Aspicilia Massal.
(HYMENELIACEAE)

After zillions of authors;

ReReReRev. 5/94 and still totally screwed up, I'm sure

Thallus crustose, weakly cracked to distinctly areolate, areoles contiguous to scattered, flat to strongly convex; some species placodioid, with radiating marginal lobes, others fruticose (growing loose on soil), or (in some Eurasian species) umbilicate, foliose, or forming irregular globular masses; surface white, grayish, greenish, brownish, bluish, yellowish, or blackish; isidia and soredia sometimes present; cephalodia absent; pseudocyphellae sometimes present; attached by hyphae; upper cortex often distinctly paraplectenchymatous. Medulla I.

Apothecia usually immersed in thallus, aspicilioid (cryptolecanorine), occasionally becoming emergent, more rearely lecanorine and soon emergent and ± sessile; disc flat to concave, blackbrown to bluegreen or black, sometimes whitepruinose; thalloid exciple poorly developed and becoming excluded, more rarely well developed and persistent, often little more than a slightly raised rim of thallus tissue, but well differentiated in some species; true exciple usually colorless and poorly developed, lateral to and below the hymenium, sometimes broadening above and concolorous with epihymenium. Hymenium usually more than 100 um tall, colorless, I+ greenish or blue; epihymenium brown to green, usually N+ green ("Aspicilia green"), sometimes N (or in some Eurasian species N+ redviolet?), K or K+ green fading to brown. Paraphyses simple to sparingly branched, frequently anastomosed, shortcelled and often ± moniliform especially towards tips, the apices cohering to form a well defined epithecium; hypothecium hyaline or very pale brownish; asci cylindrical to clavate, unitunicate, thin walled, flaccid; outer coat K/I+ blue, wall and apical dome K/I (asci and tholus I+ blue according to Rogers); spores to 8 (but often fewer), rather large, thin walled, simple (occasionally spuriously 1septate), hyaline, globose to ellipsoid, sometimes with a thin perispore, I.

Pycnidia immersed, elongately flaskshaped to almost globose, singular or in clusters; wall colorless, or at least in upper part brownish or greenish (pigment as in epithecium); fulcrum exobasidial (acrogenous); conidiogenous cells sessile or on short conidiophores, subcylindrical; pycnospores bacilliform, cylindrical or filiform, straight or curved, simple, colorless. Norstictic acid, stictic acid, aspicilin, unknown phenolics,

atranorin, physodalic acid, gyrophoric acid, placodin, taurine, or no substances. Apothecial disks C. Photobiont Trebouxia or other chlorococcoid genera; cells globose to ellipsoid. On calcareous or acidic rocks, sometimes ± immersed in fresh water; less often soil or wood; mainly temperate to arctic.

Distinguished from Lecanora by the K/I acsus apical dome, and by the tendency for the paraphyses to be muriform. Bellemereadiffers in having Porpidiatype asci and I+ blueviolet medulla. Superficially similar species of Pertusaria differ in their larger, often thickwalled ascospores, and thinner, nonmonililiform, paraphyses. Hymenelia s. lato and Ionaspis differ in having a generally thinner, noncorticate or weakly corticate thallus and usually palecolored apothecial disks. Megaspora is distinguished by the very large (over 30 um long), thickwalled ascospores and in growing on mosses or bark or wood. Lobothallia has a lobate thallus, nonmoniliform paraphyses, and a brown, N epihymenium.

The color of the thallus should be accurately recorded on collection as this may rapidly alter in the herbarium.

This genus is almost certainly the worst single genus of organisms on earth (or maybe the whole universe) from a taxonomic point of view. I could go on a long time about just how horrible it is, but let me just make a few brief points and be done with it. Lots and lots of luck!

1. The damn things are everywhere, and are one of the most frequent and abundant kinds of lichens on rocks.
2. Half the time they're sterile, and then truly hopeless except maybe if they have isidia or soredia.
3. Most of the rest of the time the spores are immature, or incredibly variable in size and shape, so spore measurements given in the literature are mostly useless.
4. The K reactions (especially K+ yellow) are notoriously variable and unreliable (especially since many "K" taxa may well be K+ after HCl), and a lot of socalled species are based on them; TLC data is available only for a very few taxa.
5. The color and form of the thallus within a single "species" can vary all to hell, mostly due to environmental modifications.
6. There's too damned many species described based on minor variations referred to under 4 and 5.
7. Most herbaria have few if any "reliably determined" comparison material.
8. A lot of the types are missing, worthless, or else lost in

the labyrinths of the herbarium in Paris.
9. Most keys and descriptions in the literature are a lot of bull, and in any case frequently contradictory and totally useless.

PRELIMINARY NATURAL CLASSIFICATION OF ASPICILIOID LICHENS WITH SIMPLE, ELLIPSOID TO GLOBOSE SPORES

After Eigler, Roux, Hafellner, and others

Rev. Feb. 1994

1. Medullary hyphae thickwalled, widecelled to narrowcelled; texture prosoplectenchymatous. Apothecia usually sessile, but sometimes immersed. Paraphyses not branched (except sometimes near tips) and not anastomosing. Asci usually with well visible "nasse apicale" and amyloid ring. ..... LECANORACEAE and other Lecanoralike families

1. Medullary hyphae ± thinwalled and ± widecelled; texture mostly nongelatinized pseudoparenchymatic, seldom appearing prosoplechtenchymatous. Apothecia often immersed, at least when young. Paraphyses (usually) branched and anastomosing. Asci (usually) without "nasse apicale" and amyloid ring. 2

2. Algae bluegreen. Paraphyses cells cylindrical. Spores small, ± oblong or oblongellipsoid. Discs redbrown. 3

2b Algae green. 4

3. Apothecia sessile, small, margin disappearing. Thallus thin crustose, pale brown. Asci short ellipsoid, small. Paraphyses thick, free. Hymenium very short. ..... ("lactea group")

3. Apothecia immersed, disc shiny, margin of older apothecia strongly lobed, lecanorine. Thallus thick crustose and deeply cracked. Asci rhomboid or clavated. ..... Euopsis ("granatina group")

4. Subhymenium and underlying tissue of the apothecium redbrown to black. Epihymenium decurrent to thoroughly diffuse rusty redbrown. Apothecia ± appressed, sessile; disc black, punctiform then papilliform, then warty, etc.; margin wide. Tissues swollen, appearing ± prosoplectenchymatous. Spores oblongellipsoid to ovoid. Asci clavate, with side walls thickened, I+ pale blue then soon red, except upper part which is I+ persistent blue. Paraphyses thin, cells only convex above. Spermatia rodshaped. ..... "Mosigia" Massal. ("bockii group") [At least part of the species have now been submerged into the lecideoid genus Rimularia)

4. Subhymenium pale; epihymenium not as above. 5

5. Spores in ascus in single and double series, ellipsoid, rather large, non halonate. Asci linear, I+ pale blue, tip thickened, with internal I+ blue cap. Paraphyses thin, filiform, branched and anastomosing. Apothecia immersed to pseudolecanorine, discs usually pale brownish. ..... (TRAPELIACEAE, not usually treated as an Aspicilioid)**5. Spores, asci, etc. otherwise.** 6

6. Thallus placodioid, with very narrow, closely appressed marginal lobes. Spermatia fusiform to short bacilliform. Spores ellipsoid to oblongfusiform, small. Asci very small, apical apparatus of the candicanstype, paraphyses, hymenium and apothecia of the olivascenstype. Apothecia ± adnate. Sometimes (L. demissa) sorediate. On rock. ..... ("olivascens group")
6. Thallus not lobed, or (Lobothallia, and some species of "Aspicilia subg. Sphaerothallia") lobes coarser or more loosely attached. 7

7. Apothecia ±sessile. Paraphyses thin to ± thick. Thalllus and discs ± brown (also see Fuscidea atlantica and F. intercincta, which have brownish spores). 8
7. Apothecia ± immersed, at least when young. 9

8. Discs deep redbrown, margin swollen. Tissue in apothecium slightly gelatinized, with crystals. Thallus with high projecting papillae, pale. Asci rhomboid to oblongclavate. Spores large, oblongellipsoid. Paraphyses cells convex only down to middle. Epihymenium diffuse redbrown. Apothecia of the acceptandatype. ..... ("acceptanda group")
8. Discs dark brown. Tissue in apothecium extremely nongelatinized, clearly pseudoparenchymatous; without crystals. Thallus "lumpy", dark brown. True epithecium present in complanata. Asci with I+ pale blue tholus and I+ dark blue ring. Spores 8 per ascus, ellipsoid, halonate at least when young. Paraphyses much branched and anastomosing, tips submoniliform and pigmented. Apothecia "appressed". On volcanic rock. ..... Koerberiella Stein. (=Lecanorella; "josiae group")

9. Medulla (usually?) I+ blueviolet. Ascus walls thick. Spores with halo. Epihymenium reddish, HNO3 or + purple. Discs redbrown to black. Thallus ± grey, crustose, closely attached to rock. Hymenium medium to tall. Paraphyses cells ± cylindrical.

Spores small to medium, Ascus structures I+ blue, with I+ blue tholus. ..... FAMILY?: Bellemerea Haffelner & Roux ("alpina group"; "Pseudoaspicilia")

9. Medulla (usually?) I; ascus walls thin; spores with or without halo. ..... HYMENELIACEAE sensu lato (see separate key)

Thallus with cephalodia. ..... PORPIDIACEAE: Amygdalaria

Key to HYMENELIACEAE sensu lato

1. Epihymenium pale reddish or yellowish, or deep bluish, N, N+ orange, N+ violaceous pink, or N+ intensified green. Pycnospores under 10 um long. Hymenium tall to very tall. Discs usually either ± pale or dark and then distinctly bluish. Paraphyses very loose, cells convexmoniliform throughout. Hymenium mostly with much gelatin. Algae trentepohlioid or protococcoid. On calcareous or siliceous rocks. Apothecia small, cryptolecanorine (immersed); paraphyses embedded in a gelationous matrix. Thalli extremely thin, often endolithic, without phenolic acids. HYMENELIACEAE Krber emend. Hafellner, s. str. The superspecific classification of this group is currently under revision, and this choice is probably not a good one. 2

1. Epihymenium brownish to greenish, often N+ green, but sometimes N. Pycnospores often over 15 um long. Hymenium short to tall (or very tall in Megaspora). Thallus usually thick, episubstratal, crustose to lobate or fruticulose. Paraphyses simple to branched and anastomosing, moniliform or not. Ascus tip (tholus) I or I+ pale blue. Spores 28 per ascus, nonhalonate. Algae protococcoid. On various substrates, usually rock. "ASPICILIACEAE Poelt ad int."] 8

2. Asci with distinctly amyloid (I+ blue) tholus and gelatin, without "chambre oculaire" or "masse axiale". Paraphyses slightly branched, tips not thickened, cells only convex above. Spores ellipsoid, 8 per ascus. Epihymenium bluegreenviolet. Hypothecium hyaline (yellowish to brownish according to Eigler). Thallus epilithic, though often thin, grey to yellowish. Algae protococcoid. On ± pure limestone. ..... EIGLERIACEAE: Eiglera flavida (Hepp) Haffelner (syn.: Lecidea contraria)

2. Asci without amyloid tholus. HYMENELIACEAE sensu str. 3

3. Photobiont Trentepohlia. Hymenium to 80(90) um. Apothecial pigment yellowish, N+ orange, K+ violet, or dark green, N or intensified (blue)green, K. Thallus pale pinkish or yellowish, to dark grayish brown, epilithic, rimose to rimoseareoalte. Apothecia immersed; disc pale to black. Ionaspis [emended concept being published]. 4

3. Photobiont chlorococcoid, or if Trentepohlia then hymenium mostly over 80 um (averaging 120 um) high. Apothecial pigment bluish green to brownish, N+ violaceous pink, or N; K. Thallus endo to epilithic and then continuous to cracked or squamuloseareolate. Apothecia usually immersed, mostly rather

small. At least upper part of parathecium of rather short, thickwalled cells. Asci without thallus or tholus not amyloid. Hymenelia Krphlh. sensu lato (em. Poelt & Vezda). 5

4. Apothecial pigment N or intensified green. Epihymenium very dark green. Apothecia black. Hymenium (70)80(92) um. Arcticalpine, widely distributed. ..... Ionaspis s.str. (chrysophana group): I. chrysophana

4. Apothecial pigment N+ orange, K+ violet. Epihymenium pale or olive. Apothecia pale. Exciple colorless. ..... Ionaspis Th. Fr. pr. p. ("odora group): I. odora and I. lavata

5. Ascospores halonate (sometimes difficult to see). Paraphyses submoniliform to moniliform. Disc brown or whitish, the brownish coloration given by an epipsamma (granular inspersion of the epihymenium). Thallus yellowish, orangish, reddish, or brownish. Apothecia immersed; thalline margin prominent or not. Epihymenium hyaline, N, K. Hymenium (45)75110(140) um. Paraphyses simple to dichotomously branched, anastomosed, generally larger at the apices. Ascus tips I. Hypothecium hyaline. Excipulum hyaline to various shades of yellow, orange, or brown, to blackish, N, K. Thallus epilithic, conitnuous to rimoseareolate. Photobiont Trebouxia, rarely trentepohlioid. On siliceous rocks, often wet. Borealhemiboreal to temperate; Pacific NW and Appalachians. In Egan's list, this is treated under Hymenelia. ..... [Hymeneliella ined.] (lacustris group)

5. Ascospores not halonate. Paraphyses not moniliform. Disc pinkish or black, the coloration given by pigment of the epihymenium and hymenium. Thallus [mostly?] not orangish or ochraceous. On siliceous or calcareous rocks. Epihymenium N+ violaceous pink or negative. Hymenium (80)120(150) um high. Arcticalpine, with one population in the Great Lakes region. Hymenelia (prevostii group) [Syn. Manzonia Garovaglio (cantrana group)]. 6

6. Photobiont Trentepohlia. Epihymenium pale or olive (epulotica group), or bluegreen (heteromorpha group). ..... epulotica/heteromorpha group (majority of the species previously placed in Ionaspis)

6. Photobiont chlorococcoid. 7

7. Exciple bluegrey or dark brown. Epihymenium and often hymenium intensive blue. Apothecia bluegray to blueblack. Thallus endolithic. On ± pure limestone. ..... coerulea group

7. Exciple colorless. Epihyemnium not or at most weakly yellowish colored. Apothecia rose, yellowbrown, redbrown or dirty whitish. Thallus epi or endolithic. On siliceous or calcareous rocks. ..... ceracea group (including H. prevostii, type species of Hymenelia (included in Ionaspis by Eigler; includes "Pinascisca similis" Massal.)

8. Epihymenium brown, N or almost. Discs often reddish brown, to black. Paraphyses not moniliform. Thallus clearly lobate at margin (to squamulosesubfruticose in one species), usually thick; centrally distinctly rimoseareolate, areolate or verrucoseareolate, without papillae, not chalky. Paraphyses almost always simple, and nonmoniliform. Spores small (1015 x 68 um), thinwalled..... Lobothallia (Clauz. & Roux) Hafellner (A. alphoplacaradiosa group; Circinaria Choisy non Link nor Fee)

8. Epihymenium usually greenish, N+ stronger green. Thallus effuse to determinate, or zonate, or sometimes radiating to lobed but then usually rather thin. Paraphyses usually at least slightly branched, often ± moniliform. Spores various. 9

9. Spores very large, 3060 x 2040 um, thickwalled (1.53 um). Asci I+ pale blue, with amorphous amyloid gelatin at tip. Apothecia urceolate, discs ± greyblack, margins thick. Paraphyses thin, weakly branched and anastomosing. Hymenium very tall. Hypothecium olive green to brown. Exciple ± pale. Spores 48 per ascus. Thallus verrucose. On soil, mosses or wood. ..... Megaspora (Clauz. & Roux) Hafellner (Syn.: Pachyospora sensu Poelt & Vezda non Massal.): M. verrucosa Koerber

9. Spores small to large (to 35 um long), thinwalled. Asci I (but hymenial gel often I+ pale to dark blue at least initially). Apothecia not urceolate. Paraphyses branched and anastomosing (except A. epiglypta). Hymenium usually lower. Hypothecium [usually?] pale. Pycnospores mostly over 15 um long. Usually on rock. (Many problems remain in this group, and much work needs to be done to reconcile the various published keys; descriptions of particular "apothecium types" referred to by Eigler and others need to be included). ..... Aspicilia ± sensu stricto (including "Sphaerothallia" Nees, "Pachyospora" Massal., and "Agrestia" Thomson)

ARTIFICIAL KEYS TO ASPICILIA IN NORTH AMERICA

The major groups are as follows:

I. On soil or moss.
II. On bark or wood.
III. On rock. Sorediate, Isidiate, or Papillatetuberculate
IV. On rock. Thallus determinate, orbicular, often zonate, radiate, or lobed.
V. On rock. Thallus effuse.
VA. K+ red
VB. K+ yellow
VC. K. On calcareous rock.
VD1. K. On wet siliceous rock.
VD2 etc. K. On dry siliceous rock.