

## Some pyrenomycetous fungi from Mt. Rainier National Park.

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With plate VIII & 1 Fig.

The material used for the basis of the present paper was collected by Dr. E. G. Simmons in Mt. Rainier National Park, during the summer of 1948, and this data should be added to all the collections cited. Dr. Simmons's field work was made possible by a grant from the Faculty Research Fund of the University of Michigan.

The rather abundant occurrences of species of the genera *Pleospora* and *Leptosphaeria*, have been discussed in a previous paper (Wehmeyer 1952) and compared with those found in the Rocky Mountains of Wyoming (Wehmeyer 1946, a & b). The general remarks in that paper apply also to these collectoins. There are often several ascus and pycnidial stages found together on the same stems, which makes the connection of these stages rather hypothetical. Except in a general way, and in some species, there was no host limitation apparent on dead herbaceous and woody stems.

Certain widely distributed and commonly occurring species of subalpine and alpine habitats were found common to both the Wyoming and Mt. Rainier areas. *Apiosporella alpina*, *Mycosphaerella Tassiana*, *M. delphiniicola*, *M. dolichospora*, and *Nectriella pedicularis*, were such species. Aside from this rather limited common element, and a few closely related species (as *Rosellinia ovalis* from Wyoming, and *R. ligniaria* from Mt. Rainier), the species were distinct for the two areas. One must always take into consideration the limited number of collections, in such a comparison, for more numerous collections over a longer period of time would no doubt increase the number of species common to both floras. Nevertheless, these collections were sufficient to turn up the species common in both areas a number of times.

*Bifusella acuminata* (E. & E.) Bonar & Cke.

Ascocarps thickly scattered, shining black, rounded to ellipsoid, apparently superficial merely blackening the cuticular surface, shrinking in a wrinkled fashion, rupturing irregularly by a slit.

Asci 75—110 × 12.5 μ. Spores dumbbell-shaped with a thick gelatinous envelope, one-celled, hyaline, 19—25 × 2.5 μ, without sheath.

Collection: *R 1581*, on *Juncus drummondii*, Wonderland Trail, 5000 ft., July 18.

This fungus was described by Ellis (1895) as *Duplicaria acuminata*. Bonar and Cooke (1942) transferred it to *Bifusella* because of the dumbbell shaped ascospores, which they gave as 28—33 × 3.5—4 μ without the sheath. This collection appears immature, which may account for the smaller spore size.

*Lophoderium gramineum* (Fr.) Chev.

Ascocarps ellipsoid, scattered, 220—500 × 200—300 × 150 μ, subepidermal, opening by a median slit; walls 9—20 μ thick, lighter brown below. Asci clavate, tapered below, 75—90 × 8.5—11 μ. Spores long filiform, hyaline, somewhat pointed, straight, 35—70 × 0.8—1 μ.

Collection: *R 2288 b*, on *Poa* sp., Mazama Ridge, 5700 ft., July 21.

This collection approaches *L. phlei* Tehon in the smaller ascocarps and apparent lack of periphyses, but the spores, asci and host suggest *L. gramineum*.

*Lophodermium durilabrum* Darker.

Ascocarps dull black, 750—800 × 400 μ, intraepidermal. Asci clavate with an apical obtusely thickened wall, 85—95 × 8.5—9 μ. Spores long filiform, parallel, 45—65(70) × 1—1.5 μ.

Collection: *R 1560*, on *Pinus monticola* (needles), Wonderland Trail, 5000 ft., July 18.

This material was checked by Dr. D a r k e r, who states (in litt.) that the smaller spore measurements are due to immaturity. Immature *L. nitens* also occurs on these same needles.

*Lophodermium nitens* Darker.

Ascocarps 1000 × 400—500 μ, accompanied by the pycnidial stage and showing the characteristic transverse black lines on the needles. Asci 75—100 × 12—13 μ. Spores 55—63 × 0.8—1 μ. Paraphyses filiform with coiled tips.

Collection: *R 1454*, on *Pinus monticola*, Longmire Hot Springs, 2700 ft., July 9; *R 1560 a*, on *Pinus monticola*, Wonderland Trail, 5000 ft., July 18; *R 1940*, on *Pinus albicaulis*, Dege Peak Trail, 6800 ft., Aug. 19.

*Microthyrium* spp.?

Several collections on *Gramineae* and *Juncaceae* showed the flattened circular radiate fruiting bodies of microthyriaceous fungi, but most of these were immature. Inasmuch as further collecting, perhaps later in the season, might turn up mature material the following are mentioned briefly.

1- Ascocarps 200—300 μ in diameter, superficial, upper wall radiate, splitting in a radiate fashion, often with a few long spine-

like hyphae radiating from the base. Asci clavate,  $43-53 \times 12.5-16 \mu$ , interspersed with filiform paraphyses. Immature spores one-celled, hyaline, fusoid-ellipsoid,  $12.5-16 \times 4-5 \mu$ .

Collection: *R 1961*, on *Luzula wahlenbergii*, Summerland, 5500 ft., Aug. 16.

When matured in a damp chamber, 2-celled somewhat apiospore spores were found, which were  $14-17 \times 3-4 \mu$ .

2- Ascocarps  $100-300 \mu$  in diameter, clustered, somewhat adherent, subcuticular to superficial; upper wall not definitely radiate, prosenchymatous, wrinkled to crateriform. There is no basal wall and the interior of these fruit bodies consisted of a dense palisade of filiform paraphyses, as in a young *Rhytisma*. No asci or spores.

Collection: *R 2192 c*, on *Poa epilis*, Indian Henry's Hunting Ground, 5500 ft., Aug. 2.

3- Ascocarps  $100-120 \mu$  in diameter superficial widely scattered; upper wall radiate with a central punctate ostiole. No superficial hyphae but a few radiate hyaline ones from the margin of the fruit body. Asci clavate with a sac-like base, and a thickened apical wall,  $30-35 \times 7 \mu$ . No spores seen.

Collection: *R 2205 a*, on *Calamagrostis canadensis*, Nisqually Glacier Trail, 3900 ft., July 15.

*Meliola niessleana* Wint. Figs. 1-2.

Appearing on the living leaves as small, 1-2 mm. diameter, cobwebby spots, caused by the richly branching, coarse ( $5-7 \mu$ ), dark, brown, superficial mycelium. Hyphopodia alternate, two-celled, apical cell broadly ovate,  $23-26 \times 12.5-15 \mu$ . Perithecia roughened or wrinkled, globose,  $100-150 \mu$  in diameter, without an ostiole. Setae erect stiff, tapered, dark brown to black,  $250-500 \mu$  long,  $7-9 \mu$  in diameter, somewhat curved, arising from the mycelium or about the base of the perithecia, but not from the perithecia themselves. Asci not seen. Spores (?) large, fusoid to ellipsoid, straight or slightly inequilateral or curved, ends blunt, very slightly or not at all constricted at the septa, three-septate, dark brown,  $35-50 \times 12.5-16 \mu$ .

Collection: *R 1919*, on *Gaultheria humifusa*, Summerland, 5500 ft., Aug. 16.

This material fits the description, by Winter (1885) of *M. niessliana*, on *Rhododendron* from the European Alps, Except for the larger perithecia ( $240-260 \mu$ ) of that species. Most of the perithecia on this specimen are young or old and decayed. The spores (fig. 2) seen were found free on the leaf surface, but seem to belong to this fungus. It is at most a variety of *M. niessleana*.

*Nectria episphaeria* (Tode) Fr.

Collection: *R 1385 a*, on old fungus stromata, on *Alnus* sp., Nisqually River, 2700 ft., July 1.

*Nectriella pedicularis*. (Tracy et Earle) Seav.

Collection: *R 1938*, on *Valeriana sitchensis*, Dege Peak Trail, 6800 ft., Aug. 19.

*Amphisphaeria applanata* (Fr.) Ces. & de Not. subsp. *vestigialis* Fairm. Fig. 3.

Perithecia 400—500  $\mu$  in diameter, hemispheric, flattened below, superficial, black, with a minute papillate ostiole and a very thick (50—80  $\mu$ ) wall of thick-walled brown parenchyma. Asci clavate to cylindric-clavate, but saccate swollen at the base at first, apical wall thickened, with a protruding plug of cytoplasm in this thickening. Paraphyses filiform, numerous. Spores biseriate, elongate ellipsoid, straight or slightly curved, brown unequally two-celled, upper cell often the longer, lower cell smaller, rounded, 23—30  $\times$  9—10.5  $\mu$ .

Collections: *R 1463*, on coniferous wood, Wonderland Trail, 4000 ft., July 11; *R 1889*, on *Alnus*, Tahoma Creek, Aug. 9.

There are a number of species of *Amphisphaeria* described in the literature which are similar to this collection, but only a comparative study of all of them can determine the proper relationships. *A. applanata* was described by Saccardo (1882, p. 718) as having spores 24  $\times$  8  $\mu$  with "loculo superiori minori, obtuso, loculo inferiori majori, ventricosus acuminato", but later (1891, p. 741), he follows Winter and says "sporidia subdisticha, loculo superiori majori". Winter (1887) gave the upper cell as the longer and the spores as 24—26  $\times$  8—10  $\mu$ . Fairman (1910) described his subspecies as differing from *A. applanata* in being upon coniferous wood, having flattened perithecia, and the longer acuminate cell above. The spores were given as 30—33  $\times$  8—10  $\mu$ . This collection differs from *R 1967* (*A. Juniperi*) in the somewhat smaller perithecia and spores which are more unequally two-celled, although not as strongly so as in Fairman's figures.

*Amphisphaeria juniperi* Tracy & Earle.

Perithecia rather thickly scattered, 500—600  $\times$  350  $\mu$ , flattened below, hemispheric, rather carbonaceous; wall 50  $\mu$  thick to 150  $\mu$  around the basal margin, composed of thick-walled dark brown parenchyma; ostiole stout, papillate. Asci cylindric, soon evanescent, imbedded within an agglutinate mass of filiform interthecial strips, 90—100  $\times$  17—19  $\mu$ . Spores biseriate, ellipsoid, two-celled, brown, constricted at the septum, 28—34  $\times$  9—12.5  $\mu$ .

Collection: *R 1967*, on decorticated wood of *Tsuga*, Rampart Ridge, 2700 ft., Aug. 23.

This is again a provisional determination. *A. Juniperi* differs from this collection only in the "globose" perithecia and more "fusoid" spores. *A. papilla* (Schw.) E. & E. is also identical except

for the large perithecia (750—1000  $\mu$ ) and hardwood substrate. *A. abietina* Fairm, on *Tsuga*, has smaller spores (23—28  $\times$  6—10  $\mu$ ). *Apiosporella alpina* Wehm.

This species which was described from Wyoming (Wehmeyer, 1946 a), was much more abundant on Mt. Rainier, on various dead herbaceous stems, particularly those of *Pedicularis* and *Valeriana*. The spores of these collections ran (12)16—21.5  $\times$  5.5—7  $\mu$ , and the asci 60—90  $\times$  9—14  $\mu$ . These spores were somewhat broader on the average and the asci somewhat smaller than those of the Wyoming collections, but the plants were otherwise identical. As in Wyoming, *Phoma pedicularis* was often found associated with *A. alpina*, the slightly smaller pycnidia being mixed with and scarcely distinguishable from the perithecia.

Collections: *R 1590 d*, on *Valeriana sitchensis*, Mazama Ridge, 6000 ft., July 21; *R 1599* and *R 1612*, on *Pedicularis* sp., Mazama Ridge, 5500 ft., July 21; *R 1611*, on *Pedicularis contorta*, 5700 ft., July 21; *R 1614*, *R 1616* and *R 1617*, on *Pedicularis contorta*, Van Trump Park, 5800 ft., July 25; *R 1672*, on *Valeriana sitchensis*, Tree-line Ridge, 6500 ft., *R 1675 a*, on *Pedicularis contorta*, Eagle Peak, 5700 ft., July 29; *R 1748*, on *Pedicularis contorta*, Indian Henry's Hunting Ground, 5500 ft., Aug. 3; *R 1954 a*, on *Pedicularis latifolia*, Berkeley Park, 6000 ft., Aug. 17; *R 2343 b*, on *Lupinus subalpinus*, Reflection Lake, 4865 ft., July 5.

*Bertia moriformis* (Tode) deNot.

Collections: *R 1431* on decorticated wood, Eagle Peak, 3500 ft., July 6; *R 1680 a* on *Populus trichocarpa* S. W. Entrance, July 28; *R 2078*, on hemlock wood, Nisqually River, Aug. 29; *R 2295*, on decorticated *Vaccinium*, Tahoma Creek, 2295 ft., July 18.

*Cryptodidymosphaeria conoidea* (Niessl) Höhn. Fig. 4.

Perithecia 100—120  $\mu$  in diameter, immersed in the upper portion of the stroma of *Heterosphaeria patella*; wall thin, 12—20  $\mu$  thick, prosenchymatous, pale yellowish at first becoming dark brown; ostiole short conic, erumpent through the surface of the host stroma. Asci cylindrical, about 50—55  $\times$  5.5—6.5  $\mu$ . Spores uniseriate or in part biseriate, ellipsoid, two-celled, brown, slightly constricted at the septum, 9—10  $\times$  4—5  $\mu$ .

Collection: *R 1492 e*, parasitic in the stroma of *Heterosphaeria*, on dead herbaceous stems, Louise Lake, 4600 ft., July 13.

This species was first described as *Didymosphaeria conoidea* Niessl (1875). In 1903, Rehm (1903, p. 385) described a second *Didymosphaeria* (*patellae*) as a parasite upon *Heterosphaeria patella*. In the same year, Höhnel (1903) described a *Coniothyrium heteropatellae*, with pycnidia parasitic upon *Heteropatella lacera*, the conidial stage of *Heteropatella linariae*. Later, Höhnel (1905)

pointed out that *D. conoidea* was actually parasitic in the perithecia of *Leptosphaeria doliolum* and was probably the same as Rehm's *D. patellae*, and that his *Coniothyrium heteropatellae* was probably the conidial stage of this parasitic fungus. Finally, Rehm (1906, p. 384) placed *D. conoidea* in a subgenus *Cryptodidymosphaeria*. Höhn el (1917, p. 359) raised this to generic rank and at the same time created a new genus *Cryptophaella* for his *Coniothyrium heteropatellae*.

These parasitised stromata were accompanied by *Heteropatella umbilicata*, but the parasitised ones bore the perithecia above a parallel palisade layer of paraphyses such as are typical of the *Heterosphaeria* fruit bodies. One locule, filled with one-celled, ellipsoid, brown spores,  $4-5 \times 3.5 \mu$ , was seen, which was probably the *Cryptophaella* stage of this fungus.

*Diaporthe araliae* E. & E.

Collection: *R 1562 a*, on *Oplopanax horridum*, Wonderland Trail, 4000 ft., July 18.

Asci  $40-60 \times 7-9 \mu$ . Spores  $13-16 \times 3.5-4 \mu$ , sometimes with faint appendages. It differs from *D. araliae* only in the lack of the extension of the blackened zone into the wood.

*Diatrypella discoidea* Cke. & Pk. var. *alni* Cke.

Asci long stalked,  $32-35 \times 5-6 \mu$ . Spores  $2.5-5 \times 0.5-1 \mu$ . This has the discoid stromata and small spores usually associated with this species.

Collection: *R 1385*, on *Alnus* sp., Nisqually River, 2700 ft., July 1.

*Didymella proximella* (Karst.) Sacc.

Perithecia rather evenly scattered globose to depressed, 175—300  $\mu$  in diameter; wall 20—60  $\mu$  thick, composed of coarse dark brown parenchyma. Asci stout clavate, with the wall slightly thickened at the apex, not fasciculate, but with no interthecial tissue. Spores biserial, broad ellipsoid-fusoid, two-celled, hyaline, upper cell often somewhat enlarged, four-guttulate (18)  $20-26 \times 6-8 \mu$ .

Collections: *R 1575*, on *Carex spectabilis*, Frog Heaven, 4300 ft., July 15; *R 2272*, on *Carex* sp., S. E. Entrance, 3200 ft., July 22.

*Didymosphaeria arenaria* subsp. *macrospora* Sacc. & Scallia.

Perithecia flattened spheric,  $300-400 \times 200-250 \mu$ , immersed, appearing at first as blackened spots, later strongly erumpent as a papillate ostiole; wall 50—100  $\mu$  thick, composed of coarse, black-brown parenchyma. Asci broad clavate, becoming elongate, cylindrical, thin-walled,  $100-125 \times 23-28 \mu$ . Spores biserial, two-celled, clavate-ellipsoid, with the upper cell somewhat broader and rounded the lower cell more tapered, hyaline, granular at first, becoming yellow-brown, finally brown,  $35-41 \times 12.5-15 \mu$ .

Collection: *R 2195 a*, on *Elymus glaucus*, Dege Peak Trail, 6800 ft., Aug. 19.

The original description (Saccardo, Peck & Trelease, 1904), "Sporidiis  $40 \times 13.5 \mu$  (nec  $30 \times 14 \mu$ ), fuscellis", is very brief but the figures (Ibid., Pl. 4, fig. 9) show similar spores and this collection is probably the same fungus.

*Didymosphaeria massarioides* Sacc. & Brun.

Perithecia  $350-300 \mu$ , membranous, thickly scattered, immersed in the leaf tissue, barely erumpent as a papillate ostiole. Asci clavate, then long cylindrical apical wall thickened and containing an apical cytoplasmic plug,  $90-125 \times 10-12.5 \mu$ . Paraphyses filiform, disappearing at maturity. Spores biseriata, then uniseriate, ellipsoid, two-celled, yellow-brown, slightly constricted,  $18-21.5 \times 9-9.5 \mu$ .



Fig. I. — 1. Ascospore of *Eriosphaeria macrospora* sp. nov. — 2. Ascospores of *Mycosphaerella taraxaci* Karst. — 3. Ascospores of *Zignoella ovoidea* (Fr.) Sacc.

Collection: *R 2189 d*, on *Silanion hystrix*, Berkeley Park, 6000 ft., Aug. 17.

There seems to be no such species with broad, light yellow brown spores described on grasses and this determination is provisional, inasmuch as the material is insufficient for a species description.

***Eriosphaeria herbarum*** sp. nov. Figs. 5 & 6.

Perithecia rather thickly scattered or gregarious, formed under the epidermis, but very soon erumpent-superficial, somewhat blunt pyriform, or flattened globose,  $200-400 \mu$  in diameter; wall  $20-50 \mu$  thick, composed of large-celled, thick-walled, brown-black parenchyma, often thin or almost lacking at the base, covered with stiff, curved or sinuate, dark brown, pointed hairs which are  $50-150 \times 5-6 \mu$ . Asci clavate with a thickened apical wall, into which there is a protrusion of epiplasm, base claw-like, mostly 16-, sometimes 8-spored,  $140-160 \times 31-35 \mu$ . There may be interthecial strips when young, but these disappear with maturity. Spores biseriata, two-celled, hyaline, broad fusoid, inequilateral or slightly curved, com-

monly with four large guttulae, constricted at the central septum and midway toward each end of the spore  $(28)30-40 \times 8-13 \mu$ .

Collections: *R 1601*, on *Lupinus lyallii*, Mazama Ridge, 5700 ft., July 21; *R 1934*, on *Achillea millefolium* var. *alpicola*, Dege Peak Trail, 6900 ft., Aug. 19 (Type); *R 2338 d*, on *Valeriana sitchensis*, Mazama Ridge, July 21; *R 2335 a*, on dead stems, Eagle Peak, 5500 ft., July 29.

This species is fairly common on dead stems. The setose perithecia are formed beneath the epidermis, but this tissue is usually exfoliated by the time the fungus is mature and the perithecia are then superficial. The spores vary in size with maturity and may have a gelatinous layer of epiplasm about them when released from the ascus, and this may be drawn out into a apical appendage, which however, soon disappears. It is possible that at full maturity the may be three-septate, and they appear so in Amanns mounting solution or in young spores, but the additional "septa" are merely separations of the protoplasm and do not show in fresh spores in good condition. The asci are mostly 16-spored, but this is not a specific character, for both 8-spored and 16-spored asci can be seen in the same perithecium. This might be considered a 16-spored form of the following species, but the spores are consistently smaller even in 8-spored asci. Spores in 16-spored asci run about  $26-32 \times 8-11 \mu$ .

**Erisosphaeria herbarum** sp. nov. Figs. 5 & 6.

Perithecia 200—400  $\mu$  diametro, depresso-globosa vel subpyriformia, erumpentia, mox superficialia, dense dispersa; pariete 20—50  $\mu$  crasso, pseudoparenchymatico, atro-fusco, ad basim tenui, ubique setis rigidis, curvulis vel sinuosis, atrobrunneis, attenuatis, 50—150  $\mu$  longis, 5—6  $\mu$  crassis obtecto. Asci clavati, 140—160  $\mu$  longi, 31—35  $\mu$  lati, interdum 8-, plerumque 16-sporei in apice incrassati. Paraphyses numerosae, in maturitate mucosae. Sporae biseriatae, uniseptatae, hyalinae, crasse fusiformes, inaequilaterales vel leniter curvatae, 4-guttulatae, ad septum constrictae,  $(28)30-40 \mu$  longae, 8—13  $\mu$  crassae.

Specimen typicum legit E. G. Simmons (*R 1934*), in caulibus *Achilleae millefolii* var. *alpicolae*, loco "Dege Peak Trail" dicto, in Monte "Rainier", in republica Washingtonensi, alt. 6900 ped., 19. Aug., 1948.

**Erisosphaeria macrospora** sp. nov. Fig. 1.

Perithecia scattered, 200—400  $\mu$ , globose to pyriform, soon superficial; walls 30—50  $\mu$  thick of compacted brown parenchyma; ostioles conic; perithecium covered with a long, somewhat flexuous, but spiny tomentum of stiff hairs. Asci broad clavate, thick walled,  $220-240 \times 50-60 \mu$ . Spores overlapping biseriate, fusoid-ellipsoid, hyaline, protoplast often fourparted when young, and with a thick gelatinous envelope; at maturity two-celled, with four globose oil droplets, slightly curved, ends rounded, constricted at the central septum and halfway toward each end of the spore,  $53-65 \times 17-25 \mu$ .



Collection: *R 1746*, on Composite stems, Indian Henry's Hunting Grounds, 5500 ft., Aug. 3. (Type).

This species is very similar to the previous one differing only in the much larger spores and asci which are 8-spored. A few smaller spores, down to  $28\ \mu$  in length were seen in this material, but these were definitely immature, showing the four parted protoplast and thick gelatinous envelope.

***Eriosphaeria macrospora* sp. nov. Fig. 1.**

*Perithecia* dispersa, 200—400  $\mu$  diametro, globosa vel pyriformia, erumpentia, mox superficialia; pariete 30—50  $\mu$  crasso, atro, pseudoparenchymatico, setis longis, rigidis, flexuosis, attenuatis, fuscis oblecto; ostiolo conico. Asci late clavati, 220—240  $\times$  50—60  $\mu$  crasse tunicati. Sporae imbricatae, uniseriatae, fusoideo-ellipsoideae, hyalinae, maturitate uniseptatae, 4-guttulatae, leniter curvatae, 53—65  $\mu$  longae, 17—25  $\mu$  crassae.

Specimen typicum legit E. G. Simmons (*R 1746*), in culmis Compositarum, loco „Indian Henry's Hunting Ground“ dicto, ex Monte „Rainier“, in republica Washingtonensi, alt. 5500 ped., 3. Juni, 1948.

*Eutypella alnifraga* (Wahl.) Sacc.

Collection: *R 1867*, on *Alnus* sp., lower Tahoma Creek, Aug. 9.

***Guignardia carycphylla* (Cke. & Harkn.) comb. nov. Fig. 8.**

*Perithecia* globose, 120—150  $\mu$  in diameter, in small gregarious groups, at first immersed, but soon strongly erumpent-superficial; with a flattened depressed area on the upper side, containing a minute, scarcely visible ostiole; walls 15—30  $\mu$  thick, of coarse tick-walled, blackbrown parenchyma. Asci clavate, with a thickened apical wall, 70—80  $\times$  14—17  $\mu$ . No interthecial tissue present. Spores irregularly biseriatae, ovoid to oblong-cylindric, sometimes very slightly inaequilateral, one-celled, hyaline, 17—25  $\times$  5.5—9  $\mu$ .

Collections: *R 1928 a*, on *Penstemon tolmiei*, and 1929 a, on *Artemisia tacomensis*, Burroughs Mt. Aug. 20.

There has been a great deal of confusion and discussion in the literature concerning the disposition and proper generic names for this group of “amerosporous” pyrenomycetes. The name *Guignardia* is used here as previously discussed (Wehmeyer 1946 a), in the sense of Petrak and Miller and Thompson. Von Arx (1951) has recently studied the type of the genus *Laestadia* (*L. alnea* (Fr.) Awd.) and finds it to be a *Plagiostoma*. He also accepts *G. bidwellii* as the type of the genus *Guignardia*. The name *Discosphaerina* Höhn. has also been used in recent years for fungi similar to these collections. Our material was sent to Von Arx, who states (in litt.) that he considers *Discosphaerina* a synonym of *Guignardia* and that these collections are near *Physalospora euganea* Sacc. (which should be a *Guignardia*), but also fit the description given by Cooke & Harknes (1885) for their *Sphaerella carycphylla*, which is here transferred to *Guignardia*.

These collections are no doubt related to the species complex surrounding *Guignardia umbelliferarum* (Ilöhn.) Petr. This species has been studied by Guyot, et al (1947) who gives an extended synonymy of related species and finds all of them to be a component of the high mountain flora of southern Europe and north Africa. The spores ( $7-18 \times 2.5-6 \mu$ ) of the European species are smaller than these American collections, although Petrak (1940) states that the spores may be  $10-20(24) \times 4.5-8 \mu$  which would include the American material.

*Hypoxyylon rubiginosum* (Pers.) Fr.

Collection: *R 1388*, and *Alnus* log, Longmire Springs, 2700 ft., July 1.

*Lasiosphaeria canescens* (Fr.) Karst.

Perithecia 250—450  $\mu$  globose, covered with a setose tomentum of light red-brown, stout, pointed, very thick-walled hairs. Asci 100—124  $\times$  10—15  $\mu$ , with a refractive ring in the thickened apical wall. Spores cylindric, curved, one-celled, 28—34  $\times$  5—5.5  $\mu$ .

Collections: *R 1680* and *R 1694*, on *Populus trichocarpa*, S. W. Entrance, July 28.

This species is very similar to *L. strigosa*, but this collection has the smaller perithecia and spores and the crust-like, crowded, light colored perithecia of *L. canescens*.

*Metasphaeria xerophylli* (Ell.) Sacc.

Perithecia thickly scattered, 150—200  $\mu$  in diameter, erumpent as papillate ostioles; wall thin, (10—15  $\mu$ ) of small thick-walled parenchyma. Asci broad saccate at first, then cylindric-clavate, 60—80  $\times$  14—17  $\mu$ , imbedded in an interthecial tissue which may separate into strips. Spores biseriate, fusoid, three-septate, hyaline, inaequilateral or curved, often with a broad gelatinous envelope when first ejected, 19—22  $\times$  6—7  $\mu$ .

Collection: *R 1485*, on *Xerophyllum tenax*, Eagle Peak, 5600 ft., July 6.

This fungus fits very well the type collection of *Leptosphaeria xerophylli* Ell., as issued in N. A. F. No. 1340, on *Xerophyllum asphodeloides*, from New Jersey. On this exsiccatus, the same spores are found upon the surface of the stem where they have turned brown in color, after ejection. The collection from Mt. Rainier, apparently bears two very similar fungi. The second fungus has slightly larger perithecia (150—300  $\mu$ ) with thicker walls (15—30  $\mu$ ), larger asci (90—125  $\times$  17—21  $\mu$ ) and spores (25—30  $\times$  8—9  $\mu$ ) which are two-celled but with four oil globules and a characteristic constriction between the septum and each end of the spore. It seems to be a *Didymella*, but there is insufficient material for its description.

*Melanomma pulvis-pyrius* (Pers.) Fck.

Collection: *R 2358*, on *Alnus* sp., lower Tahoma Creek, Aug. 26.

*Mycosphaerella*. Binomials are difficult to apply with accuracy in the genus *Mycosphaerella*. The following binomials are applied to distinctive groups of collections, but their interpretation may vary with the investigator.

*Mycosphaerella alpina* v. Arx. Fig. 9.

Perithecia small, 80—100  $\mu$  in diameter, immersed, scattered over wide areas of the leaf or leaf sheath, barely erumpent through a rupture of the epidermis; wall parenchymatic, 10—15  $\mu$  thick. Asci broad clavate to saccate, broader below with a thickened apical wall, 30—35  $\times$  12.5—15  $\mu$ . Spores fasciculate, long narrow, clavate-fusoid, two-celled, hyaline, broader above, tapered below, 19—23  $\times$  3.5—4  $\mu$ .

Collection: *R 1961 a*, on *Luzula wahlbergii*, Summerland, 5500 ft., Aug. 16.

This collection has perithecia and asci similar to *M. Tassiana*, but the spores are narrower and more spindleform; they are intermediate between *M. recutita* (Fr.) Johans. and *M. alpina*, as described by von Arx (1949). The collection previously described from Wyoming (Wehmeyer 1946 a) as *M. perexigua* is more likely the *M. recutita* of von Arx.

*Mycosphaerella aronici* (Fck.) Volk. Fig. 10.

Perithecia globose, 100—200  $\mu$  in diameter, immersed at first, but soon erumpent-superficial, scattered or clustered, on heavily blackened spots or streaks upon the stem; wall thick, 30—50  $\mu$ , composed of large, black, thick-walled parenchyma. Asci broad clavate to saccate, upper wall thickened. Spores oblong-ellipsoid to clavate, two-celled, hyaline, constricted at the septum, upper cell sometimes shorter and broader, 35—43  $\times$  9—10  $\mu$ .

Collection: *R 1926 a*, on *Aster foliaceus*, Burroughs Mt., 7200 ft., Aug. 20.

This species was first described in the conidial stage only, by F u c k e l; the ascus stage was later described by V o l k a r t (1903), on leaves of *Doronicum*, but the description fits this material. V o n A r x (1950) says that this species is similar to *M. macrospora* (Kleb.) Jrst., but parasitises members of the *Compositae*. It differs from *M. dolichospora* in the broader spores and the host plants.

*Mycosphaerella delphinicola* Earle.

Collections: *R 1405 a*, on dead stems, Narada Falls, 4600 ft., July 2; *R 1406*, on *Ligusticum purpureum*, Narada Falls, 4600 ft., July 2; *R 1430*, on Umbellifer, Reflection Lake, 4865 ft., July 5; *R 1489 a*, on Umbellifer, Louise Lake, July 13; *R 1610*, on *Valeriana sitchensis*, Mazama Ridge, 6000 ft., July 21; *R 1671 a*, on *Ligusticum purpureum*,

Treeline Ridge, 6500 ft., July 30; *R 2350*, on Umbellifer, Reflection Lake, 4865 ft., July 5.

The spores in these collections are comparatively small,  $10-16 \times 2.5-3.5 \mu$ , and the perithecia nearly always show characteristic, coarse but sparse, dark brown radiating hyphae on the stem surface, which are easily visible under a hand lens. This species was also found in Wyoming, where the spores ran slightly larger (W e h m e y e r 1946 a)  $12.5-18 \times 3.5-5 \mu$ .

*Mycosphaerella dolichospora* (Sacc. & Fautr.) Wehm.

Collections: *R 1405*, on dead stems, Narada Falls, 4600 ft., July 2; *R 1489 c*, on Umbellifer, Louise Lake, 4000 ft., July 13.

This species was also abundant in Wyoming, where it was also common on stems of Umbellifers (W e h m e y e r, 1946 a). It is characterised by the long narrow, somewhat curved spores and by having the perithecia on elongate blackened patches of toruloid hyphae.

*Mycosphaerella muhlenbergiae* Ell. Fig. 13.

Perithecia small,  $75-100 \mu$  in diameter, widely but evenly scattered over wide areas of leaf sheath or stem, with no discoloration of the substrate, appearing as minute dots. Asci broad clavate, broader at the apex at first, then elongating, apical wall strongly thickened,  $30-43 \times 9-11 \mu$ . Spores biseriate, two-celled, hyaline, fusoid to fusoid ellipsoid,  $12.5-15 \times 3.5-4.5 \mu$ .

Collections: *R 2209 b*, on *Muhlenbergia filiformis*, Indian Henry's Hunting Ground, 5300 ft., July 18; *R 2277 a*, of *Festuca* sp., Mazama Ridge, 5700 ft., July 21; *R 2289 b*, on *Poa* sp., Mazama Ridge, 5500 ft., July 21; *R 2349*, on *Juncus* sp., Comet Falls, 4500 ft., July 25.

There are dozens of species on grasses which would be difficult to separate from this species. It differs from *M. recutita* and *M. delphiniicola* in the scattered perithecia with no discoloration of the substrate or radiating tomentum. Ellis' (1883) *Sphaerella muhlenbergiae* seems to fit these collections.

*Mycosphaerella taraxaci* Karst. Fig. 2.

Perithecia  $150 \mu$  in diameter, thickly scattered, on leaves as epiphyllous, shiny black, circular spots. Asci stout clavate, apical wall thickened,  $60-70 \times 14-17 \mu$ . Spores biseriate, elongate fusoid, two-celled, hyaline, slightly constricted, upper cell occasionally somewhat broader,  $17-23 \times 3.5-4 \mu$ .

Collection: *R 2351*, on Composite (*Gnaphalium?*), Louise Lake, 4600 ft., July 13.

This collection has spores similar to that placed under *M. alpina*, but the perithecia are larger and found on blackened spots. It is difficult to distinguish between the descriptions of *M. Taraxaci* and *M. confinis* Karst., but this specimen conforms more closely to the former.

*Mycosphaerella tassiana* (Not.) Johans.

Collections: *R 1750*, on *Lupinus subalpinus*, *R 2200*, on *Muhlenbergia filiformis*, 5500 ft., Aug. 3 and *R 2209 a*, on *Muhlenbergia filiformis*, 5200 ft., July 18, all from Indian Henry's Hunting Ground; *R 1812*, on *Chrysanthemum leucanthemum*, Longmire Hot Springs, July 9; *R 2152*, on *Juncus* sp., Frog Heaven, 4300 ft., July 15; *R 2189*, on *Sitanion hystrix*, Berkeley Park, 6000 ft., Aug. 17; *R 2201 b*, on *Phleum alpinum*, Van Trump Park, 5800 ft., July 26; *R 2215 a*, on *Elymus glaucus*, Nisqually Glacier, 3200 ft., July 11; *R 2284*, on grass stems, Wonderland Trail, 5000 ft., July 18.

This ubiquitous species was again common on Mt. Rainier, but not as abundant as in Wyoming (Wehmeyer, 1946 a). All these collections show the characteristic, shiny black perithecia, clavate, wedge shaped-spores and saccate thick-walled asci. The spores ran  $11-26 \times 4-10.5 \mu$  in size.

*Ophiobolus acuminatus* (Sow.) Duby.

Perithecia 200—350  $\mu$ , erumpent as an elongate conic to cylindrical ostiole. Asci cylindrical,  $125-180 \times 7-9 \mu$ . Spores filiform, 16—20 septate separating into two halves,  $125-140 \times 2.5-3.5 \mu$ .

Collections: *R 1383*, on *Heracleum lanatum*, Nisqually River, 2700 ft., July 1; *R 1452*, on *Cirsium lanceolatum*, Longmire Hot Springs, 2700 ft., July 9.

*Phomatospora luzulae* Cocc. & Mor. Fig. 14.

Perithecia 150—250  $\mu$  in diameter, globose, thickly scattered, immersed, erumpent as papillate ostioles; wall membranous, parenchymatic. Asci crowded, narrow clavate, then cylindrical,  $53-60 \times 4-5 \mu$ . Spores overlapping uniseriate to biseriate, fusoid, hyaline, one-celled, with a small guttula in each end,  $9-12 \times 2.5-3 \mu$ .

Collection: *R 2190*, on *Elymus glaucus*, lower Tahoma Creek. Aug. 9.

This binomial is used because of the large perithecia and narrow fusoid spores. Of similar species on similar hosts, *P. arenaria* Sacc. Bomm. & Rouss. has much broader spores ( $12-15 \times 6 \mu$ ) and *Physoleptora antarctica* has much smaller perithecia (65—80  $\mu$ ).

*Phylleutypa wittrockii* (Eriks.) Petr.

Collections: *R 1912*, on *Linnaea longifolia*, Round Pass, 4000 ft., Aug. 9.

Immature, but with the characteristic blackened stromata on the upright shoots.

*Rosellinia ligniaria* (Grev.) Nit.

Perithecia gregarious or densely clustered, pyriform, with short conic ostioles, 200—250  $\mu$  in diameter, roughened by numerous short stout stiff spines,  $8-20 \times 2.5-3 \mu$ ; walls rather carbonous, 20—40  $\mu$  thick. Asci long cylindrical,  $70-80 \times 8.5-9 \mu$ , with numerous, fili-

form paraphyses. Spores uniseriate, ellipsoid to broad ovoid-ellipsoid, slightly flattened, one-celled, olive-brown, two guttulate, with a faint germ slit in the narrow edge,  $9-11 \times 6.5-7 \times 5.5-6 \mu$ .

Collection: *R 1562*, on *Oplopanax horridum*, Wonderland Trail, 4000 ft., July 18.

Many similar species of *Rosellinia* have been described with minor variations in perithecial, ascus or spore size or the presence or absence of spines or tomentum upon the perithecia. Their interpretation by various authors, however, has been variable and conflicting. The perithecia of this collection are identical with those figured by Greville (1823, vol. 2: 82) for his *Sphaeria ligniaria*. The spores of this species have been given by European authors as  $15-18 \times 8-9 \mu$  and by Ellis (1892) as  $12-14 \times 5-6 \mu$  or as  $10-12 \times 7-9 \mu$  in some Canadian specimens. This collection differs from that reported as *R. ovalis*, from Wyoming, by the writer (Wehmeyer 1946 a) in the short bristly and more pyriform perithecia and from that reported as *R. conglobata*, var. *microtricha*, from Nova Scotia (Wehmeyer, 1942), in being somewhat larger throughout (i. e., perithecia asci and broader spores). *Teichospora obducens* (Fr.) Fck. Fig. 11.

Perithecia  $500-600 \mu$  in diameter, scattered, carbonaceous, globose, smooth. Asci long cylindrical, apical wall thickened,  $190-225 \times 12.5-14 \mu$ , with numerous filiform paraphyses. Spores overlapping uniseriate, fusoid-ellipsoid, yellow-brown, seven-septate, scarcely constricted, inaequilateral, with 2 vertical septa, often at varying angles in some cells,  $31-35 \times 12-13 \mu$ .

Collection: *R 1746 c*, on Composite stems, Indian Henry's Hunting Ground, 5500 ft., Aug. 3.

This species has been widely interpreted and could include many of the species of *Teichospora* described. This collection has spores in the upper end of its range.

*Teichospora symphoricarpi* (Tracy & Earle) Sacc. & D. Sacc. Fig. 12.

Perithecia  $300-500 \mu$  in diameter, globose with a flattened base, carbonaceous. Asci long cylindrical but agglutinated in this specimen. Paraphyses filiform. Spores uniseriate, broad ellipsoid, yellow-brown, three- to five-septate, slightly constricted, straight or inaequilateral,  $23-26 \times 12.5-13 \mu$ .

Collection: *R 1618*, on *Sambucus callicarpa*, Comet Falls Trail, 4500 ft., July 25.

This collection might be placed under the wider interpretations of *T. obducens*, but the spores are shorter and mostly five-septate (Figs. 11 & 12).

*Trematosphaeria callicarpa* Sacc.

Perithecia 600—800  $\mu$  in diameter, hemispheric. Asci long clavate, 150—220  $\times$  32—38  $\mu$ . Spores bi- to tri-seriate, long fusoid, brown, seven-septate to nine-septate, end cells papillate, hyaline and the next 2—3 cells small and brown, 88—110  $\times$  17—21  $\mu$ .

Collection: R 1422, an decorticated wood, Narada Falls, 4000 ft., July 4.

Saccardo (1883, p. 116) describes this species as having spores 80  $\times$  25  $\mu$  and five-septate, i. e., with one small end cell. A collection previously described from Nova Scotia (Wehmeyer, 1942) had spores with 1—2 small end cells, i. e., 5- to 7-septate. This collection has large spores with three small end cells. This might be considered a variety if found to be constant.

*Valsella furva* (Karst.) Sacc.

Appearing on the surface as thickly scattered, angular, pustulate ruptures of the periderm, exposing the brownish bark cortex, through which the short punctate ostioles are barely erumpent. Disc about 1.5 mm. in diameter; perithecia 300—400  $\times$  250  $\mu$ , clustered, beneath a grayish ectostroma, in the unaltered bark cortex. No blackened zones. Asci clavate, 35—43  $\times$  7.5—8.5  $\mu$ , polysporous. Spores 3- to 4-seriate, about 32 in each ascus, allantoid, hyaline, one-celled, (7)8—9  $\times$  1.5—2  $\mu$ .

Collection: R 1447, on *Alnus sinuata*, Nisqually Glacier Trail, 4000 ft., July 8.

The spores of this collection are slightly larger than those given for *V. furva* (5—8  $\times$  1—1.5  $\mu$ ). *V. alnicola* Berl. (*V. furva* Berl. & Bres.) is probably this same species although the stromata of *V. alnicola* are given as being larger.

*Zignoella ovoidea* (Fr.) Sacc. Fig. 17.

Perithecia 250—300  $\mu$  in diameter, globose to somewhat elongate, superficial, with only the base immersed; wall 30—50  $\mu$  thick, pro-senchymatous; ostiole stout papillate or often somewhat flattened and slit-like. Asci cylindric-clavate, 85—90  $\times$  8.5—10  $\mu$ . Paraphyses filiform numerous. Spores biserial, four-celled, hyaline, fusoid, slightly curved, scarcely constricted, 23—26  $\times$  4—4.5  $\mu$ .

Collection: R 1681, on *Oplopanax horridum*, S. W. Entrance, July 28.

This fungus could be placed in one of several genera, and similar species have been described in each. If the often flattened ostioles are taken into consideration, it could be placed in *Lophiotrema* (i. e., *L. Hederae* Fck.). If placed in the *Amphisphaeriaceae* because of the sunken base, it might be a *Trematosphaeria* (i. e., *T. subferruginea* Fck.). If these characters are ignored it could be placed in *Zignoella* or *Melanomma*. *Zignoella ovoidea* is a widely interpreted species which seems to include many of these forms.





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### Explanation of plate VII.

1. Perithecium, hyphopodia and setae of *Meliola niessleana* Wint. —
2. Type of spore found associated with perithecia of *Meliola niessleana* Wint. —
3. Ascospores of *Amphisphaeria applanata* subsp. *vestigialis* Fairm. —
4. Vertical section of apothecial stroma of *Heterosphaeria patella* parasitised by *Cryptodidymosphaeria conoidea* (Niessl) Höhn. —
5. Vertical section of perithecium of *Eriosphaeria herbarum* sp. nov. —
6. Ascospores of *Eriosphaeria herbarum* sp. nov. —
7. Ascospores of *Cryptodidymosphaeria conoidea* (Niessl) Höhn. —
8. Ascospores of *Guignardia caryophyllea* (Cke. & Harkn.) comb. nov. —
9. Ascospores of *Mycosphaerella alpina* v. Arx. —
10. Ascospores of *Mycosphaerella aronici* (Fck.) Volk. —
11. Ascospores of *Teichospora obducens* (Fr.) Fck. —
12. Ascospores of *Teichospora symphoricarpi* (Tracy & Earle) Sacc. & D. Sacc. —
13. Ascospores of *Mycosphaerella muhlenbergiae* Ell. —
14. Ascospores of *Phomatospora luzulae* Cocc. & Mor. —
15. Ascospores of *Eriosphaeria macrospora* sp. nov. —
16. Ascospores of *Mycosphaerella taraxaci* Karst. —
17. Ascospores of *Zignoella ovoidea* (Fr.) Sacc.

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