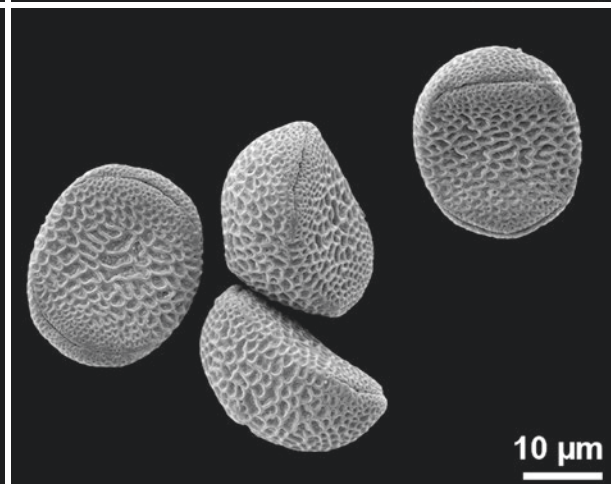
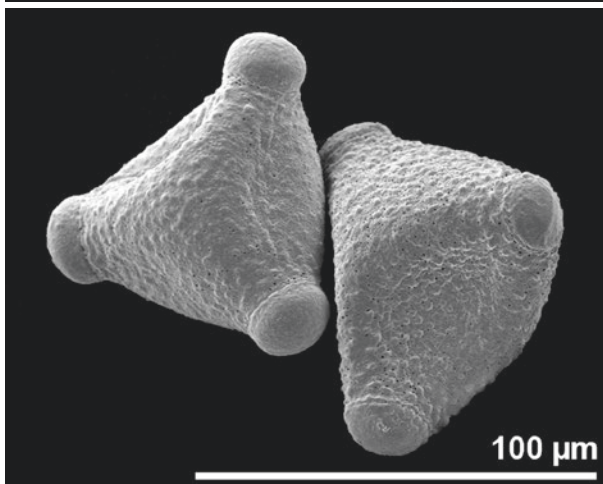
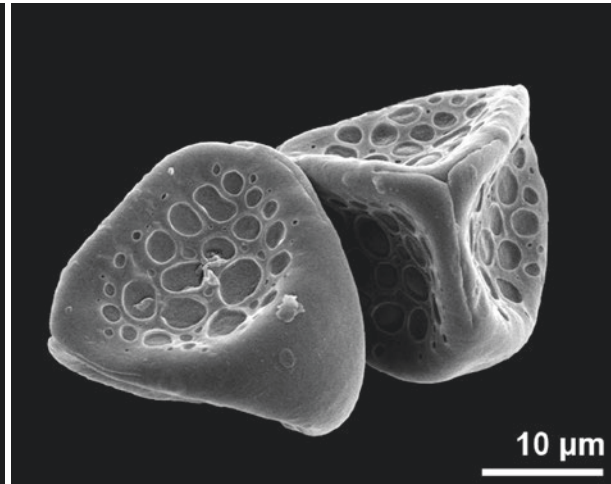
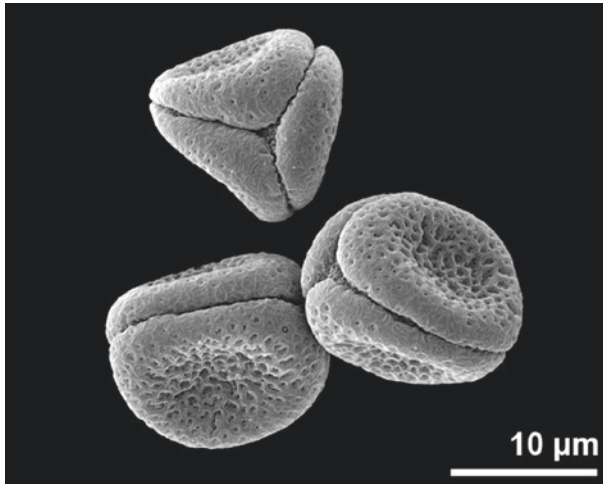
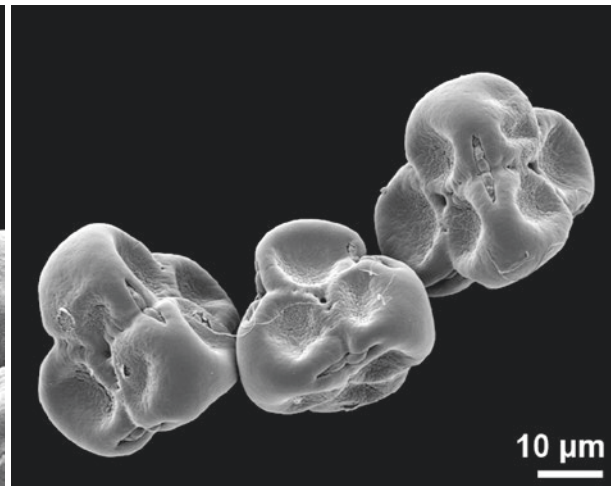
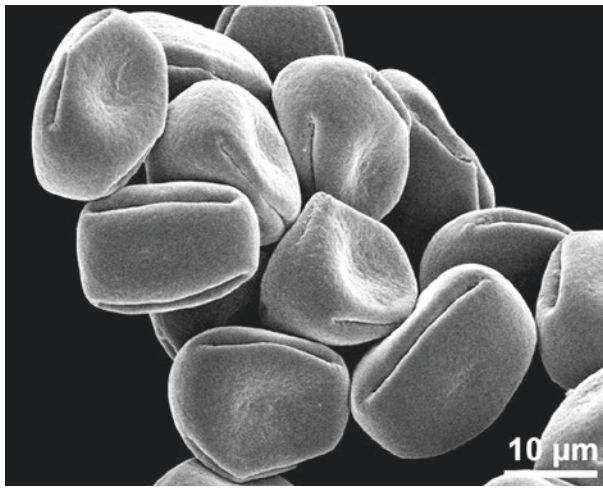
■ ■ ■ *Bupleurum rotundifolium*, Apiaceae
colporate

■ ■ ■ *Leucadendron discolor*, Proteaceae
porate

■ ■ ■ *Erica arborea*, Ericaceae
tetrads, colporate

■ ■ ■ *Melampyrum arvense*, Orobanchaceae
colpate

■ ■ ■ *Melastoma sanguineum*, Melastomataceae
colporate, heteroaperturate



■ ■ *Verbena officinalis*, Verbenaceae
colporate

■ ■ *Ardisia crenata*, Primulaceae
syncolporate

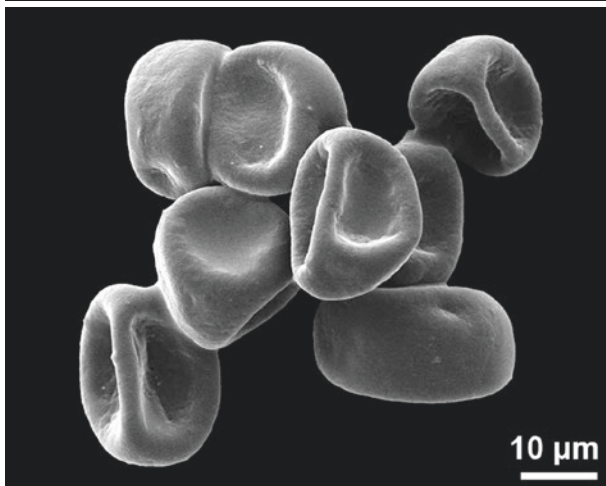
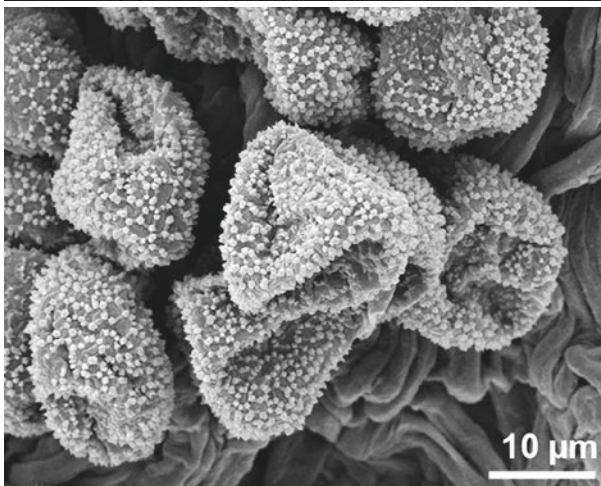
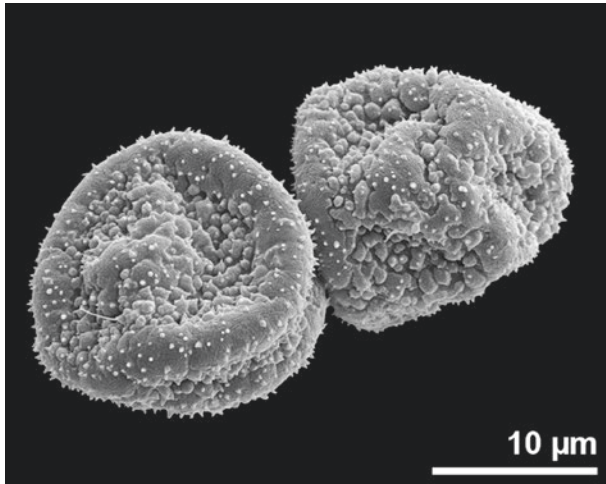
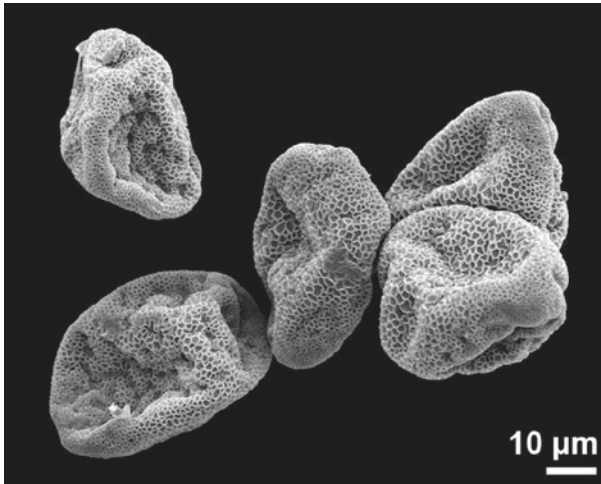
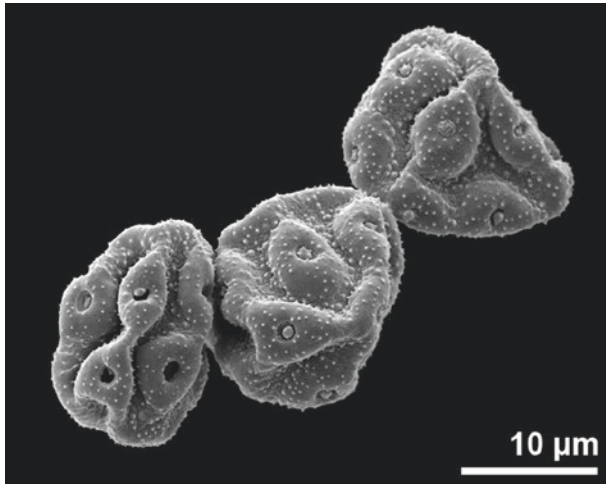
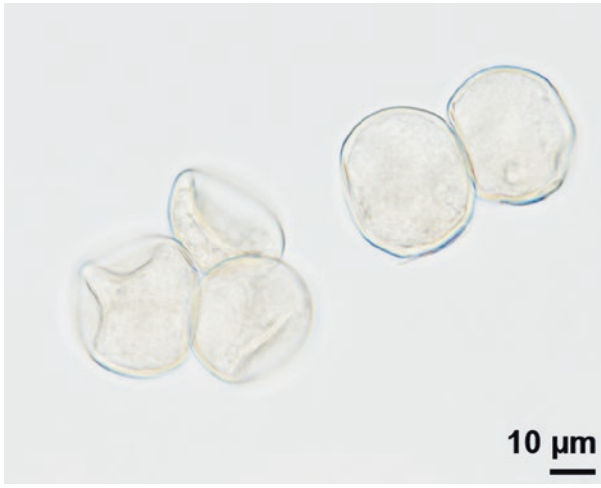
■ ■ *Grevillea banksii*, Proteaceae
porate

■ ■ *Tsusiophyllum tanakae*, Ericaceae
tetrads, colpate

■ ■ *Thesium arvense*, Santalaceae
colpate, triradiate colp

■ ■ *Tropaeolum moritzianum*, Tropaeolaceae
colpate

infoldings, irregular



■ Poaceae
ulcerate

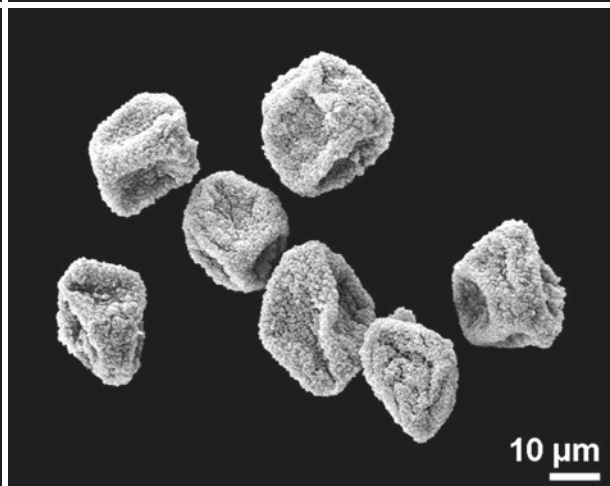
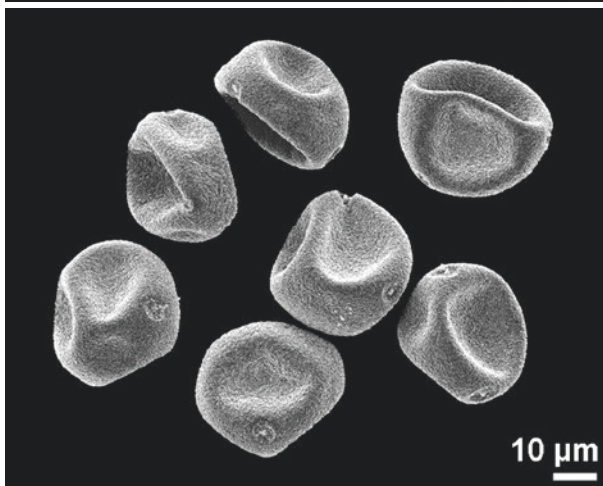
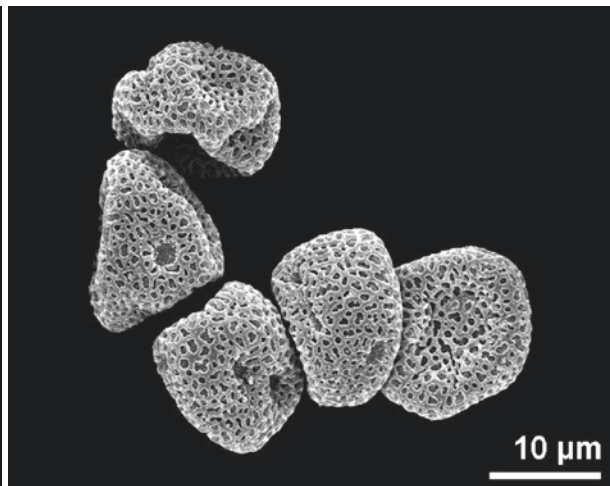
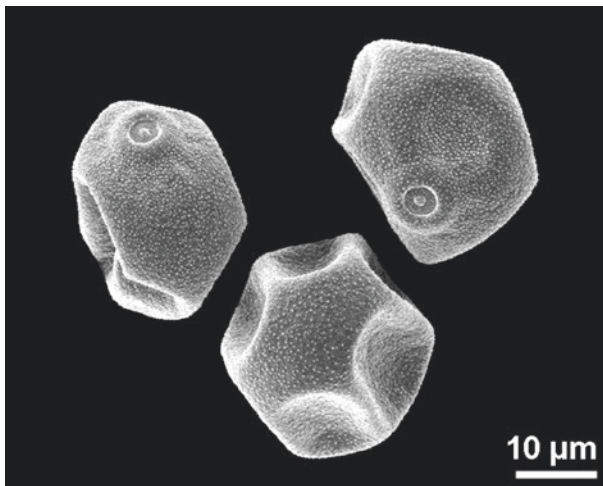
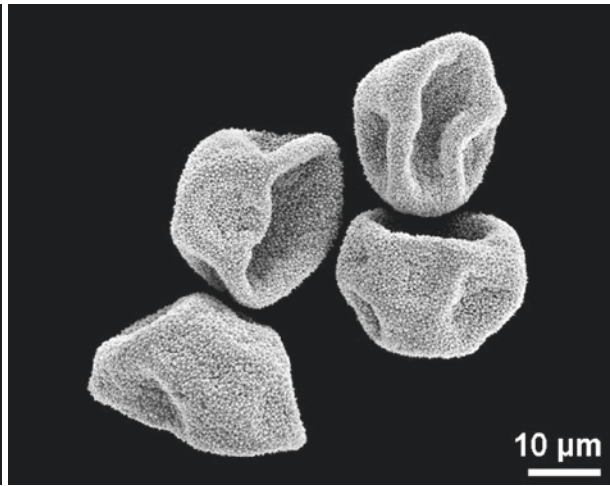
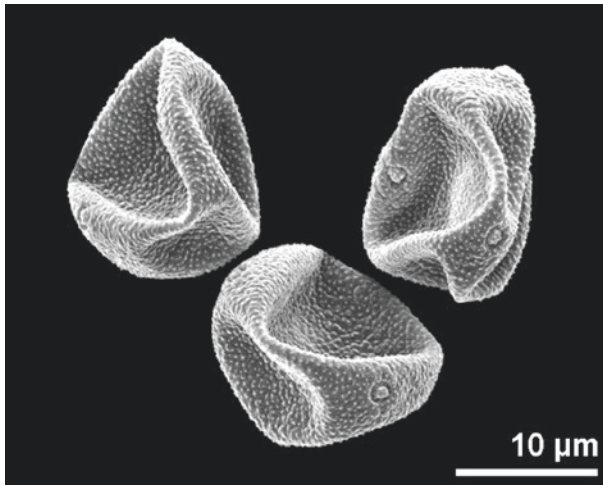
■ *Guzmania elvallensis*, Bromeliaceae
sulcate

■ *Callitriche stagnalis*, Plantaginaceae
inaperturate

■ *Dorstenia contrajerva*, Moraceae
pantoporate

■ *Smilax spinosa*, Smilacaceae
aperture condition unclear

■ *Vanilla planifolia*, Orchidaceae
porate



■ ■ *Urtica dioica*, Urticaceae
 ■ ■ porate

■ ■ *Sesleria albicans*, Poaceae
 ■ ■ ulcerate

■ ■ *Coriaria nepalensis*, Coriariaceae
 ■ ■ porate

■ ■ *Populus alba*, Salicaceae
 ■ ■ inaperturate

■ ■ *Anthurium radicans*, Araceae
 ■ ■ porate

■ ■ *Orobanche hederiae*, Orobanchaceae
 ■ ■ inaperturate

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