



## MEGALOSPORA <sup>1</sup>

Gintaras Kantvilas <sup>2</sup>

*Megalospora* Meyen, in F.J.F. Meyen & J. Flotow, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.*, Suppl. 1, 19: 228 (1843).

Type: *M. sulphurata* Meyen

*Austroblastenia* Sipman, *Biblioth. Lichenol.* 18: 82 (1983); type: *A. pauciseptata* (Shirley) Sipman

Thallus crustose, mostly ecorticate, relatively thick, pale whitish grey or yellowish, with or without soredia or isidia. Photobiont *Dictyochloropsis*, with ± globose cells 6–12 µm wide. Ascomata apothecia, biatorine to lecideine, usually discoid, sessile, basally constricted. Disc persistently plane or becoming convex, sometimes pruinose. Proper exciple generally thick and persistent, glossy, in section cupulate or, rarely, annular, multi-layered and composed of tightly packed, radiating, branched and anastomosed, conglutinated hyphae. Hymenium densely interspersed with oil droplets. Paraphyses slender, c. 1–2 µm thick, branched and anastomosed, not capitate. Asci clavate, 1–8-spored, of the *Megalosporaceae*-type: with an intensely KI+ blue outer coat and a well-developed, KI+ blue tholus lacking internal differentiation, sometimes with a short, conical ocular chamber. Ascospores generally very large (30–100 µm or more long), bicellular to variously transversely septate or muriform, hyaline, ellipsoid to oblong, non-halonate, with or without thickened walls and/or septa. Conidiomata pycnidia, immersed. Conidia bacilliform, c. 5 × 0.7 µm. Chemistry: containing zeorin, together with either pannarin or usnic acid; one non-Australasian species contains xanthones.

A genus of about 40, chiefly corticolous species, widespread throughout the world, but with a distinct predilection for wet forests in oceanic climates. The cool temperate rainforests of austral regions and montane rainforests in the tropics tend to be the most species-rich areas. The species are distinguished from each other chiefly by the combination of thallus chemistry and ascospore type. These characters also readily distinguish *Megalospora* from other crustose genera with large, transversely septate or muriform spores, such as *Lopadium*, *Megalalaria* and *Megaloblastenia*. The iodine reaction of the hymenium in *Megalospora* is variable; with the exception of *M. disjuncta*, where it is I+ yellow-red, in the other Tasmanian species it is I+ blue, with the reaction mostly confined to the asci.

The genus *Austroblastenia* was erected by Sipman (1983) for two Australasian species with thick transverse septa, but otherwise shares all salient features with *Megalospora* s.str. Following a molecular study by Kantvilas & Lumbsch (2012), it was found to be closely related to *M. lopadioides* and subsumed within *Megalospora*. However, further molecular study involving a greater representation of the species with one-spored asci and muriform ascospores could see an alternative classification where *Austroblastenia* is resurrected and expanded to include *M. lopadioides*, *M. clandestina* and their non-Tasmanian relatives.

Key references: Sipman (1983); Kantvilas (1994, 2018); Kantvilas & Lumbsch (2012).

- |   |   |   |
|---|---|---|
| 1 | Thallus yellowish, P- (containing usnic acid and zeorin); ascospores bicellular                                 | 2 |
|   | Thallus grey, P+ orange (containing pannarin and zeorin); ascospores variously transversely septate or muriform | 3 |

1 This work can be cited as: Kantvilas G (2023). *Megalospora*, version 2023:1. In MF de Salas (Ed.) *Flora of Tasmania Online*. 6 pp. (Tasmanian Herbarium, Tasmanian Museum and Art Gallery: Hobart). <https://flora.tmag.tas.gov.au/lichen-genera/megalospora/>

2 Tasmanian Herbarium, Tasmanian Museum & Art Gallery, PO Box 5058, UTAS LPO, Sandy Bay, TAS 7005, Australia.

2(1) Thallus granular, often becoming abraded and coarsely sorediate; ascospores ± oblong, occurring singly in the ascus, 100–145 × 30–56 µm	2 <i>M. disjuncta</i>
Thallus smooth, with farinose soredia occurring in discrete, roundish soralia; ascospores broadly ellipsoid, 6–8/ascus, 30–56 × 19–34 µm	8 <i>M. subtuberculosa</i>
3(1) Ascospores muriform	4
Ascospores transversely septate only	6
4(3) Ascospores (4–)8 per ascus, with thick, transverse septa and thin longitudinal septa	7 <i>M. pupa</i>
Ascospores single in the ascus, with numerous, irregularly-orientated, thin septa	5
5(4) Thallus sorediate; apothecial exciple containing calcium oxalate crystals	1 <i>M. clandestina</i>
Thallus not sorediate; calcium oxalate lacking	4 <i>M. lopadioides</i>
6(3) Ascospores with 3 unevenly thickened transverse septa, 30–50 µm long	5 <i>M. pauciseptata</i>
Ascospores uniformly 1-septate, >50 µm long	7
7(6) Thallus not sorediate; ascospores ± oblong, occurring singly in the ascus	3 <i>M. gompholoma</i> subsp. <i>fuscolineata</i>
Thallus soon dissolving into coarse, granular soredia; ascospores broadly ellipsoid, (1–)2(–4) per ascus	6 <i>M. pulverata</i>

### 1 *Megalospora clandestina* Kantvilas

*Crypt. Biodivers. Assess.*, Special Vol.: 7 (2018). Type: Tasmania, Gowan Brae, c. 500 m S of Circular Marsh, 42°00'S 146°29'E, 900 m, on base of old eucalypt in light woodland bordering a grassland, 20 February 2014, G. Kantvilas 45/14 (holo—HO!).

Thallus creamish white, forming undelimited patches to c. 10 cm wide, sorediate; soredia arising in irregular, erumpent soralia and soon spreading across much of the thallus surface. Apothecia 0.4–1 mm diam.; disc plane, pale to dark red-brown, epruinose; exciple glossy red-brown, initially darker than the disc, concolorous in the oldest apothecia, in section annular, 40–70 µm thick laterally, orange-brown at the upper, outer edge, dilute orange-brown to hyaline within, in the lower part interspersed with calcium oxalate crystals. Hypothecium 100–130 µm thick, pale orange-brown to hyaline. Hymenium 60–90 µm thick, hyaline, overlain by an orange-brown epithelial layer 10–20 µm thick; asci single-spored, 60–95 × 20–30 µm. Ascospores (30–)36–54.0–70(–72) × 12–19.9–28(–30) µm, broadly ellipsoid to oblong, irregularly densely muriform, thin-walled, with individual cells c. 2–6 µm wide (*lopadioides*-type).

Chemistry: pannarin and zeorin; thallus K–, KC–, C–, P+ orange, UV± dull whitish.

Very rare and known only from the type collection, from the rotting bark and wood of an old eucalypt in subalpine woodland at the margins of a grassland, a very unusual habitat for any species of *Megalosporaceae*. Without apothecia, this species could easily be confused with *Megalaria pulvereae* (Borrer) Hafellner & Schreiner (containing atranorin and fumarprotocetraric acid) or *Buellia griseovirens* (Turner & Borrer ex Sm.) Almborn (norstictic acid), which can occur in the same type of habitat. Its closest relative is the Western Australian endemic, *M. occidentalis* Kantvilas.

### 2 *Megalospora disjuncta* Sipman

*Willdenowia* 15: 559 (1986).

Thallus yellowish to yellowish grey, composed of contiguous to overlapping granules and forming wide-spreading, undelimited patches to c. 15 cm wide that overgrow and encrust bark and corticolous bryophytes; granules 0.3–0.5 mm wide, becoming inflated, bursting and dissolving into soredia. Apothecia 1.5–4 mm diam.; disc pale to dark red-brown, glossy, epruinose; exciple pale fawn-brown to grey brown, paler than the disc, often radially fissured and scabrid, in section cupulate, 120–200 µm thick, ± hyaline to pale brownish and interspersed with crystals that dissolve K+ yellowish at the outer edge, dark red-brown, K+ intensifying within, lacking calcium oxalate crystals. Hypothecium 80–125 µm thick, hyaline. Hymenium 150–225 µm thick, hyaline, overlain by an orange-brown epithelial layer c. 20 µm thick; asci single-spored, 120–180 × 34–65 µm. Ascospores 100–145 × 30–56 µm, oblong, 1-septate (*atorubicans*-type); wall 2–4 µm thick.

Chemistry: usnic acid and zeorin; thallus K-, KC-, C-, P-, UV-.

Widespread in temperate rainforests along the eastern coast of mainland Australia and on the North Island of New Zealand. In Tasmania, it is known only from the Furneaux Islands, where it grows as an epiphyte or over bryophytes on sheltered granite boulders in wet scrub on cloud-shrouded pinnacles. The yellowish, sorediate thallus, large, red-brown apothecia and large, bicellular ascospores make this species easily recognisable.

Flinders Island, Fotheringate Creek, 40°12'S 148°04'E, 670 m, 1997, A.C. Rozefelds (HO); Flinders Island, Strzelecki Peaks near summit, 40°12'S 148°04'E, 680 m, 1997, G. Kantvilas 292/97 (HO); Cape Barren Island, southern side of gully E of Mt Munro, 40°22'12"S 148°07'22"E, 540 m, 2007, J.S. Whinray L4674 (HO, MEL).

### 3 *Megalospora gompholoma* (Müll.Arg.) C.W.Dodge **subsp. fuscolineata** Sipman

*Biblioth. Lichenol.* 18: 103 (1983).

*Megalospora taylori* C.W.Dodge, *Nova Hedwigia* 19: 478 ('1970') [1971]. Type: Tasmania, *sine loco*, J.D. Hooker, ex herb. Taylor no. 641 (holo—FH!).

Thallus whitish to pale grey, smooth to a little wrinkled, forming undelimited patches to c. 8 cm wide, not sorediate. Apothecia 1.5–3.2 mm diam.; disc plane at first, usually becoming convex, black-brown to black, glossy, commonly bluish grey-pruinose; exciple black-brown to black, smooth, matt to glossy, in section cupulate, 70–180 µm thick laterally, opaque dark brown, K+ reddish at the outer edges, pale brown and K+ orange-brown within, with calcium oxalate crystals in the subapothecial medulla. Hypothecium 60–130 µm thick, hyaline. Hymenium 140–200 µm thick, hyaline, overlain by a brown epithelial layer 10–15 µm thick; asci single-spored, 120–155 × 22–40 µm. Ascospores (70–)73–90.7–104(–110) × 24–29.7–36(–38)µm, oblong, 1-septate (*atrорubicans*-type); wall 1–3 µm thick.

Chemistry: pannarin and zeorin; thallus K-, KC-, C-, P+ orange, UV± dull whitish.

Highly localised in Tasmania and known only from across the north of the island and from Flinders Island; also reported from Victoria, Lord Howe Island and New Zealand. Most Tasmanian collections are from the smooth bark of *Pomaderris apetala*, growing in lowland sclerophyllous woodlands and forest where subdominant trees (such as *Pomaderris*) are relatively old and robust. It is readily distinguished by its esorediate, grey thallus, single-spored asci and very large ascospores. In the field, it can sometimes be confused with *Megaloblastenia marginiflexa*, which grows in the same habitats, but differs by its non-inspersed hymenium, eight-spored asci and polaribilocular ascospores. One specimen has discrete, roundish soralia and may represent a discrete taxon worthy of further investigation.

The Gnomon, 41°11'S 146°02'E, 475 m, 1991, G. Kantvilas 233/91 (HO); Flinders Island, Walkers Lookout, 40°03'S 148°05'E, 400 m, 2007, G. Kantvilas 37/07 (HO); Dip Falls, 41°02'S 145°22'E, 200 m, 2019, G. Kantvilas 104/19 (HO).

### 4 *Megalospora lopadioides* Sipman

*Biblioth. Lichenol.* 18: 165 (1983). Type: Tasmania, Lake Judd forest, 42°59'S 146°25'E, 640 m, on *Melaleuca*, 28 July 1973, G.C. Bratt 73/917 (holo—HO!).

Thallus creamish white, forming extensive undelimited patches, sometimes covering entire twigs or young trunks, esorediate. Apothecia 0.8–2.5 mm diam., occasionally rather urceolate when young, when old often regenerating with clusters of young apothecia; disc plane, red-brown to black, epruinose, rather glossy; exciple glossy dark red-brown to black, concolorous with or darker than the disc, in section cupulate, 70–150 µm thick laterally, orange-brown, K+ intensely yellow-orange within, greyish black, K+ bluish green, N+ crimson at the outer edges, this sometimes surrounded by a thin, hyaline layer; calcium oxalate crystals lacking. Hypothecium 70–100 µm thick, hyaline to pale yellowish, K+ yellow. Hymenium 120–200 µm thick, hyaline, overlain by a diffuse greyish, K+ blue-green, N+ crimson epithelial layer 10–20 µm thick, sometimes also with flecks of a violet, K+ bright blue-green pigment; asci single-spored, 110–150 × 30–58 µm. Ascospores (64–)68–91.0–116(–120) × 26–35.5–48(–50) µm, broadly ellipsoid to oblong, irregularly densely muriform, thin-walled, with individual cells c. 2–6 µm wide (*lopadioides*-type).

Chemistry: pannarin and zeorin; thallus K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, P<sup>+</sup> orange, UV $\pm$  dull whitish.

Widespread and common in wet forests, scrub and heathland throughout the wetter parts of Tasmania, but especially so in the western half of the island; also known from New Zealand and the subantarctic islands. It is a very conspicuous component of the epiphytic lichen flora in thamnian and implicate rainforest, in the understorey of scrubby sclerophyllous vegetation, and on emergent trees and shrubs in buttongrass moorland. At higher elevations in the south-west, it is found on rocks in sheltered, moist crevices. The violet, K<sup>+</sup> vivid blue-green apothecial pigment (*fucatus*-violet) is seen mainly in specimens from exposed situations.

Fagus Creek, 41°39'S 145°56'E, 980 m, 1984, G. Kantvilas 375/84 & P.W. James (BM, HO); Mt Freycinet, 42°13'S 148°18'E, 600 m, 1995, G. Kantvilas 145/95 (HO); Lake Cygnus, 43°08'S 146°14'E, 880 m, 2006, G. Kantvilas 492/06 (HO).

### 5 *Megalospora pauciseptata* (Shirley) Kantvilas & Lumbsch

*Austral. Syst. Bot.* 25: 215 (2012); —*Heterothecium pauciseptatum* Shirley, *Pap. & Proc. Roy. Soc. Tasm.* 1893: 218 (1894); *Lopadium pauciseptatum* (Shirley) Zahlbr., *Catal. Lich. Univ.* 4: 309 (1927); *Austroblastenia pauciseptata* (Shirley) Sipman, *Biblioth. Lichenol.* 18: 82 (1983). Type: Tasmania, Mt Wellington, Bower Creek, on bark of tree, W.A. Weymouth, 10 August 1889 (holo—BR!; iso—NSW!).

Thallus creamish white to pale grey, smooth to rugulose, or coarsely rimose-areolate, forming patches to c. 8 cm wide, occasionally delimited by a thin, grey-black prothallus, sorediate; soredia whitish, coarse, arising in discrete, roundish, erumpent, pustular soralia 0.5–1.5 mm wide that coalesce and spread across the thallus. Apothecia 0.7–3 mm diam., occasionally shallowly lobate; disc plane or a little convex, glossy red-brown, epruinose; exciple paler than the disc, pale beige to fawn-grey, occasionally with a thin, dark red-brown to grey inner rim adjacent to the disc, in section cupulate, 65–140  $\mu$ m thick laterally, with the outer part hyaline and often diffusely red-brown at the upper edge, grey within due to dense inclusions of minute droplets and granules that do not dissolve in K or N; calcium oxalate crystals lacking. Hypothecium 120–180  $\mu$ m thick, hyaline. Hymenium 100–160  $\mu$ m thick, hyaline, overlain by a diffuse red-brown epithelial layer 10–20  $\mu$ m thick; asci 8-spored, 85–100  $\times$  28–40  $\mu$ m. Ascospores 30–35.5–43.5(–50)  $\times$  16–19.6–24  $\mu$ m, ellipsoid, 4-celled, with thick septa and rhomboid to lens-shaped locules (*paucispetata*-type); wall c. 2.5  $\mu$ m thick.

Chemistry: pannarin and zeorin; thallus K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, P<sup>+</sup> orange, UV<sup>+</sup> white (soralia).

Widespread on the bark of trees and shrubs in forest, woodland and scrub, and on emergent trees in heathland and moorland. This species is rarely fertile in drier areas, but the thick, whitish, sorediate thallus is readily identifiable by its chemistry. It is also present in Victoria and New Zealand.

Upper Olga River, Transect 7, 42°51'S 145°50'E, 70 m, 1976, G.C. Bratt 76/281 et al. (HO); near Reece Dam, 41°43'S 145°07'E, 170 m, 1989, G. Kantvilas 266/89 (HO); MacGregor Peak, N of summit, 42°59'S 147°57'E, 550 m, 2010, G. Kantvilas 5/10 (F, HO).

### 6 *Megalospora pulverata* Kantvilas

*Lichenologist* 26: 355 (1994). Type: Tasmania, Douglas River, 41°46'S 148°12'E, on *Pomaderris apetala* in wet scrub on riverbank, 80 m, October 1984, G. Kantvilas 734/84 (holo—HO!).

Thallus pale greyish white to cream-white, soon becoming entirely coarsely granular-sorediate and forming a thick, irregularly spreading, pulverulent crust to c. 15 cm wide. Apothecia 1–3(–4) mm diam., sometimes becoming somewhat lobate with age, usually nestled in the thallus; disc plane to undulate, brown to black, typically greyish or purplish grey-pruinose; exciple black, glossy, in section cupulate, 100–240  $\mu$ m thick laterally, dark brown to orange-brown, K<sup>+</sup> deep red, most intensely pigmented beneath the hypothecium, greenish black, K<sup>+</sup> bluish green, N<sup>+</sup> crimson at the upper and outer edges, containing calcium oxalate at the base. Hypothecium 50–80(–120)  $\mu$ m thick, hyaline. Hymenium 130–240  $\mu$ m thick, hyaline, overlain by a brownish epithelial layer 10–15  $\mu$ m thick; asci (1–)2(–4)-spored, 110–180  $\times$  30–50  $\mu$ m. Ascospores (46–)48.5–65.4–80(–98)  $\times$  24–31.0–38(–40)  $\mu$ m, broadly ellipsoid, 1-septate, straight or a little bent (*suphurata*-type); wall 1–3  $\mu$ m thick.

Chemistry: pannarin and zeorin; thallus K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, P<sup>+</sup> orange, UV<sup>+</sup> white (soralia).

Locally common on bark or, rarely, on mossy, sheltered rocks in coastal and lowland parts of the east, north and north-west, where it occurs in wet sclerophyll forest, wet sclerophyllous scrub, mixed forest and *Melaleuca ericifolia*-dominated swamps. *Pomaderris apetala* is a favoured host, as it is with several other species of Megalosporaceae, although flaky or spongy bark such as that of *Bedfordia* and *Melaleuca* are also colonised. This species is very commonly sterile, and even specimens with abundant apothecia tend to contain few well-formed spores. However, it is easily determined by the thick, grey, sorediate thallus containing pannarin. It is also found in south-eastern mainland Australia.

Mt Duncan, 41°12'S 146°02'E, 650 m, 1992, G. Kantvilas 290/92 (HO); Welcome Swamp, 40°57'S 144°48'E, 40 m, 2001, G. Kantvilas 1210/01 (HO); NE of Prossers Sugarloaf, 42°40'S 147°50'E, 570 m, 2018, G. Kantvilas 123/18 (HO).

### 7 *Megalospora pupa* (Sipman) Kantvilas & Lumbsch

*Austral. Syst. Bot.* 25: 215 (2012); —*Austroblastenia pupa* Sipman, *Biblioth. Lichenol.* 18: 84 (1983).

Thallus greyish white to pale greenish grey, effuse, smooth, faintly rimose, forming roundish patches to c. 6 cm wide, often delimited by a thin, black prothallus, esorediate. Apothecia 0.7–1.8 mm diam.; disc plane, pale red-brown, typically faintly greyish-pruinose; exciple glossy dark brown to black, darker than the disc, in section cupulate, 70–160 µm thick laterally, red-brown, K<sup>+</sup> orange-brown or red-brown intensifying, darkest at the edges and beneath the hypothecium, generally paler within, usually with a thin, hyaline outermost layer; calcium oxalate crystals lacking. Hypothecium 60–110 µm thick, hyaline to pale yellowish, K<sup>+</sup> yellowish. Hymenium 180–250 µm thick, hyaline, K<sup>+</sup> yellowish, overlain by a thin, grey-brown to reddish brown, K<sup>+</sup> yellowish brown epithelial layer 6–10 µm thick; asci (4–)8-spored, 160–220 × 38–65 µm. Ascospores (40–)42–59.4–80(–84) × 18–25.5–36 µm, ellipsoid, sometimes a little bent, muriform, with 9–11(–13) transverse, usually thickened septa, each transverse section divided with 3–5 longitudinal septa (*pupa*-type); wall 0.5–1.5 µm thick.

Chemistry: pannarin and zeorin; thallus K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, P<sup>+</sup> orange, UV<sup>±</sup> dull whitish.

Widespread throughout Tasmania in rainforest and wet scrub where it occurs mainly on young trunks and branches; also present in New Zealand. In its superficial appearance, this species can be confused with young forms of *M. lopadioides*, although it generally has a thinner, less extensive thallus and smaller apothecia where the disc is at least faintly pruinose and never black. The ascospore type is diagnostic.

W of Mt Charter, 780 m, 1989, G. Kantvilas 161/89 (distributed as *A. Vězda: Lich. Sel. Exsicc.*: 2351) (HO); Algonkian Mountain, 42°24'S 146°03'E, 960 m, 1990, G. Kantvilas 129/90 (HO); Flinders Island, Mt Strzelecki, 40°12'05"S 148°04'18"E, 680 m, 2014, G. Kantvilas 182/14 (HO).

### 8 *Megalospora subtuberculosa* (C.Knight) Sipman

*Biblioth. Lichenol.* 18: 123 (1983); —*Lecidea versicolor* var. *subtuberculosa* C.Knight, *Trans. Proc. New Zealand Inst.* 7: 358 (1875).

Thallus pale yellow, smooth, glossy, sometimes faintly rimose, forming patches to 12 cm wide, sometimes delimited by a faintly greyish leading edge, sorediate; soralia discrete, ± circular, usually convex, (0.5–)1(–1.5) mm wide, concolorous with the thallus or with a greenish tinge. Apothecia very rare, 1–2.5 mm diam.; disc plane, red-brown to black-brown, epruinose; exciple smooth and entire, concolorous with the disc or a paler beige-brown, with a thin, darkened rim adjacent to the disc, in section cupulate, 120–200 µm thick laterally, dark brown to orange-brown, K<sup>+</sup> intensifying, most intensely pigmented beneath the hypothecium, becoming paler to almost hyaline towards the outer edges, containing calcium oxalate at the base. Hypothecium 80–120 µm thick, hyaline, K<sup>+</sup> yellowish. Hymenium 140–170 µm thick, hyaline, overlain by a brownish, K<sup>+</sup> orange-brown epithelial layer 10–15 µm thick; asci 6–8-spored, 120–160 × 28–48 µm. Ascospores 30–40.4–50(–56) × 19–24.9–31(–34) µm, broadly ellipsoid, 1-septate, straight (*suphurata*-type); wall 1.5–2 µm thick, with a gelatinous epispore.

Chemistry: usnic acid and zeorin; thallus K<sup>-</sup>, KC<sup>-</sup>, C<sup>-</sup>, P<sup>-</sup>, UV<sup>-</sup>.

Highly localised in lowland wet sclerophyll forest and rainforest, in particular where *Pomaderris apetala*, the preferred host tree, is common in the understorey; also known from eastern mainland Australia and New Zealand. This species is very rarely fertile but is very eye-catching and easily identified by its smooth, glossy yellow thallus with scattered, roundish soralia.

Near Lyons River, 41°09'S 145°24'E, 340 m, 1982, G. Kantvilas 22/82 (HO); Pruanna Road, Campbell Range, 41°09'S 145°27'E, 280 m, 1991, G. Kantvilas 400/91, B. Fuhrer & J. Jarman (HO); Sandspit River, 42°43'S 147°51'E, 170 m, 2010, G. Kantvilas 99/10 (F, HO).

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