

FOLIOSE KEY

(IF PHOTOBIONT BLUE-GREEN, SEE KEYS TO CYANOLICHEN GENERA)

Rev. 2/94

Although species of foliose lichens are relatively well known and easily distinguished (at least if you can do TLC!), the genera are often a big pain. I have attempted to follow the main organization of Hale's How to Know the Lichens, but have pulled out some of the more distinctive taxa earlier in the keys, removed genera containing only cyanobacteria, and tried to explain what his system of "colors" (chemistry) means. For more information on the segregates of Parmelia, Cetraria, and Physcia, see the separate documents on those.

1. Thallus or at least apothecial disks yellow, orange, or red, K+ purple (anthraquinones); spores hyaline, polarilocular. [If spores simple, see Fulgensia]. "ORANGE LICHENS": Xanthoria

1. Thallus and apothecia not orange or red; if yellow then upper cortex K-; spores brown and 1-septate to polarilocular, or hyaline and simple. 2

2. Upper surface of thallus bright yellow-green (pulvinic acid derivatives), or \pm pale yellow to yellow-green or pure green (usnic acid, sometimes only in trace amounts), K- (without atranorin) or rarely (Arctoparmelia) K+ yellow (with atranorin in addition to usnic acid) but then surface usually distinctly yellowish. "YELLOW-GREEN LICHENS"--KEY A

2. Upper surface of thallus white or gray (sometimes bluish or greenish, or yellowish after long storage in herbarium, but then always K+ yellow, with atranorin, without usnic acid), or brownish or olive green to brown, red-brown, or black, or bright green. 3

3. Lower surface fibrous or cottony (lens), with raised to flat, pale to dark veins (sometimes indistinct or fused). Apothecia borne on upper sides of lobe margins. "VEINED LICHENS": Peltigera

3. Lower surface corticate, or fibrous and cottony, but without veins. 4

4. Thallus with round, white or yellow pores (cyphellae or pseudocyphellae) on the lower or upper surface (lens). "PORED LICHENS"--KEY B

4. Thallus without pores (but white papillae present on lower side of one Nephroma species, and netlike or irregular whitish markings often present on members of Parmelia s.

lato). 5

5. Upper surface (when fresh) at least partly white to pale gray, greenish (especially when wet) or bluish; often turning yellowish to brownish in old herbarium specimens; sometimes turning reddish or purplish; cortex usually K+ yellow, always with atranorin (sometimes only in trace amounts). [Note: Parmelia omphalodes and Punctelia stictica can be entirely brown, but they were keyed out earlier among genera with pseudocyphellae; Physcia phaea and some Hypogymnia spp. tend to have a brownish tinge). 6

5. Upper surface \pm brown (reddish to greenish) or dark gray or blackish, or (especially when moist) olive green to bright green, not white to pale gray, or if partly so then it is due to powdery pruina, or to growth in extremely shaded conditions, and the cortex is always K-, without atranorin. KEY D

6. Lobes generally broad, 4-20 mm wide (use ruler), apically rotund and with a \pm distinct bare zone below at the margins; thallus usually loosely attached to suberect.
"BROAD-LOBED MINERAL GRAY LICHENS"--KEY C-1

6. Lobes generally narrow and linear, 0.5-6 mm wide, apically obtuse and without a distinct bare zone below at the margins (or lacking rhizines completely); thallus usually adnate to appressed.

7. Lower surface jet black, at least at the center, and black to dark brown (rarely mottled brown or white-brown) at the margin (use lens only to examine tiny specimens). "NARROW-LOBED MINERAL GRAY LICHENS WITH A BLACK LOWER SURFACE"--KEY C-2

7. Lower surface uniformly brown to tan or white (orange pigmented or darkening toward center only in some Heterodermia species). "NARROW-LOBED MINERAL GRAY LICHENS WITH A PALE LOWER SURFACE"--KEY C-3

A. THALLUS ± YELLOW-GREEN

1. Thallus bright greenish yellow, KC- (pulvinic acid derivatives).
..... 2

1. Thallus ± pale yellow or yellow-green, to ± pale, pure or slightly grayish green, KC+ yellow (usnic acids) 3

2. Thallus lobes narrow (0.1-0.5 mm wide); spores 16-32/ascus; pycnidia laminal Candelaria

2. Thallus lobes ca. 1 cm wide; spores 8/ascus; pycnidia marginal. Cetraria s. lato: Vulpicida

3. Lobes over 1 cm wide. Thallus large and loosely attached. 4

3. Lobes under 1 cm wide. Thallus generally smaller and more closely attached except sometimes at margins. [If lobes ascending, very numerous and crowded into mats or turfs, see Cladonia (primary squamules). 5

4. Upper surface heavily reticulately ridged. Lower surface mottled brown and cream, short tomentose. Apothecia rare, borne on upper surface. Lobaria oregana

4. Upper surface smooth, not ridged. Apothecia, if present, borne on underside of lobe tips. Nephroma (arcticum)

5. Lower surface tightly attached throughout except sometimes at margins, without lower cortex and rhizines. (see Dimelaena if spores brown and 1-septate, Lecanora and Squamarina if spores hyaline and simple or thallus sterile)

5. Lower surface more loosely attached, with lower cortex and often rhizines. 6

6. Growing free on soil, without rhizines. (If growing in coastal areas of Baja California and lobes very elongated, see Niebla) 7

6. Growing at least partly firmly attached, on rock, bark or wood; usually with rhizines. 8

7. Lower surface without rhizines, ecorticate, or yellowish to blue-green or blue-black. Lobes short and broad, flattened to inrolled, or if elongated then becoming terete (but solid, not inrolled), without lower cortex. (Rhizoplaca)

7. Lower surface usually with rhizines, corticate, tan to brown or black (without bluish or greenish tinges). Lobes elongated, flattened to inrolled and becoming tubular. (Xanthoparmelia)

8. Lobes narrow (0.2-0.5 mm wide), tightly appressed; pycnidia

- exobasidial.** Parmeliopsis
- 8. Lobes usually larger, mostly \pm more loosely appressed; pycnidia (in the case of Parmelia s. lato) endobasidial; usually on rocks or soil, but sometimes on bark or wood.** 9
- 9. Upper surface with pseudocyphellae.** 10
- 9. Upper surface without pseudocyphellae.** [If thallus umbilicate, see Omphalora if thallus very large, Rhizoplaca if thallus small]. 11
- 10. Growing in the arctic.** Asahinea chrysantha
- 10. Growing in temperate areas (mostly southwestern).**
..... Parmelia s. lato: Flavopunctelia
- 11. Lobe margins flat, or downward curving; apothecia and pycnidia, if present, on the upper surface.** [Possibly some forms of Evernia spp. might also key out here]. (Parmelia s. lato: Arctoparmelia, Flavoparmelia, Flavopunctelia, Ahtiana, Pseudoparmelia, Hypotrachyna, Xanthoparmelia, Relicina)
- 11. Lobe margins strongly curled upwards; apothecia and pycnidia, if present, on the margins (or underside).** 12
- 12. Thallus erect, subfruticose. Arctic-alpine.** (Cetraria s. lato: Allocetraria)
- 12. Thallus \pm appressed, not subfruticose. Temperate to boreal or tropical.** 13
- 13. Growing in tropical to temperate areas at low to moderate elevations.** Parmotrema
- 13. Growing in temperate to boreal at moderate elevations.** 14
- 14. Growing in the canopy of old-growth forests of the Pacific NW, rare.** Nephroma (occultum, silvae-veteris)
- 14. Growing lower on the trunk or branches, not primarily in old-growth forests, eastern or western.** Tuckermannopsis

B. THALLUS WITH CYPHELLAE OR PSEUDOCYPHELLAE

1. Cyphellae (recessed, large enough to be seen without a lens) present among tomentum on lower surface; no pores on upper surface. Sticta

1. Cyphellae absent; pores not recessed, smaller (best seen with a lens). 2

2. Pseudocyphellae present on lower surface only. Pseudocyphellaria

2. Pseudocyphellae absent on lower surface, present on upper surface. 3

3. Lobe margins appressed, flat or downward turned; pycnidia and apothecia, if present, on surface. (see Parmelia s. lato: Punctelia, Parmelia, and Melanelia)

3. Lobe margins lifted or curled upward; pycnidia and apothecia, if present, on margins. 4

4. Upper surface yellow to yellowish tan. Arctic. Asahinea (chrysantha)

4. Upper surface whitish, grayish, or greenish, K+ yellow, with atranorin. Temperate to boreal or arctic. Cetrelia

**C-1. THALLUS ± WHITE TO GRAY, K+ YELLOW.
Lobes broad and rotund (4-20 mm wide).**

1. Lobe margins with cilia. Parmelia s. lato: Parmotrema and Rimelia

1. Lobe margins without cilia. [If distinct pseudocyphellae present, see Cetrelia; if thallus umbilicate see Rhizoplaca and Glypholecia] 2

2. Lobe margins ascending or curled upwards. Pycnidia or apothecia, if present, often (but not always) on margins. 3

2. Lobe margins flat, appressed. Pycnidia or apothecia, if present, on upper surface. Parmelia s. lato: Canoparmelia, and possibly others

3. On rocks, plant remains and soil, arctic tundra. Asahinea (scholanderi)

3. Mostly on bark or wood; not in arctic tundras; in temperate areas (to boreal in Platismatia glauca, to tropical in Parmotrema); Parmotrema also frequent on rock. 4

4. Thallus sorediate or isidiate. Apothecia and pycnidia usually rare. 5

4. Thallus without soredia or isidia. Apothecia and pycnidia common. 6

5. Medulla often K+, C+, KC+ or P+, with phenolic substances. Thallus with marginal soralia in discrete soralia (without isidia) or with laminal isidia (not on network of ridges). Tropical to temperate. Parmelia s. lato: Parmotrema

5. Medulla K-, C-, KC-, P-, with fatty acids only. Thallus with marginal soredia-isidia or subfruticose outgrowths (not in discrete soralia), or with laminal isidia on a network of ridges. Temperate to boreal. Platismatia

6. Upper surface with a network of ridges. Lower surface mottled white or tan towards margins; lobes not black-margined on upper side. Platismatia

6. Upper surface smooth to irregularly wrinkled. 7

7. Lower surface black; lobes often with black margins on upper side. (see Esslingeriana idahoensis)

7. Lower surface brown or white, or if black, then lobes without black margins on upper surface. Parmotrema

B-2. THALLUS ± WHITE TO GRAY, K+ YELLOW.
Lobes narrow (0.1-)0.5-4(-6) mm wide);
Lower surface black.

1. Thallus hollow and ± inflated. Rhizines lacking. 2

1. Thallus not hollow and inflated (but sometimes rounded in cross section). Rhizines present or not. 4

2. With conspicuous perforations through the whole thallus; otherwise very similar to forms of Hypogymnia physodes. Menegazzia

2. Perforations, when present, confined to the underside or the lobe tips. 3

3. Lower surface with frequent and regularly distributed, small, rounded perforations. Lobes very narrow. Cavernularia

3. Lower surface at most with few, irregularly distributed, coarse perforations, mostly near the lobe tips. Lobes usually coarser. Hypogymnia

4. Lobes ± rounded in cross-section, nodular. Rhizines lacking. Spores colorless, simple. 5

4. Lobes flattened in cross-section, and not nodular. Rhizines present or not. 6

5. Arctic-alpine. Brodoa

5. Boreal or temperate. Hypogymnia

6. Lower surface with a thick spongy layer of tomentum. Eastern. Anzia

6. Lower surface moderately to sparsely rhizinate or bare, corticate (except in some Heterodermia spp.). Distribution various. 7

7. Thallus subfruticose, very loosely attached, the lobes erect to pendulous, with few or no rhizines. 8

7. Thallus clearly foliose to almost crustose, the lobes ± appressed and radiating, often with rhizines. 10

8. Lower surface flat. Medulla C-. 9

8. Lower surface channelled (upper surface curled downward). Medulla C+ red. Pseudevernia

9. Lower surface jet black, wrinkled (lens). Esslingeriana (idahoensis)

9. Lower surface black at center, mottled brown to white at the tips,

smooth. Platismatia

10. Medulla pale orange, pale yellow, or red. 11

10. Medulla white. 12

11. Lobes 2-6 mm wide, adnate to loosely adnate, with diffuse soralia or pustules. Spores simple, hyaline. Parmelia s. lato: Hypotrachyna, Myelochroa)

11. Lobes 1-2 mm wide, closely adnate to appressed, the soralia small, linear or round. Spores 1-septate, brown. Pyxine

12. Upper surface \pm weakly reticulately ridged and white-spotted, especially towards lobe tips (lens). 13

12. Upper surface smooth (ridged only in Canoparmelia crozalziana), without white markings and spots.

13. Lobes mostly 2-4 mm wide, somewhat loosely adnate. Parmelia s. lato: Parmelia s. str. and Canoparmelia

13. Lobes 0.5-1 mm wide, tightly attached. Pyxine

14. Lobes with short, basally inflated (bulbate) marginal cilia. Parmelia s. lato: Bulbothrix

14. Cilia, if present, not basally inflated. 15

15. Rhizines dichotomously branched. Parmelia s. lato: Hypotrachyna

15. Rhizines, if present, simple to irregularly or perpendicularly branched. The remaining genera are difficult to distinguish when sterile; the best method is probably to distinguish the more common species, following Hale's How to Know the Lichens, or simply to try the species keys for each genus until the best match is found. With experience, and by looking at reliably identified specimens, one can usually get a "feeling" for the genera. 16

16. Lobes tightly appressed, confluent and crowded; rhizines often absent. Lobes mostly under 1 mm wide. Spores brown, 1-septate. [If lower side completely attached to the substrate (thallus crustose), see Diploicia and Dimelaena, or if cephalodia present and spores hyaline and simple, see Placopsis]. 17

16. Lobes more loosely adnate, discrete, not confluent and crowded. 18

17. Rhizines present. Medulla often UV+. Pyxine

17. Rhizines absent. Medulla UV-. Dirinaria

18. Lobes usually to 1-2 mm wide. Spores brown, 1-

septate. 19

18. Lobes usually 2-4 mm wide. Spores hyaline, simple.
Parmelia s. lato (various genera)

19. Upper cortex fibrous, of periclinally interwoven hyphae; upper surface frequently white; lower surface often ecorticate. Spores, if present, brown, 1-septate. (see Heterodermia)

19. Upper cortex cellular or of anticlinally arranged hyphae, not fibrous; thallus color usually light gray Physcia

B-3. THALLUS WHITE OR GRAY, K+ YELLOW.

Lobes narrow.

Lower surface brown to white.

1. Lobe margins with numerous long, conspicuous cilia; lobes often (but not always) strongly ascending or very loosely attached and elongated (subfruticose). Spores brown, 1-septate. 2

1. Cilia, if present, short or few, usually inconspicuous. Lobes ± appressed and radiating, short to elongated. [If lobes ascending, various numerous and crowded into turfs or mats, see Cladonia (primary thallus)]. 3

2. Upper cortex fibrous. Lower cortex often absent.
Heterodermia

2. Upper cortex not fibrous. Lower cortex present.
Physcia (P. tenella group)

3. Lower side ecorticate. Upper cortex fibrous. Spores brown, 1-septate. Heterodermia

3. Lower side corticate. Upper cortex usually not fibrous. Spores hyaline and simple or brown and 1-septate. 4

4. Apothecia and spores present. 5

4. Apothecia or at least spores absent. 8

5. Spores brown, 1-septate. 6

5. Spores hyaline, simple. 7

6. Upper cortex fibrous. Heterodermia

6. Upper cortex not fibrous. Physcia

7. Lobes relatively broad and loosely attached. Parmelia s. lato

7. Lobes narrower and tightly attached. Imshaugia (placorodia)

8. Lobes very narrow (under 1 mm) and closely adnate. 9

8. Lobes broader, often more loosely adnate. 11

9. Thallus isidiate. Imshaugia (I. aleurites)

9. Thallus sorediate. 10

10. Upper surface slightly shiny. Occurring on bark or wood, often of spruce and fir, often burnt. Parmeliopsis (P. hyperopta)

10. Upper surface matt, sometimes pruinose. Occurring on rocks, or soil, or on bark or wood of various types, but not on burnt bark or wood. Physcia

11. Lobe margins with bulbate (basally inflated) cilia.

Parmelia: Bulbothrix

11. Lobe margins without such cilia. 12

12. Upper surface finely reticulately cracked.

Canoparmelia caroliniana

12. Upper surface continuous. [The following genera are difficult to distinguish, and Canoparmelia salacinifera and Pseudoparmelia sphaerospora will also key out here; see How to Know the Lichens for distinguishing at least the more common species]. 13

13. Upper cortex fibrous. Heterodermia

13. Upper cortex not fibrous. Physcia

C. THALLUS ± BROWN OR DARK, K-.

1. Ascocarps perithecia, appearing as tiny black pits on upper surface (sometimes best seen with lens). Dermatocarpon

1. Ascocarps, if present, apothecia. 2

2. Apothecia, if present, on the lower surface. 3

2. Apothecia absent or on the upper surface 4

3. Containing cyanobacteria. Thallus matt. (see Nephroma)

3. Containing green algae. Thallus usually ± shiny. Tuckermannopsis

4. Apothecia sunken into upper surface of thallus. Solorina

4. Apothecia, if present, adnate to sessile. [If lobes ascending, very numerous, crowded into a mat or turf, see Cladonia (primary thallus). 5

5. Lower surface with tomentum, often (but not always) with a conspicuous network of dark channels and pale, raised, bare areas, corresponding to a network of ridges and depressions on the upper surface; lobes coarse, loosely attached. Lobaria

5. Lower surface without tomentum, and without a conspicuous reticulate pattern on the upper and lower surfaces. [Note: Pannaria and other genera that have a tomentum on the underside are mostly smaller and tightly appressed, and in any case always contain cyanobacteria as the only photobiont, and are keyed out under CYANOLICHENS. 6

6. Thallus with long, conspicuous cilia (Note: specimens of Phaeophyscia hispidula may key here, conspicuous black, protruding rhizines appearing almost as cilia are typical of this species). 7

6. Thallus without long cilia (but sometimes with numerous short cilia or projecting rhizines in Phaeophyscia). [If thallus with cyanobacteria, see CYANOLICHEN key]. 8

7. Lobes margins curled upwards or ascending; lobes appressed and radiating to erect and fruticose. Spores hyaline, simple. Cetraria sensu lato

7. Lobe margins flat or curved downward (but lobes sometimes very loosely attached and subfruticose) Spores brown, 1-septate. Anaptychia

8. Lobes rounded in cross-section, sometimes hollow. Rhizines absent. 9

8. Lobes flattened in cross-section (but may be strongly curved upwards or downwards), solid. Rhizines present or absent. [If thallus umbilicate, see Umbilicaria and Lasallia]. 11

9. Thallus very dark brown to black; lobes very narrow; thallus tightly appressed (almost crustose) towards center. [Forms of Pseudephebe minuscula may also key out here]. Parmelia s. lato: Allantoparmelia

9. Thallus at least partly paler, more grayish; lobes broader; thallus more loosely appressed. [If lower cortex lacking, see Lobothallia]. 10

10. Lobes solid. Brodoa

10. Lobes hollow. (Hypogymnia)

11. Lobe margins \pm strongly lifted up or curled up. Pycnidia and apothecia, if present, marginal. Cetraria sensu lato (see key at beginning of Cetraria document)

11. Lobe margins flat or curled downward. Pycnidia and apothecia, if present, laminal. 12

11. Rhizines absent, or if present, short, few, and inconspicuous. 12

11. Rhizines present, usually longer, relatively numerous and conspicuous. Lobes often over 0.2 mm wide. 13

12. Lobes small (0.1-0.2 mm wide), dull, dingy brown or gray. [If lower cortex lacking, and growing on rock, also see Dimelaena and "Lecanora demissa"]. On bark or wood, less often on rock. Hyperphyscia

12. Lobes coarser, shiny, dark brown to almost black. On rock, arctic-alpine. Parmelia s. lato: Allantoparmelia

13. Upper surface of thallus HNO_3 + blue or violet. Lobes appressed, the margins not curled or lifted up. On rocks, usually in arid or semi-arid areas at low to moderate elevations. Parmelia s. lato: Neofuscelia

13. Thallus HNO_3 - (or red-brown). On various substrates; if on rock then often in moist climates or at higher elevations. The following genera are sometimes difficult to distinguish from each other; see How to Know the Lichens for distinguishing common species. 14

14. Lobes usually 1.5-2 mm wide or greater (with some exceptions), olive green to medium brown or almost black; spores if present, colorless and non-septate; upper surface often shiny, often with pseudocyphellae (lens). Parmelia s. lato: Melanelia

14. Lobes usually 0.5-1 mm wide or less (with some exceptions!),

gray to gray brown to dark brown or olive brown; spores, if present, brown and 1-septate. Upper surface always matt, without pseudocyphellae. (Also see key at beginning of Physcia document for more thorough treatment of Physcia s. lato). 15

15. Upper cortex (compound microscope) fibrous, with periclinal hyphae. Mainly eastern or southern.
Anaptychia

15. Upper cortex appearing cellular. Widely distributed.
16

16. Upper surface pruinose including apothecial disks; rhizines often squarrose, medulla never red or orange. Physconia

16. Upper surface usually lacking pruina; rhizines simple, medulla red or orange in some species. (see key to Physcia s. lato) Phaeophyscia and Physciella

ADD:

Thallus subfruticose. Subtropical. Everniastrum