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Contributions to the Lichen Flora of North America.

II. The Lichen Flora of the Great Smoky Mountains.

By

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With 2 plates and 7 figures in the text.

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1. Introduction.

In 1939 I began a study, founded on personal observation in the field, of North America's lichen flora, i. a. in order to compare it with that of Europe. I hope to be able, during further journeys, to take up the study again. During my 1939 journey, which lasted about two months, in addition to Cuba (short stay), I visited only the eastern part of the U. S. A., especially various districts in the Appalachian Mountains. To begin with I stayed in Maine, and the results of the studies persued there have been published as no. I in this series (DEGELIUS 1940). After sojourning up in the northern part, I intended to make my way to a district in the southern section of that long mountain range, to a district differing more widely than Maine from Northwest Europe. After consulting my American botanical colleagues, I selected the Great Smoky Mountains, which constitute one of the Appalachian Mountain's southernmost sections, and, with the adjoining Blue Ridge, its highest part.

The highest and, for its natural history, most valuable, part of the Great Smoky Mountains is nowadays, by act of Congress 1926, a national park, called Great Smoky Mountains National Park, which, with its area of nearly 1800

square kilometers, constitutes the sixth largest of the U. S. A.'s national parks (it covers an area of about one fifth that of the famous Yellowstone National Park). I concentrated my lichenologic excursions within the boundaries of the National Park district, and, during two unforgettable September weeks, with the picturesque little village of Gatlinburg as my starting point, I roamed about a large part of the National Park's central and highest districts (Clingman's Dome, Forney Ridge, Mt. Kephart, Mt. Le Conte, Cherokee Orchard, Laurel Falls, etc.). My intention was, above all, to obtain as good an idea as possible of the general composition and vertical distribution of the lichen flora in this, from many points of view so interesting, southern part of the Appalachian Mountains, where one might expect, among other things, an interesting mixture of northern and southern species.

The lichen flora of the Great Smoky Mountains, as distinct from the vascular-plant, the bryophyte, and the fungus floras, was hitherto unknown, although occasional collections have been made. JENNISON (1939, p. 296) mentions a collection of lichens from the National Park which was destroyed, some years ago, in the Morrill Hall fire in Knoxville. According to verbal information from American botanists, the late Mr. R. H. TORREY of New York is said to have assembled a collection of lichens during excursions in this district, but I do not know where that collection is now. The only information I have read on lichens in the district were the mentions of seven *Cladonia* species (of which one, *Cl. strepsilis*, seems doubtful to me on account of the substratum) in CAIN 1935 (p. 575), and a note on *Umbilicaria (Gyrophora) Dillenii* in SHARP 1930.

Before turning to a description of the lichen flora, I shall say a few words on the topography, etc., of the National Park, a knowledge of which is necessary for understanding the composition of the lichen flora.

The National Park, the size of which has already been mentioned, lies on the border between the States of Tennessee and North Carolina, and is a pronouncedly mountainous country, extending vertically from about 400 to a little over 2000 m above sea-level. The highest point is Clingman's Dome, 2030 m, which is the second highest mountain in the Appalachians; the highest, Mt. Mitchell (2045 m), lies not far off in Blue Ridge. These heights are not sufficient for the existence of a timber line and for the development of an alpine belt. As a matter of fact, the higher, as well as the lower, parts are covered with forest. The district is, therefore, a mountainous country, to a great extent wooded. Sharply

Fig. 1. Looking West from Forney Ridge (N. C.). In the foreground open meadow with a specimen of *Rhododendron catawbiense*. Further off are *Abies Fraseri*. About 1820 m above sea-level. — The author's photograph, 12. 9. 1939.

outlined mountain peaks are scarcely found at all in the district, but the mountains usually form extended ridges with steep sides. From open points commanding wide views, one can see these high ridges set closely one behind the other in a long row; a curious type of landscape. The highest parts merely form rather unimportant elevations of these ridges. On account of the steep sides of the ridges and the dense forests, the country is not very easily penetrated, and one is, to a great extent, limited to the ground lying nearest whatever roads and trails exist.

The higher parts of the country are characterized by a heavy rainfall, exceeding 2000 mm annually. These high levels also abound in mists and clouds, which further increase the humidity, and which gave this mountain range its name.

The substratum within the area I visited is composed exclusively of non-calcareous rocks (only one unimportant instance of calcareous rock is said to exist in the National Park, and that in a district which I did not visit). Naked rocks of any considerable size are few.

The National Park, however, is not one of those districts altogether untouched by civilized man. For, before its allocation as a national park, rather extensive felling took place here and there, the signs of which have not yet disappeared.

Fig. 2. From the coniferous forest belt on Mt. Le Conte Tenn.), about 1700 m above sea-level. — The author's photograph, 13. 9. 1939.

Nowadays, there are no settlements in the Park, with the exception of some buildings and works connected with the National Parks Service, etc. The country is crossed by a number of roads and trails. Among them, crossing the highest parts, is the famous »Appalachian trail», that hiking trail, about 2000 miles long, which stretches the whole length of the mountain range from Mt. Katahdin in Maine in the North to Fort Oglethorpe in Georgia in the South.

»The Smokies» were originally the hunting ground of the Cherokee Indians, but, nowadays, this tribe is scantily represented and only outside the National Park.

As I have already mentioned, the district is mainly wooded. An important difference in the composition of the forest exists, however, between the higher and lower levels. In the former, coniferous forest is predominant, in the latter, chiefly broad-leaved (deciduous) forest. The boundary between these two belts lies at about 1300 m or somewhat higher. According to JENNISON (1939, p. 269), 147 different species of trees and large shrubs have been recorded from the Park, of which about 20 are not native. About 100 species may be classified as forest trees, the majority of them being deciduous.

The lower levels are thus coated by deciduous forest made up of a highly mixed vegetation of many different trees and tall shrubs. Among the most common may be mentioned:

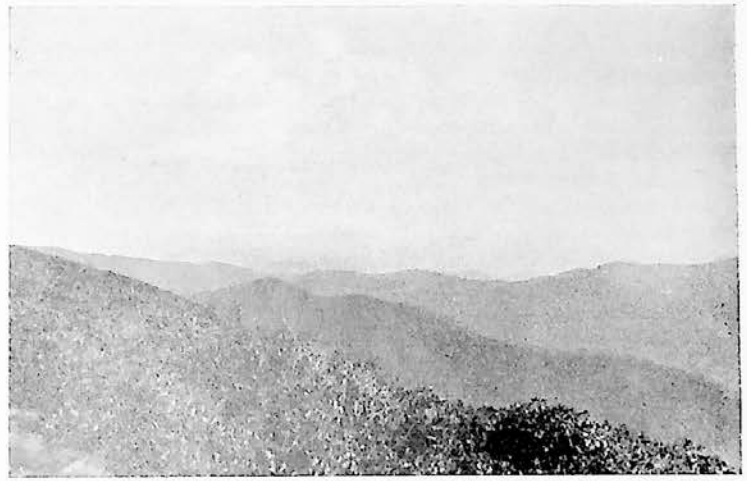

Fig. 3. View from Cliff Top, Mt. Le Conte (Tenn.), about 1970 m above sea level. In the foreground shrub vegetation of *Rhododendron catawbiense, Rh. carolinianum, Kalmia latifolia, Menziesia pilosa*, etc. In the background may be seen, i. a. Clingman's Dome. — The author's photograph, 13. 9. 1939.

Acer rubrum, spicatum and other species, *Aesculus octandra, Aralia spinosa, Betula lenta, lutea* and other species, *Carpinus caroliniana, Carya glabra* and other species, *Castanea americana, Celtis occidentalis, Cornus florida, Fagus grandifolia, Fraxinus americana, Halesia carolina, Hamamelis virginiana, Juglans* spp., *Liquidambar styraciflua, Liriodendron tulipifera, Magnolia Fraseri* and other species, *Platanus occidentalis, Quercus montana* and *rubra, Sassafras variifolium, Tilia* and *Ulmus* spp. Near water-courses, *Rhododendron maximum* is abundant. Especially on the higher levels, hemlock *(Tsuga canadensis)* is the foremost of the coniferous trees interspersed in this forest. Also unmingled forest of pine (*Pinus pungens* and other species) occurs. — The trees given above are not quite uniformly distributed. The height above sea-level, the soil, etc. affect the distribution to a certain extent. CAIN and SHARP (1938, p. 278) distinguish two main divisions of these forests: the cove hardwoods (including such forest types as Aesculo-Tilietum, Halesio-Saccharodendretum and Liriodendro-Tsugetum) and the chestnut-oak-hickory-pine complex.

The higher levels of the mountains are coated with coniferous forest, belonging to the Canadian spruce-fir forest complex (see CAIN 1935, CAIN and SHARP 1938). Just above

the deciduous forest belt, from about 1300 to 1500 or 1600 m, red spruce (*Picea rubens* = *P. rubra*, *P. australis*) is dominant, but, with increasing height, the southern balsam fir or FRASER's fir (*Abies Fraseri*) is more abundant, and, at a certain level, co-dominant with red spruce, and finally, on the highest levels (from about 1800 m), it dominates completely. The deciduous trees occurring in this belt are *Carpinus caroliniana*, *Fagus grandifolia*, *Sorbus americana* and other species. They occur either singly, or, in some places, ± co-dominantly with the above coniferous trees (mixed forest), *Fagus* even dominant on suitable localities. Open spaces are often overgrown with a thick shrub vegetation of *Rhododendron* spp., *Kalmia latifolia*, *Menziesia pilosa*, *Leiophyllum Lyonii* and other species. Slopes previously devastated by fire are often occupied by *Prunus pennsylvanica*.

For further information on the topography, and especially on the vegetation, of the district, I refer the reader to the works cited in the bibliography and more especially to CAIN 1936, which gives a comprehensive summary of botanical literature.

I shall take the opportunity here to give my heartiest thanks to Mr. ARTHUR STUPKA, Park Naturalist (Gatlinburg, Tenn.) for his kindness in placing facilities for working at my disposal in the scientific station belonging to the National Park, for his arranging a permit for me to collect lichens within the National Park, in addition to his general helpfulness. I also had the pleasure of his company on several excursions in the district, some of them hiking tours led by him. Furthermore, I should like to thank Dr. H. M. JENNISON and Mr. J. P. PORTER (Univ. of Tenn., Knoxville) who led other hiking tours in which I took part, and also the following botanists for giving me valuable information in connection with my journey to the Smoky Mountains: Dr. H. A. GLEASON (New York Botanical Garden), Dr. L. R. HESLER, Dr. STANLEY A. CAIN and Dr. AARON J. SHARP (Univ. of Tenn., Knoxville) and Dr. DAVID H. LINDER (Farlow Herbarium, Cambridge, Mass.). — Finally let me thank my friend Dr. A. H. MAGNUSSON (Göteborg) for his kindness in working up and describing three new saxicolous *Lecidea* species, a new *Lecanora* (*Aspicilia*) and a new *Stereocaulon* in my material. I must also thank Dr. H. SANDSTEDE (Bad Zwischenahn, Oldenburg) and Mr. C. F. E. ERICHSEN (Hamburg) for revising some *Cladonia* and *Pertusaria* species.

2. The Lichen Flora of the District.

A. The General Composition and Vertical Distribution of the Lichen Flora.

It is apparent from the foregoing paragraphs that one may, by taking into consideration the different forest types, divide the district into several altitude belts. These belts are also of the greatest significance in the distribution of the lichen flora. It is practical, from the lichenologic standpoint, to distinguish between two main belts, which I shall call The deciduous forest belt and The coniferous forest belt. In the latter, however, the higher levels where *Abies Fraseri* is ± dominant, are so much richer in lichens than the lower levels, dominated by *Picea rubens*, that I have, in the following account, distinguished, whenever appropiate, a special *Abies Fraseri* (sub-)belt. The greater abundance in this belt, as compared with the lower *Picea rubens* (sub-)belt, depends partly on the damper climate and partly on the fact that bark of *Abies* in itself carries a much more plentiful lichen flora than that of *Picea*.

In order to form an idea of the different vertical distribution of the lichen species within the area investigated, I have, with these two main altitude belts as a basis for discussion, divided the species of the following catalogue into three groups. I am well aware of the fact that, as the investigations in the district proceed, certain changes as regards grouping might be necessary; for my knowledge of a good deal of the species is at present restricted merely to one or a few localities. But for the rest of the species, these three groups should, at any rate to a great extent, remain adequate.

1. Species observed with about equal frequency within both belts: the following 43 (21 % of all species observed):

Arthopyrenia pinicola
A. cfr *subprostans*
Arthonia punctiformis
Graphis scripta
Crocynia membranacea
Cr. neglecta
Leptogium cyanescens (near the 3. group)
L. saturninum
Dendriscocaulon umhausense
Pannaria rubiginosa
Coccocarpia pellita
Lobaria pulmonaria (near the 3. group)
L. quercizans (do.)
Nephroma helveticum
Lecidea olivacea
L. subtilis
Bacidia Schweinitzii
Cladonia cristatella
Cl. delicata
Cl. ochrochlora
Cl. pyxidata
Cl. squamosa

Umbilicaria Dillenii
U. papulosa
Acarospora fuscata
Pertusaria multipuncta
P. pertusa
P. velata
Lecanora insignis
Ochrolechia pallescens
Parmelia caperata
P. conspersa
P. crinita
Parmelia dissecta
P. reticulata
P. rudecta
Rinodina ascociscana
Pyxine sorediata
Anaptychia leucomelaena
A. palmatula
A. sorediifera
A. speciosa
A. squamulosa

2. Species observed solely, or chiefly, within the deciduous forest belt: the following 66 (32 % of all species observed; those denoted by an asterisk were found only in one locality within the district but many of them abundantly):

Verrucaria spp.
**Polyblastia* cfr *intercedens*
**Staurothele tenuissima*
**Dermatocarpon miniatum*
Microthelia inops (?)
**Arthopyrenia fallax*
Pyrenula bahiana
**P. brunnea*
**Trypethelium virens*
**Pleurotrema solivagum*
**Arthonia* cfr *caesia*
**A. cinnabarina*
**Opegrapha cinerea*
Melaspilea demissa
**Graphis tenella*
**Catinaria Laureri*
Ocellularia subtilis
**Conotrema urceolatum*
**Thermutis velutina*
Collema furfuraceum
**Leptogium chloromelum*
L. corticola
**L. lichenoides*
Parmeliella corallinoides
P. microphylla
Pannaria leucosticta
Sticta Weigelii
**Peltigera canina*
**P. rufescens*
Lecidea albocaerulescens
**L. crustulata*
**L. deminutula*
**L. latypea*
**Bacidia* cfr *fuscorubella*
**B. umbrina*
**Rhizocarpon intermedium*
**Rh. reductum*
Cladonia didyma
**Pertusaria leioterella*
Lecanora conizaea
L. olivaceopallida
**L. subfuscata*
Ochrolechia Yasudae
**Lecania* cfr *erysibe*
Parmelia aurulenta
**P. frondifera*
P. subquercifolia
**P. trichotera*
**Caloplaca* sp.
**Buellia dialyta*
B. disciformis
**B. punctiformis*
**Rinodina chrysomelaena*
**R. confragosa*
R. exigua
R. tephraspis
Physcia ciliata
**Ph. melops*

Physcia orbicularis
**Ph. picta*
Ph. subtilis
**Ph. Wainioi*
**Anaptychia corallophora*
**A. hypoleuca*
**Lepraria candelaris*

3. Species observed solely, or chiefly, within the coniferous forest belt: the following 97 (47 % of all species observed; those denoted by an asterisk were found only in one locality within the district but many of them abundantly):

Normandina pulchella
**Leptoraphis contorta*
**L. quercus*
Arthonia biseptata
**Catinaria albocincta*
**Microphiale diluta*
**M. lutea*
**Ephebe lanata*
**E. solida*
**Pyrenopsis* cfr *sanguinea*
**P. subfuliginea*
Leptogium americanum
Pannaria pityrea
Erioderma mollissimum
Lobaria scrobiculata
Sticta fuliginosa
Pseudocyphellaria crocata
**Ps. Mougeotiana*
Nephroma parile
**N. resupinatum*
Peltigera polydactyla
**Lecidea Degelii*
**L. granulosa*
**L. gyrodes*
L. helvola
**L. humosa*
L. macrocarpa
**L. mollis*
**L. subsimplex*
L. symmicta
Bacidia chlorantha
**B. endocyanea*
**Rhizocarpon grande*
**Rh. plicatile*
**Cladonia bacillaris*
**Cl. botrytes*
**Cl. caespiticia*
**Cladonia* cfr *caroliniana*
Cl. coccifera
Cl. fimbriata
Cl. Flörkeana
Cl. furcata
Cl. gracilis
**Cl. impexa*
**Cl. incrassata*
Cl. macilenta
Cl. mitis
Cl. nemoxyna
**Cl. rangiferina*
**Cl. santensis*
**Cl. tenuis*
**Cl. uncialis*
**Stereocaulon pileatum*
**St. tennesseense*
**Sarcogyne simplex*
**Pertusaria amara*
P. laevigata
**Lecanora hypoptoides*
L. lacustris
**L. pinastri*
**L.* cfr *piniperda*
**L. polytropa*
**Haematomma cismonicum*
H. ochrophaeum
Parmeliopsis aleurites
Parmelia Arnoldii
P. cetrarioides
P. Cladonia
P. dubia
P. enteromorpha
P. furfuracea
P. laevigata
P. lobulifera
P. olivacea

Parmelia pertusa
P. physodes
P. revoluta
P. saxatilis
P. sorocheila
**P. subaurifera*
P. tubulosa
P. vittata
Anzia colpodes
Cetraria atlantica
C. ciliaris
C. glauca
Cetraria oakesiana
Alectoria altaica
A. bicolor
A. nidulifera
A. sarmentosa
**Ramalina* sp.
Usnea cavernosa
**Rinodina laevigata*
**Physcia aipolia*
**Ph. stellaris*
**Lepraria chlorina*

It is difficult to accomplish a complete analysis of the above three groups with regard to the general distribution of the species in eastern North America, because too little is known about the distribution of many species. Even now, the most of the Southern States are far too little known, and this is true also of many Northern States. Nevertheless, we have some knowledge on the subject, and I shall, therefore, make an attempt, as far as it is possible, to show clearly the connection between the vertical distribution of the species within the district and their general distribution in eastern North America. With regard to the latter question, I can scarcely go further than to divide the species into three groups: the Ubiquitous (about equally distributed in the North and in the South, except for the high mountain ranges), the Northern and the Southern.

In group one (which includes all those species which, as far as we know at present, are ± equally distributed over both altitude belts) the majority of the species (at least 60 %) belong to the Ubiquitous element. The Southern species are few (here belong e. g. *Anaptychia leucomelaena* and *A. sorediifera*). Only a few non-ubiquitous species play any prominent rôle in the lichen vegetation.

In group 2 the Southern species are, as one would expect, more abundant, nevertheless they do not dominate. They make up at least 20 % of the total number of species in the group. Some of them are among the most common species in this belt (e. g. *Pyrenula bahiana* and *Sticta Weigelii*). The Ubiquitous species are, however, manifestly the most abundant in this group. Northern species are very scarce and play no prominent part. Too little is known of the general distribution of many species (about 40 %) to place them with certainty in any one of these phyto-geographic groups.

In group 3, the largest group, the Northern element is

manifestly predominant, making up at least 50 % of the total number of species in the group. Next come the Ubiquitous species with at least 25 %, but the group of species, which, with our present knowledge, cannot be accurately classified, is about as large. The Southern species, at any rate, are extremely few and play no rôle in the lichen vegetation (here belong e. g. *Cladonia santensis* as well as *Erioderma mollissimum* and *Parmelia sorocheila* which are, from the phyto-geographical standpoint, very interesting; cf. below). — The Northern element, thus, plays by far the greatest rôle. Many species referred here are very common and dominate the lichen vegetation, e. g. *Haematomma ochrophaeum*, *Parmelia cetrarioides*, *P. Cladonia*, *P. enteromorpha*, *P. pertusa*, *P. vittata*, *Cetraria atlantica*, *C. oakesiana*, to name a few examples. The Northern species, when occurring in the southern parts of North America, are practically solely confined to the coniferous forest belt in the mountain ranges, where they often are just as common as on the plains further north. They might, therefore, be called Northern (Boreal)—montane. One sometimes speaks of a Canadian or Hudsonian element of these southern mountain ranges. The outstanding importance of this element in the coniferous forest belt is apparent also in other plant groups and in the fauna.

A noteworthy element in the coniferous forest belt is constituted by the oceanic or »Atlantic» species (see DEGELIUS 1935), of which all are certainly not wholly confined to this belt (some belong to group 1 and some even to group 2), but the majority occur, nevertheless, most abundantly within the coniferous forest belt. Their behaviour in the Smoky Mountains is very illustrative of this element's ecological demands (which I attempted to elucidate in my thesis of 1935, quoted above). They thrive here in the most oceanic habitats, viz. the mossy trunks more especially of *Sorbus americana* and *Carpinus caroliniana*, but also of *Abies Fraseri* itself, highest up, in the *Abies Fraseri* belt, with its outstanding humidity. These tree-trunks are often entirely coated by ± oceanic species. The oceanic species belong, in fact, to a wide-spread, southern insular element with off-shoots further north in ocean-climatic territories. Concerning their general distribution in eastern North America, they may be allotted to the Ubiquitous, the Northern and the Southern elements. Among the oceanic foliaceous and fruticose lichens which, especially in the coniferous forest belt in the Smoky Mountains (above all higher up in this belt), are particularly common, and in places dominating, might be mentioned: *Alectoria bicolor*, *Leptogium cyanescens*, *Lobaria quercizans*, *Parmelia laevigata*, *P. lobulifera*,

Pseudocyphellaria crocata (including *Ps. Mougeotiana*), *Sticta fuliginosa* (this species not infrequently c. ap.); *Parmelia cetrarioides* (most often the dominating lichen on trunks of *Abies Fraseri*) and *P. pertusa* are also closely related to this category. Among other oceanic foliaceous and fruticose lichens which occur in the coniferous forest belt (some also below it) may be mentioned: *Anaptychia leucomelaena*, *Coccocarpia pellita*, *Erioderma mollissimum*, *Leptogium americanum*, *Normandina pulchella*, *Pannaria pityrea*, *P. rubiginosa*, *Parmelia Arnoldii*, *P. crinita*, *P. dissecta*, *P. revoluta*. *Sticta Weigelii*, on the other hand, is mainly distributed in the deciduous forest belt.

SHARP (1938 and 1939, p. 335 onwards) has pointed out the occurrence among the bryophytes in the Smoky Mountains of a tropical element, including numerous species. Some of them are distributed also in the surrounding plains, others are absent there, and do not re-occur nearer than in Southwestern U. S. A., Central America with Mexico and the West Indies. Among the lichens, similar types could be pointed out. To the former type, which is less noteworthy, as it affords an example of a more continuous distribution of what one might call tropic—subtropic species, belong some of the species treated above as Southern (e. g. *Graphis tenella*). The latter type, however, is more noteworthy; it includes species which appear in the southernmost parts of the Appalachian Mountains, but which, as far as we know at present, are absent in the surrounding plains, and do not re-occur nearer than in Central America, the West Indies and South America. Here belong the following species, which were classified above as Southern: *Pyrenula bahiana*, *P. brunnea*, *Erioderma mollissimum*, *Anaptychia sorediifera* (also reported in the catalogue from a locality in Illinois), *A. corallophora* and *Parmelia sorocheila*. All these were previously unknown from North America. *Pleurotrema solivagum*, described as a new species in this paper, should also be referred here, as it belongs to a mainly tropical family (*Paratheliaceae*). For further information concerning the total distribution of these species see the following catalogue. Compare the similarity of distribution with some tropical bryophytes on SHARP's maps. However, I should like to add that some of the latter lichen species, when further investigated, will probably prove to belong to the former type; i. e. I have reason to suppose that they do actually occur even on the surrounding plains, although, hitherto, they have escaped notice or been confused with other species.

The lichen flora of the Smoky Mountains, judged from what I myself saw in the districts I visited, cannot be regarded as rich (the lichen vegetation, on the contrary, is rich). The following list gives about 200 species; to these must be added a further 20, which could not be classified with certainty owing to the inadequate material. It is obvious that, when further investigations are made in the district, which I studied only in part and for a short time, more species may be added to the ones I found. But it is certain that the lichen flora will, even so, prove to be rather poor. This depends principally on the great predominance of forest and the consequent inconsiderable variation in substratum, and the scarcity of naked rocks, which are so rich from the lichenologic standpoint.

Yet many interesting, and in certain cases surprising, finds were made. Apart from other species new to science (see below), we should first of all mention *Pleurotrema solivagum*, which represents a family new to North America, the mainly tropical *Paratheliaceae*. Furthermore, a genus new to North America, *Erioderma*, with the species mentioned below. The following 14 species have hitherto never been reported from the U. S. A. (those marked with an asterisk are new to the whole of America), the species new to science not included:

**Arthopyrenia pinicola*	**Arthonia caesia* (cf. below)
**Leptoraphis quercus*	**Parmelia dissecta*
Pyrenula bahiana	*P. sorocheila*
P. brunnea	*Physcia melops*
**Catinaria albocincta*	**Ph. Wainioi*
Erioderma mollissimum	*Anaptychia corallophora*
**Ochrolechia Yasudae*	*A. sorediifera*

But also among the others there are many worthy of particular note, as being interesting from a phyto-geographic standpoint, e. g. species which were hitherto reported only from one or more localities in the U. S. A., or only from entirely different districts:

Arthopyrenia fallax (California, Maine), *Leptoraphis contorta* (Maine), *Opegrapha cinerea* (Florida), *Crocynia neglecta* (New England), *Thermutis velutina* (Minnesota), *Pyrenopsis subfuliginea* (Massachusetts), *Leptogium americanum* (Maine), *Pseudocyphellaria Mougeotiana* (Maine), *Nephroma parile* (northern U. S. A.), *Lecidea granulosa* (northern U. S. A.), *L. helvola* (Maine), *L. mollis* (White Mts.), *L. subsimplex* (Maine, Ohio), *Bacidia chlorantha* (northern U. S. A.), *B. endocyanea* (Massachusetts), *Rhizocarpon plicatile* (Maine), *Rh. reductum* (Maine), *Cladonia impexa* (northern U. S. A.), *Cl. mitis* (northern U. S. A.), *Stereocaulon pileatum* (northeastern U. S. A.), *Pertusaria amara* (northern U. S. A.), *P. laevigata* (Maine, Florida), *P. leioterella* (Maine), *Lecanora*

hypoptoides (New York), *L. pinastri* (Maine), *Parmelia Arnoldii* (California, Maine), *P. cetrarioides* (New England), *P. revoluta* (Maine), *P. subaurifera* (northern U. S. A.), *P. trichotera* (California, Washington), *P. tubulosa* (Washington, Maine), *Cetraria ciliaris* (northern U. S. A.), *Alectoria altaica* (Maine), *A. bicolor* (New England), *A. sarmentosa* (northern U. S. A.).

The following 15 species, new to science, were met with within the district, and are described in the present paper:

Staurothele tenuissima DEGEL., *Microthelia inops* DEGEL., *Pleurotrema solivagum* DEGEL., *Arthonia biseptata* DEGEL., *Lecidea Degelii* H. MAGN., *L. deminutula* H. MAGN., *L. gyrodes* H. MAGN., *L. subtilis* DEGEL., *Rhizocarpon intermedium* DEGEL., *Stereocaulon tennesseense* H. MAGN., *Lecanora (Aspicilia) olivaceopallida* H. MAGN., *L. insignis* DEGEL., *Parmelia lobulifera* DEGEL., *Physcia subtilis* DEGEL., *Anaptychia squamulosa* DEGEL. — Further, the following three varieties: *Lecidea helvola* (KÖRB.) TH. FR. v. *longispora* DEGEL., *L. olivacea* (HOFFM.) MASS. v. *inspersa* DEGEL., and *Parmelia sorocheila* VAIN. v. *cataubiensis* DEGEL., and a form: *Umbilicaria papulosa* (ACH.) NYL. f. *lacerata* DEGEL.

B. Catalogue of Species.

The following list includes 206 species, a few of which are not definitely determined.

If not otherwise stated, the lichens are fertile (c. ap.). The altitude figures refer throughout to the height above sea-level, and are, in some cases, approximate.

Verrucaria.

Of this genus, I collected on rocks in the streams at Cherokee Orchard and at Laurel Falls (*Tenn.*) some amphibious species, of which one is related to *V. aethiobola* WG. Probably, they are new species.

Polyblastia.

1. **P. cfr intercedens** (NYL.) LÖNNR.

Tenn.: Laurel Falls, sparse on a very moist rock near the falls, 760 m.

Apothecia about 0,2 mm across, not immersed; excipulum entire, about 70—80 µ thick, the outer part black but the inner colourless; paraphyses indistinct; periphyses numerous; asci with (6—) 8 spores; spores with numerous cells, colourless or pale brown, 47—52 × 22—26 µ, without gelatinous covering; nucleus rich in oil drops, pale blue and then reddish with iodine.

Staurothele.

1. **St. tenuissima** DEGEL. n. sp.

Descriptio typi:

Prothallus indistinctus. *Thallus* crustaceus, uniformis, epilithicus, late expansus, tenuissimus (vulgo 0,1 mm crassus), fuscocupreus, opacus, epruinosus, rimoso-areolatus, areolis minutis (vulgo 0,15—0,30 mm latis), angulosis, contiguis, planis, laevigatis, J—. *Apothecia* numerosa, dispersa, in areolis majoribus solitaria immersa, demum parte superiore prominentia, verrucas formantia ± depressas, nigras, nudas, opacas, c. 0,3 mm latas, vertice ± applanatas vel concaviusculas, ostiolo saepe foveolato, nigro. *Pycnoconidangia* non visa.

Thallus e strato plectenparenchymatico, in parte exteriore fusco, ceterum incolorato, cellulis ± isodiametricis, diam. vulgo c. 5—8,5 (—10,5) µ, ± leptodermaticis, formatus; algae fere protococcaceae, numerosae, aequaliter distributae, diam. c. 6,5—8,5 µ, membrana modice incrassata vel sat tenui.

Excipulum integrum, non dimidiatum, sat crassum (saltem usque 65 µ), in parte exteriore fusconigrum, in parte interiore pallidum vel incoloratum, plectenparenchymaticum, cellulis ± isodiametricis (diam. usque 6,5 µ) vel oblongis, ± leptodermaticis. *Involucrellum* crassum (saltem usque 130 µ), fusconigrum (in parte interiore sat pallidum), plectenparenchymaticum, cellulis fere ut in excipulo sed majoribus (vulgo usque 8,5 µ). *Nucleus* subglobosus, incoloratus, J e subcaerulescente mox vinose rubens (gelatina hymenialis; sporae lutescentes). *Gonidia hymenialia* numerosa, ± globosa, diam. 3—4,5 µ. *Paraphyses* in gelatinam diffluxae. *Periphyses* sat numerosae, breves, c. 2 µ crassae, cellulis sat brevibus. *Asci* late clavati, c. 52—65 × 13—19 µ. *Sporae* vulgo 6—8, distichae, oblongae vel ellipticae, apicibus rotundatis vel obtusis vel sat acutis, rectae, murales (vel interdum submurales), incoloratae, 20—32 × 10,5—15 µ, cellulis sat numerosis. Apothecium intus K—.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains ad Cherokee Orchard, ad saxum gneissaceum in silva frondea, c. 760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL. — Fig. nostra 4.

The new species belongs to sect. *Polyblastioides* ZSCHACKE. The most important distinguishing features are: thallus very thin, nearly copper-brown, rimose-areolate, with very small, plane, angular areolae; apothecia small, at first immersed in larger areolae and then more or less prominent, with square or concave tip; spores usually 6—8, colourless, rather small;

hymenial gonidia globose; gelatina hymenialis slightly blue and then wine red with iodine. It is related to the North American species *St. diffractella* (NYL.) TUCK. which differs from the former in a gray or pale brown thallus with much larger areolae (more than 1 mm across), more distinctly immersed apothecia and somewhat smaller spores (acc. to FINK 15—22 × 9—12 µ), further in more irregularly formed hymenial gonidia (globose to somewhat oblong). As in *St. tenuissima* the nucleus (gelatina hymenialis) in *St. diffractella* becomes wine red when tinged with iodine (acc. to my own examination of a specimen in Herb. Upsal., collected by HALL in Illinois).

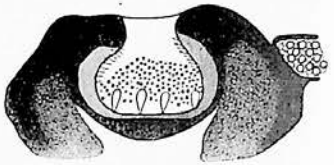

Fig. 4. *Staurothele tenuissima* DEGEL. Section through apothecium and areola (somewhat schematically).

Normandina.

1. **N. pulchella** (BORR.) NYL.

N. C.: Clingman's Dome, 1820 m; Forney Ridge, 1760 m. *Tenn.:* Mt. Le Conte, Myrtle Point, 1970 m. — On Carpinus caroliniana and Sorbus americana (on lichens and mosses or directly on bark) on high levels and especially in Abies Fraseri forests. Sterile.

Dermatocarpon.

1. **D. miniatum** (L.) MANN.

Tenn.: Cherokee Orchard, on rocks in deciduous forest, 760 m. Belongs to v. *complicatum* (LIGHTF.) HELLB.

Microthelia.

1. **M. inops** DEGEL. n. sp.

Descriptio typi:

Thallus subnullus. *Apothecia* sat numerosa, crebra—dispersa, interdum aggregata, basi immersa, primum cuticula substrati obducta, demum nuda, verrucas formantia subglobosas vel vertice angulatas, nigras, nitidulas, vulgo 0,20—0,25 mm latas, ostiolo minuto, nigro vel pallido, non depresso. *Pycnoconidangia* non certe visa.

Algae sparsae, trentepohliaceae.

Excipulum totum fusconigrum, non dimidiatum, in parte superiore 30—80 µ crassum, ex hyphis numerosis, longitudinalibus (non radiantibus) tenuibusque formatum. *Nucleus* sub-

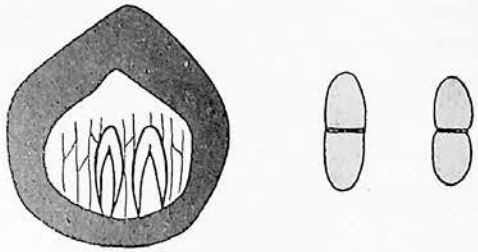

Fig. 5. *Microthelia inops* DEGEL. Section through apothecium (section not exactly medial), somewhat schematically; two spores.

globosus, decoloratus, J fuscescens. *Paraphyses* distinctae, ramoso-connexae, c. 1,5 µ crassae. *Asci* sat ventricosi vel fere subcylindrici, c. 56—78 × 17—21,5 µ, membrana vulgo 4—6 µ crassa. *Sporae* octonae, irregulariter distichae, ovales vel oblongae, rectae, 1-septatae, medio vulgo ± constrictae, obscuratae, 23—30 × 8,5—13 µ, cellulis aequalibus vel subaequalibus, ± guttatis, apicibus sat obtusis, membrana sat tenui.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains ad Cherokee Orchard, ad truncum Tsugae canadensis in silva frondea, c. 760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL. — Fig. nostra 5.

The entirely brownish-black excipulum indicates that the new species belongs to sect. *Holothelia* VAIN. By this feature it is distinguished from the, with regard to its habitus, very similar *M. micula* FLOT. [and especially its v. *megaspora* (NYL.) B. DE LESD., syn. sec. KEISSLER *M. grandiuscula* ANZI[1]]. Further, the nucleus in the new species is more globose than in *M. micula* where it is hemispherical. According to KEISSLER, are, in *M. micula*, the gelatina hymenialis and the paraphyses J + bluish but I myself have found the reaction somewhat vari-

[1] KEISSLER (in RABENHORST's Flora, 1938, p. 30) introduces for this lichen the new combination *M. micula* f. *grandiuscula* which, however, does not conform to the rules of nomenclature as the name *megaspora* is the oldest variety-name.

able. — I cannot identify this lichen with any previously described species of *Microthelia* or *Didymosphaeria*. The species-name refers to the poorly developed thallus.

I also collected the new species on Tsuga canadensis in deciduous forest near National Park Office (*Tenn.*), 455 m, and perhaps the same one, very sparse, on Carpinus caroliniana in mixed forest at Forney Ridge (*N. C.*), 1760 m. In the latter specimens the spores are longer (up to 45 µ, breadth about 13 µ) and rarely 3-septate.

Arthopyrenia.

1. **A. fallax** (NYL.) ARN.

Tenn.: Cherokee Orchard, on Hamamelis virginiana in deciduous forest, abundant, 760 m. — In U. S. A. previously known only from California and Maine (cf. DEGELIUS 1940, p. 12).

2. **A. pinicola** (HEPP) MASS.

(Syn. cfr infra.)

Tenn.: near National Park Office, on Liriodendron tulipifera and (possibly the same species) on Rhus typhina, 455 m; near Laurel Falls, on Quercus rubra, 760 m; Mt. Le Conte, Myrtle Point, on Sorbus americana, 1970 m. — On smooth bark, often on twigs.

Thallus indistinct (but *Trentepohlia*-algae often seen near the apothecia). Apothecia very small (about 0,16—0,20 mm across), scattered, black, hemispherical; nucleus yellowish brown with iodine (at least the asci); paraphyses distinct, branched and coalesced; asci ± cylindrical, about 47—56 × 10,5—13 µ; spores 8, oblong, 1-septate with one cell often larger (sometimes with indication of 1—2 septa more), colourless, 13—19 × 4,5—6 µ, sometimes with gelatinous covering.

This species is new to America. It belongs to sect. *Mesopyrenia* MÜLL. ARG. and is closely related to *A. fallax*. From that species it is distinguished by much smaller apothecia as well as by smaller asci and spores. VAINIO (Lich. fenn., I, 1921, p. 204—205) has described several species (*Didymella padicola, daphnis, abieticola, ramulicola*) closely related to *A.* (*Didymella*) *fallax*, but distinguished by smaller apothecia and spores. Among these, the specimens from America are most allied to *Didymella ramulicola* VAIN. KEISSLER (in RABENHORST's Flora, 1938, p. 138) refers all these types to *A. fallax*; he classifies *ramulicola* and *abieticola* as well as *pinicola* as *A. fallax* f. *pinicola* ARN. These »species» of VAINIO's are surely very closely related, and it is obviously better to unite

them in one species which must be named *A. pinicola* (HEPP) MASS. In my opinion, *A. pinicola* and *A. fallax* are two different species. The former species grows on foliferous as well as on coniferous trees.

The, with regard to habitus, similar species *A. punctiformis* (PERS.) ARN. differs in indistinct paraphyses (it belongs to sect. *Euarthopyrenia*) and pyriform asci.

3. **A.** cfr **subprostans** (NYL.) MÜLL. ARG.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* Cherokee Orchard, on Quercus rubra in deciduous forest, 760 m. — On old bark.

The specimens differ from *A. subprostans* in Herb. LINDIG no. 2897 in Herb. Upsal. from Nova Granata (Colombia) in less depressed apothecia.

Leptoraphis.

1. **L. contorta** DEGEL.

in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 13.

N. C.: Mt. Kephart, on smooth bark of Prunus pennsylvanica, 1790 m.

Apothecia 0,15—0,20 mm broad; excipulum 35—65 µ thick; asci cylindrical or subpyriform, 45—56 × 10,5 µ, the wall up to 3 µ thick; spores 34—50 × 1,8—2 µ. — Previously known only from its original locality (Maine: Prince's Point near Brunswick, on Quercus borealis).

2. **L. quercus** (BELTRAM.) KÖRB.

N. C.: near Newfound Gap, on trunk of Betula lutea, 1600 m.

New to America. — From its large asci (about 80—100 × 5—8 µ) and spores (58—73 × 1,5—2 µ) my specimen belongs to v. *macrospora* (EITNER).

Pyrenula.

1. **P. bahiana** MALME

in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 22 A: 11, 1929, p. 26.

N. C.: near Newfound Gap, on Fagus grandifolia, 1530 m. *Tenn.:* near National Park Office, on Liriodendron tulipifera, 455 m; Cherokee Orchard, on Acer rubrum, Hamamelis virginiana, Liriodendron tulip. and Tsuga canadensis in deciduous forest, 760 m; between Grassy Patch and Alum Cave, on

Aesculus octandra, Carpinus caroliniana and Fagus grandifolia, in deciduous forests, 1270—1300 m; Mt. Kephart, on Fagus grandifolia, 1790 m. — One of the most common pyrenolichens, especially in the deciduous forest belt; there often very abundant on the trunks.

The rich occurrence in this district of a species previously known only from one locality in South America (Brazil: Bahia, Rio Vermelho, cf. MALME l. c.) is surprising. I have compared my specimens with MALME's (Herb. Holm.), and I cannot find any difference of importance, merely that the thallus is in some specimens in my collection somewhat darker and the apothecia sometimes more prominent. The material of MALME's is, however, rather scanty. North American lichenologists have, perhaps, confused this species with others. It is distinguished from all other *Pyrenula* species mentioned from North America by the spores which are large (in my specimens 28—38 × 10,5—17 µ; in specimens collected by MALME I have found spores up to 21,5 µ broad), broadly oblong with rounded ends, not constricted and with four globose lumina. Apothecia ± denudate, black, the prominent part 0,4—0,8 mm across and usually with pale ostiole, semiglobose or depressed semiglobose; thallus thin, continuous, smooth, somewhat shining, grayish green to olivaceous or brown; prothallus indistinct or blackish. According to MALME the nucleus is »haud oleoso-inspersus»; however, I myself have seen apothecia rather rich in oil drops on MALME's own specimens.

2. **P. brunnea** FÉE.

[Syn. *P. quassiaecola* (FÉE) MÜLL. ARG., non FÉE.]

Tenn.: Cherokee Orchard, on Hamamelis virginiana in deciduous forest, sparse, 760 m.

My specimen must be referred to this tropical species which is new to North America. I have compared it with specimen collected by MALME in South America (Herb. Holm.). — My specimen has pycnoconidangia. Pycnoconidia filiform, curved, about 20—30 × < 1 µ.

Trypethelium.

1. **Tr. virens** TUCK.

Tenn.: between Grassy Patch and Alum Cave, on Fagus grandifolia, 1210 m.

Pleurotrema.

1. **Pl. solivagum** DEGEL. n. sp.

Descriptio typi:

Thallus hypophloeodes, tenuissimus, albidus vel cinereo-albidus, saepe sat bene limitatus, interdum indistinctus. *Apothecia* sat numerosa, dispersa, basi immersa, primum saepe cuticula substrati obducta, demum nuda, nigra, subopaca vel nitidula, subglobosa vel leviter oblonga, usque 0,6 mm lata, ostiolo laterali in papilla prominula. *Pycnoconidangia* non visa.

Thallus ex hyphis sparsis, tenuibus (usque 2 µ crassis), et algis trentepohliaceis, globosis (diam. 6,5—10,5 µ) vel leviter oblongis, formatus.

Excipulum totum fusconigrum, non dimidiatum, 20—70 µ crassum, ex hyphis longitudinalibus formatum. *Nucleus* incoloratus, K—, J + vinose rubens (gelatina hymenialis; sporae lutescentes). *Paraphyses* distinctae, numerosae, graciles, laxae, vulgo non ramosae, longissimae, quam asci multo longiores, c. 1 µ crassae, incoloratae, cellulis vulgo brevibus. *Asci* ± cylindrici, 65—75 × 20 µ, membrana crassa (3—8 µ). *Sporae* octonae, irregulariter distichae, ellipticae, rectae (1—) 3-septatae, non constrictae, incoloratae, 19—26 × 9—10,5 µ, apicibus acutis vel sat obtusis, membrana septisque leviter incrassatis (c. 1 µ), loculis intermediis ± cylindricis, apicalibus vulgo anguloso-subglobosis minoribusque.

Fig. 6. *Pleurotrema solivagum* DEGEL. Spore.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains ad Cherokee Orchard, ad truncum Tsugae canadensis in silva frondea, 760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL. — Fig. nostra 6.

Only 10 species of this genus were previously known, they were mainly distributed in the tropics and subtropics (in the New as well as in the Old world) and all in restricted areas. Among these only one species has 3-septate spores like *Pl. solivagum*, viz. *Pl. polysemum* (NYL.) MÜLL. ARG. from South America. From that species the new one is well distinguished. *Pl. polysemum* differs in larger and more depressed apothecia (at least up to 1 mm long) and smaller spores (usually only 15—17 × 6,5 µ) with narrower cells; further, the asci are long and narrow (tube-formed) and the spores arranged in one row, the paraphyses richly ramose and coalesced, the nucleus, according to

NYLANDER, J—. I have examined the specimen classified as no. 2691 in Herb. LINDIG (Herb. Upsal.).

The family *Paratheliaceae* is new to North America.

Arthonia.

1. **A. biseptata** DEGEL. n. sp.

Descriptio typi:

Thallus hypophloeodes, indistinctus. *Apothecia* dispersa, haud crebra, substratum haud superantia, rotundata vel leviter oblonga, diam. 0,2—0,4 mm, plana vel leviter convexiuscula, sat laevigata vel inaequalia, nigra, sat nitida, epruinosa, margine nullo. *Pycnoconidangia* sat numerosa, dispersa, immersa, vertice nigro, c. 0,05—0,07 mm lato, prominente.

Algae rarae vel rarissimae, trentepohliaceae, subglobosae (diam. 10,5—13 µ) vel oblongae, membrana modice incrassata vel sat tenui.

Excipulum nullum distinctum. *Hymenium* c. 45—65 µ crassum, (praeter epithecium) ± incoloratum, J fulvofuscum, epithecio sat crasso (10—15 µ) fusconigroque, non insperso. *Paraphyses* ramoso-connexae, c. 1—1,5 µ crassae. *Asci* ± ventricosi, c. 35—52 × 23—30 µ, membrana crassa. *Sporae* octonae, tristichae, anguste ovoideae, apicibus obtusis, incoloratae, constanter 2-septatae (3-cellulares), 19—26 × 6,5—8,5 µ, cellula suprema vulgo maxima, rectae, ad septa constrictae, strato gelatinoso nullo. Apothecium intus K—.

Pycnoconidia non visa.

Habitatio typi: America septentrionalis, Carolina septentrionalis, in montibus Great Smoky Mountains ad Forney Ridge, ad corticem Viburni alnifolii, 1760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL.

The new species belongs to those, occurring very seldom in this genus, with 3-cellular spores. It is an *Euarthonia* and is related to *A. punctiformis* ACH. and *A. populina* MASS. (some authors bring these two lichens together as one species). The former has, however, 5—6-cellular spores, the latter 4-cellular. Furthermore, these two species have asci which are widest towards the apex, not towards the base.

I collected the new species also in *Tenn.:* Mt. Le Conte, Cliff Top, on twigs of Menziesia pilosa, 1970 m.

2. **A. cfr caesia** (FLOT.) KÖRB.

(Syn. *Allarthonia caesia* ZAHLBR.)

Tenn.: Cherokee Orchard, on smooth bark of Tilia sp. in deciduous forest, 760 m.

With regard to the habitus, the gonidia and the colour of the hypothecium the specimens entirely agree with European ones. However, asci and spores are lacking. The mentioned species is not found outside Europe before.

3. **A. cinnabarina** (DC.) WALLR.

Tenn.: Cherokee Orchard, on trunk of Liriodendron tulipifera in deciduous forest, 760 m.

A form with small, pale brown apothecia.

4. **A. punctiformis** ACH.

Tenn.: Cherokee Orchard, on trunks of Liriodendron tulipifera and Tilia sp. in deciduous forest, 760 m; Dry Sluice Gap, on twigs of Viburnum cassinoides in open situation, 1710 m.

Spores are not found and therefore the determination is not quite certain.

Opegrapha.

1. **O. cinerea** CHEV.

Tenn.: Cherokee Orchard, on twig of Acer saccharum in deciduous forest, 760 m.

With regard to North America previously only known from Florida.

I have collected some other species belonging to this genus (one of them near *O. agelaea* FÉE) but my material is poor.

Melaspilea.

1. **M. demissa** (TUCK.) ZAHLBR.

Tenn.: near National Park Office, some localities on Aralia spinosa and Rhus typhina, 455 m; below Alum Cave, on trunk of Aesculus octandra in deciduous forest, 1280 m.

The size of the apothecia is according to the flora of FINK (1935) 0,2—0,4 × 0,1—0,2 mm. In my specimens, as well as in specimens collected by WILLEY at New Bedford, Mass. (Herb. Upsal.), they are much longer, 1 (—2) mm (and usually 0,1—0,2 mm broad). Hymenium about 70 µ thick (incl. epithec.), colourless or yellowish brown, J yellowish brown, epithecium about 13 µ thick or indistinct, yellowish brown; paraphyses free, not numerous; asci ± clavate, 43—50 × 10,5—13 µ; spores 8, in two rows, 1-septate, constricted, pale brown, 17—24 × (6,5—) 8,5—10,5 µ, one cell somewhat broader. The dimidiate

excipulum indicates that the species belongs to sect. *Hemigrapha* MÜLL. ARG.

Graphis.

1. **Gr. scripta** (L.) ACH.

Common on different broad-leaved trees and shrubs (Acer, Betula, Carpinus, Celtis, Cornus, Fagus, Hamamelis, Juglans, Liriodendron, Quercus, Sorbus, etc.) as well as on Abies and Tsuga. Often abundant. From the neighbourhood of National Park Office (455 m) to the ridges of the mountains (at least 1940 m) collected on nearly all localities visited.

Collected in different forms. In many localities I saw v. *recta* (SCHAER.) RABENH. (on levels from 455 to 1760 m). Some forms are somewhat similar to *Gr. lineola* ACH.

2. **Gr. tenella** ACH.

Tenn.: near National Park Office, on trunk of Liriodendron tulipifera in deciduous forest, 455 m.

Catinaria.

1. **C. albocincta** DEGEL.

in Göteborgs K. Vet.- och Vitt.-Samh.:s Handl., VI: B: 1: 7, 1941, p. 11.

N. C.: Forney Ridge, on trunk of Abies Fraseri in A. Fras. forest, sparse, 1820 m.

New to America. Previously only known from the Azores (Terceira: summit of the mountain Sta. Barbara, on twigs), collected there by H. PERSSON. — Closely related to *C. Laureri*, which also has *Trentepohlia*-gonidia and spores of the same type. It differs from that species especially in colourless hymenium which also is K—.

2. **C. Laureri** (HEPP) DEGEL.

in Göteborgs K. Vet.- och Vitt.-Samh.:s Handl., VI: B: 1: 7, 1941, p. 12. (Syn. *Ca'illaria Laureri* HEPP.)

Tenn.: between Grassy Patch and Alum Cave, on trunk of Fagus grandifolia in deciduous forest, 1210 m.

Crocynia.

1. **Cr. membranacea** (DICKS.) ZAHLBR.

[Syn. *Cr. lanuginosa* (ACH.) HUE.]

N. C.: near Newfound Gap, on Fagus grandifolia, 1530 m; Forney Ridge, on Carpinus caroliniana in mixed forests, 1760 m.

Tenn.: near Laurel Falls, on rocks, 760 m; Cherokee Orchard, on Liriodendron tulipifera in deciduous forest, 760 m; between Grassy Patch and Alum Cave, on Fagus grandifolia in deciduous forest, 1210 m. — In shady places. Sterile and usually sparse.

Often a form with grayish thallus.

2. **Cr. neglecta** (NYL.) HUE.

N. C.: Forney Ridge, on a boulder in open situation, 1820 m. *Tenn.:* near Laurel Falls, on a somewhat moist rock, 760 m. — Sterile.

Ocellularia.

1. **O. subtilis** (TUCK.) RIDDLE.

Tenn.: near National Park Office, on trunk of Liriodendron tulipifera, 455 m; Cherokee Orchard, on trunk of Liriodendron tulip in deciduous forest, 760 m; below Alum Cave, on trunk of Aesculus octandra in deciduous forest, 1280 m. — Usually ± abundant.

Conotrema.

1. **C. urceolatum** (ACH.) TUCK.

Tenn.: near Laurel Falls, on trunk of Quercus rubra, 760 m.

Microphiale.

1. **M. diluta** (PERS.) ZAHLBR.

N. C.: Forney Ridge, on trunk of Sorbus americana in mixed forest, 1760 m.

2. **M. lutea** (DICKS.) STEINER.

N. C.: Forney Ridge, on trunk of Carpinus caroliniana in mixed forest, 1760 m.

Thermutis.

1. **Th. velutina** (ACH.) FLOT.

Tenn.: near The Chimneys, on a boulder in deciduous forest, together with *Coccocarpia pellita* and *Dendriscocaulon*, 850 m. Sterile.

In the flora of FINK (1935) only mentioned from Minnesota.

Ephebe.

1. **E. lanata** (L.) VAIN.

Tenn.: above Alum Cave, on a moist rock, 1710 m.

The specimens are richly c. ap. Asci subclavate, 45—52 × 8,5—10,5 µ; spores 1-septate, colourless or slightly brownish, 13—17 × 3—4 µ.

2. **E. solida** BORNET.

N. C.: Forney Ridge, on a boulder in open situation, 1820 m. Sterile.

Pyrenopsis.

1. **P. cfr sanguinea** ANZI.

Tenn.: above Alum Cave, on a moist rock, 1710 m.

Scanty material. It tallies well with the descriptions given by ANZI (1866) and FORSSELL (1885); however, with regard to one characteristic they not agree: the areolae are not furfuraceous but glabrous. Thallus delicately areolate with plane and thin areolae; *Glococapsa*-gonidia, partly red and K + violet, about 8.5 µ in diam. Apothecia innate with ± pore-formed opening; hypothecium colourless to yellowish; hymenium about 64 µ thick, pale yellowish brown, J —; paraphyses very distinct, articulate, up to 4 µ broad; asci clavate; spores 8, broadly oval-subglobose, simple, 10—12 × 6,5— 7 µ.

P. sanguinea has not been recorded from America before.

2. **P. subfuliginea** NYL.

N. C.: Forney Ridge, on a boulder in open situation, 1820 m.

According to the flora of FINK (1935) previously collected only in Massachusetts. — To the description in the above flora I will add some anatomical details (from the specimens collected at Forney Ridge): gonidia *Glococapsa*, partly red, K + violet, large (10,5—15 µ across, exclusive of the gelatine wall); hypothecium colourless, J + blue; hymenium in the upper part yellowish, J + strongly blue and then ± wine-red; paraphyses not articulate; asci ± cylindrical; spores 8, ovoid to oblong (9—10,5 × 5—6,5 µ) or nearly globose (6,5 × 5,5 µ) or globose (8,5 µ), simple or indistinctly 1-septate.

Collema.

1. **C. furfuraceum** (ARN.) DR.

Tenn.: near National Park Office, on Juglans nigra in deciduous forest, rather sparse, 455 m; Cherokee Orchard, on Quercus montana and rubra in deciduous forest, 760 m; near The Chimneys, on boulder in deciduous forest, 850 m. — Only at Cherokee Orchard (sparsely) c. ap.

Some specimens are perhaps to be referred to *C. rupestre* (SW.) RABENH.

Leptogium.

1. **L. americanum** DEGEL.

in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 16.

N. C.: Forney Ridge, on deciduous trees in mixed forest, rather abundant, 1760 m. *Tenn.:* Mt. Le Conte, Myrtle Point, on Sorbus americana, 1970 m. — Sterile. Together with oceanic and other species as *Dendriscocaulon*, *Leptogium cyanescens*, *Lobaria pulmonaria*, *L. quercizans*, *Nephroma helveticum*, *N. parile*, *Normandina*, *Parmelia cetrarioides*, *P. saxatilis*, *Pseudocyphellaria Mougeotiana*, *Pyxine sorediata*, etc. (notice the agreement with the locality in Maine).

This species was previously known only from its original locality in Maine.

2. **L. chloromelum** (SW.) NYL.

Tenn.: near National Park Office, on trunk of Juglans nigra, sparse and sterile, 455 m.

3. **L. corticola** (TAYL.) TUCK.

(Syn. *L. cimiciodorum* MASS., *L. pulchellum* NYL.; cfr DEGELIUS in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 17.)

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* above National Park Office, on a boulder in deciduous forest, 700 m; Cherokee Orchard, on trees and rocks in deciduous forest, 760 m; near The Chimneys, abundant on rocks in deciduous forest, 850 m; near Alum Cave, on Acer spicatum in deciduous forest, 1200 m.

4. **L. cyanescens** (ACH.) KÖRB.

Common on all levels on trunks (of Acer, Carpinus, Fagus, Juglans, Liriodendron, Quercus, Sorbus, etc.) and rocks. Abundant especially on mossy trunks of Carpinus caroliniana and

Sorbus americana in the belt of Abies Fraseri, i. e. on high levels. The specimens from lower levels are often smaller. Only seen sterile. (I collected the species in all the localities visited.)

5. **L. lichenoides** (L.) ZAHLBR.

[Syn. *L. laccrum* (SW.) S. GRAY.]

Tenn.: near The Chimneys, on trunk of Acer rubrum in deciduous forest, 850 m. Sterile.

6. **L. saturninum** (DICKS.) NYL.

Tenn.: near National Park Office, on Juglans nigra, 455 m; Mt. Le Conte, Myrtle Point, abundant on Sorbus americana, 1970 m. — Sterile.

Dendriscocaulon.

1. **D. umhausense** (AUERSW.) DEGEL. n. comb.

(Syn. *Cornicularia? umhausensis*[1] AUERSW. in Hedwigia, 8, 1869, p. 113, *Dendriscocaulon bolacinum* NYL. in Flora, 69, 1885, p. 299, non *Parmelia lacera* ε *P. bolacina* ACH. Meth., 1803, p. 226, nec *Collema laccrum* ε *C. bolacinum* ACH. Lich. univ., 1810, p. 658.)

N. C.: Forney Ridge, on trunks of deciduous trees in mixed forest, 1760 m, sparse together with *Leptogium americanum*, *Lobaria quercizans*, *Normandina*, etc. *Tenn.:* near The Chimneys, on boulders in deciduous forest, 850 m, rather abundant together with *Coccocarpia pellita*, *Thermutis velutina*, and other species. — Sterile.

Some years ago I examined the above species — the specimen of NYLANDER's in Herb. NYL. in Helsingfors and the one of AUERSWALD's in RABENHORST's Lich. eur. no. 862 — thereby proving conclusively that it is identical with the cephalodia of *Lobaria amplissima* (SCOP.) FORSS. as, indeed, was previously supposed by different authors. In the beginning I regarded it as spontaneously living cephalodia, detached from the thallus of the above mentioned *Lobaria*. The occurrence. however, of *Dendriscocaulon* in several localities in North America (cf. also TUCKERMAN Syn. I, 1882, p. 155), where *L. amplissima* does not occur or is extremely rare[2], proves that

[1] Not »umhauensis» as usually written! The species is called after the place Umbausen in Tyrol.

[2] I have seen a specimen of it in Herb. Upsal., according to the label collected at Salem (in Massachusetts; the collector was, according to FORSSELL 1883, p. 21, SCHWEINITZ).

the latter conclusion was wrong. On the contrary, *Dendriscocaulon* must be a specific lichen species which usually lives (as a parasite?) in connection with *L. amplissima* (and accidentally also with some other species of the same genus). In Europe, it only rarely occurs without *L. amplissima*. In the Smoky Mountains *Dendriscocaulon* grows directly on rock or bark, in one locality together with *Lobaria quercizans* without showing any tendency to live in intimate connection with the latter. In Europe (Norway) in some localities I have also seen *Dendriscocaulon* grow directly on rock or bark, but here together with *L. amplissima* on which it sometimes grew just as on thalli of other lichens. Cf. also DUGHI 1936 and literature there cited. — The specimens from the Smoky Mountains belong to the typical form with thallus, more especially the older parts, ± pubescent.

Parmeliella.

1. **P. corallinoides** (HOFFM.) ZAHLBR.

Tenn.: Cherokee Orchard, on trunks of Quercus montana and rubra in deciduous forest, in one locality abundant, 760 m; near The Chimneys, on trunk of Quercus rubra in deciduous forest, 850 m. — C. ap. or sterile.

American specimens are usually more slender than the European ones and the isidia smaller and thinner. Anatomically and with regard to the chemical reactions I have found no differences. In the Scandinavian population I have seen somewhat similar forms but they were rare and not so conspicuous.

2. **P. microphylla** (SW.) MÜLL. ARG.

Tenn.: Laurel Falls, on rock, 760 m; near The Chimneys, on a boulder in deciduous forest, 850 m.

Pannaria.

1. **P. leucosticta** TUCK.

Tenn.: near Laurel Falls, on rock, rather sparse, 760 m; Cherokee Orchard, on a rock in deciduous forest, sparse, 760 m; Grassy Patch, on Rhododendron maximum in deciduous forest, abundant in one locality, 1210 m.

2. **P. pityrea** (DC.) DEGEL.

[Syn. *P. conoplea* (PERS.) BORY, *P. coeruleobadia* (SCHLEICH.) MASS., *P. rubiginosa* (THUNB.) DEL. v. *lanuginosa* ZAHLBR. Cfr DEGELIUS in Bot. Not. 1929, p. 104.]

N. C.: Forney Ridge, on Carpinus caroliniana and other trees in mixed forest, rather sparse, 1760 m; Mt. Kephart, on Fagus grandifolia, sparse, 1790 m. *Tenn.:* Mt. Le Conte, Myrtle Point, on Sorbus americana, abundant in one locality, 1970 m. — Sterile.

Partly in a somewhat different form.

3. **P. rubiginosa** (THUNB.) DEL.

Tenn.: near The Chimneys, on a boulder in deciduous forest, sparse, 850 m; Mt. Le Conte, Myrtle Point, on Sorbus together with the preceding species, several specimens.

Coccocarpia.

1. **C. pellita** (ACH.) MÜLL. ARG.

Rather common on different levels. On trunks of trees (Abies, Betula, Quercus, Sorbus, etc.) and on rocks in somewhat shady places. Collected in most of the localities visited. Only sterile.

At least the main part of the material belongs to v. *isidiophylla* MÜLL. ARG. which is distinguished mainly by cylindrical, branched or unbranched isidia of the same colour as the thallus and further by cuneate lobes (usually 1,5—5 mm broad). This type belongs to *C. cronia* (TUCK.) VAIN. Some specimens, by their broader lobes and the somewhat flattened isidia, approach v. *prolificans* MALME.

Erioderma.

1. **E. mollissimum** (SAMP.) DR.

[Syn. *E. limbatum* (NYL.) VAIN.]

N. C.: Mt. Kephart, on Sorbus americana, 1790 m; Clingman's Dome, on Abies Fraseri in A. Fras. forest, 1970 m. — On ± mossy trunks, sparse. All the specimens are small and, as always, sterile.

An interesting find. This genus has not previously been mentioned from North America. The species is known from a few localities in Costa Rica, Brazil, the Canaries, the Azores and Portugal. It has limbiform soredia (i. e. soredia in the margin).

Lobaria.

1. **L. pulmonaria** (L.) HOFFM.

Usually common on trees (Abies, Acer, Carpinus, Sorbus, Tsuga, etc.) in the forests. Abundant especially on Carpinus caroliniana and Sorbus americana in the Abies Fraseri belt, i. e. on high levels. C. ap. or sterile.

2. **L. quercizans** MICHX.

(Syn. *Sticta quercizans* ACH., non DEL.)

Common on high levels, abundant especially on Carpinus caroliniana and Sorbus americana in the Abies Fraseri belt, e. g. at Forney Ridge and Clingman's Dome. It was, however, collected in most of the localities visited, from 760 m upwards, and also on trunks of Acer, Aesculus, Fagus, Quercus, etc. as well as on rocks (in some localities abundant even on fairly low levels).

Identical with »*Sticta amplissima*» in the flora of FINK (1935) and others. Cf. under *Sticta Weigelii*.

3. **L. scrobiculata** (SCOP.) DC.

N. C.: Forney Ridge, 1760 m; Mt. Kephart, 1790 m. *N. C.* and *Tenn.:* Clingman's Dome, 1820 m. *Tenn.:* Mt. Le Conte, Myrtle Point and other places, 1970 m. — Usually on trunks of Carpinus caroliniana and Sorbus americana and also of Abies Fraseri in A. Fras. forest. For the most part sparse. Only seen sterile.

Sticta.

1. **St. fuliginosa** (DICKS.) ACH.

Common on high levels, abundant especially on mossy trunks of Sorbus americana as well as of Carpinus caroliniana and Abies Fraseri, rarely on Fagus grandifolia and Menziesia pilosa. Collected in all the localities visited above 1500 m. On lower levels only seen in the neighbourhood of The Chimneys, 850 m, on boulders in deciduous forest. Not infrequently, in some localities abundantly, c. ap.

In some places (Mt. Le Conte, Forney Ridge) I have collected f. *ciliata* DEGEL. (in Göteborgs K. Vet.- och Vitt.-Samh.:s Handl., VI: B: 1: 7, 1941, p. 19), which differs from the typical form by ciliate margins.

2. **St. Weigelii** (Ach.) Vain.

[Syn. *St. quercizans* Del. (non Ach. = *Lobaria quercizans* Michx.)]

Common and often abundant on lower levels, i. e. in the deciduous forest belt, from 455 to about 1300 m. Rare in the coniferous forest belt, e. g. near Newfound Gap (on Fagus grandifolia, 1530 m) and Forney Ridge (on Carpinus caroliniana in mixed forest, 1760 m). In the deciduous forest belt collected on trunks of Acer rubrum and spicatum, Aesculus octandra, Carpinus caroliniana, Fagus grandifolia, Quercus montana and rubra; common also on rocks. — Usually sterile; young apothecia in some specimens from the neighbourhood of The Chimneys.

Rather common is also v. *schizophylliza* (Nyl.) Hue, distinguished by richly lacerate lobes, but, as in the main form, the thallus is coriaceous and brown, at the ends often whitish (the under surface often paler and not so thickly tomentose).

I have once seen v. *dissecta* (Müll. Arg.) Zahlbr.: rather abundant on a boulder in deciduous forest near The Chimneys, 850 m. This type has also lacerate lobes but usually smaller and narrower than the above variety, furthermore a membranaceous and subpellucidous thallus. This variety is very closely related to the European and Macaronesian *St. Dufourei* Del. I have found the thickness of the thallus to be nearly the only distinguishing mark between these two types: in *St. Dufourei* it is usually about 130 μ thick, in *St. Weigelii* v. *dissecta* about 200—230 μ (in the main form of *St. Weigelii* up to at least 260 μ). In connection with this the cortex on both surfaces is thinner and has less numerous rows of cells in *St. Dufourei*. Usually the thallus of the latter species is smaller and still more pellucidous, having, in addition, more irregular and not so distinctly radiating lobes.

Pseudocyphellaria.

1. **Ps. crocata** (L.) Vain.

N. C.: near Newfound Gap, on Betula lutea, 1600 m; Forney Ridge, on deciduous trees in mixed forest, 1760 m. *N. C.* and *Tenn.:* Mt. Kephart, on Fagus grandifolia, 1790 m; Clingman's Dome, on Abies Fraseri and Sorbus americana in A. Fras. forest, 1820—1970 m. *Tenn.:* Mt. Le Conte, Myrtle Point, on Sorbus americana, 1970 m. — In some localities abundant but often rather sparse. Sterile.

2. **Ps. Mougeotiana** (Del.) Vain.

N. C.: Forney Ridge, on deciduous trees in mixed forest, 1760 m. Sterile.

The limit between this lichen and the preceding is not easy to draw, and perhaps it is better to refer *Ps. Mougeotiana* as a variety to *Ps. crocata*. Magnusson (1940) keeps them apart but evidently with some hesitation. He has examined all my specimens from the Smoky Mountains and refers only the one mentioned above to *Ps. Mougeotiana*.

Nephroma.

1. **N. helveticum** Ach.

N. C.: near Newfound Gap, on trees, 1550 m; Forney Ridge, common on Carpinus caroliniana and Sorbus americana in mixed forest, 1760 m. *N. C.* and *Tenn.:* Clingman's Dome, common on different trees in Abies Fraseri forest, 1820—1970 m. *Tenn.:* Cherokee Orchard, abundant on rocks in deciduous forest, 760 m; above National Park Office, on a boulder in deciduous forest, 700 m; near The Chimneys, sparse on a boulder in deciduous forest, 850 m; Grassy Patch, on Rhododendron maximum in deciduous forest, 1210 m.

2. **N. parile** Ach.

N. C.: Forney Ridge, on Carpinus caroliniana and other trees in mixed forest, together with *N. helveticum*, 1760 m. *Tenn.:* Mt. Kephart, sparse on a trunk of Fagus grandifolia, 1790 m. — Sterile.

3. **N. resupinatum** (L.) Ach.

Tenn.: Mt. Le Conte, Myrtle Point, rather sparse on trunk of Sorbus americana, 1970 m.

Peltigera.

1. **P. canina** (L.) Willd.

Tenn.: near Laurel Falls, on rocks, 760 m.

2. **P. polydactyla** (Neck.) Hoffm.

N. C.: Forney Ridge, in some localities on trunks of Carpinus caroliniana and on somewhat moist rocks, 1760—1900 m; Mt. Kephart, in Abies Fraseri forest, 1820 m; Clingman's Dome, on Abies Fraseri in A. Fras. forest, 1820 m. *Tenn.:* near

Laurel Falls, on rocks, 760 m; near Alum Cave, among shrubs in open situation, 1500 m; near Newfound Gap, 1550 m. — C. ap. or sterile.

3. **P. rufescens** (WEIS) HUMB.

Tenn.: near Laurel Falls, on rocks, 760 m. Sterile.

Lecidea.

1. **L. albocaerulescens** (WULF.) FLK.

Tenn.: Cherokee Orchard, abundant on rocks and boulders in deciduous forest near the stream, 760 m; near Laurel Falls, on rocks, 760 m; near Alum Cave, on rocks, in shady situation, 1280 m.

This species is closely related to *L. glaucophaea* KÖRB., from which it is distinguished by lack of soredia.

2. **L. crustulata** (ACH.) SPRENG.

Tenn.: near Alum Cave, on rocks, 1300 m.
Belongs to f. *oxydata* RABENH. (thallus pale ochraceous).

3. **L. Degelii** H. MAGN. n. sp.

»Thallus maculatim dissolutus, albidus, maculis saepius elongatis, ± lineariter saepeque radiatim dispositis, tenuibus, indistincte areolatis vel fissis, sorediis superficialibus convexis ornatis, jodo intense caerulescentibus, hypothallo indistincto. Apothecia rara, sessilia, majuscula, disco plano caesiopruinoso a margine tenui atro leviter prominente cincto. Excipulum hypotheciumque fuscoatrum. Epithecium inter apices ramosos paraphysium dense granulatum, KOH+ intense flavum. Sporae subfusiformes, majusculae.

Thallus in the single specimen seen covering several square cm. Thallus parts 1—3 mm long, 0,5(1) mm broad, ± distinctly arranged into branching lines, longitudinally connected or isolated, transversally well separated, sometimes also ± rounded or angular and very irregular, slightly convex, up to 0,35 mm thick, firmly attached with the thin margins, surface smooth with thin, mostly transversal cracks to subareolate; soralia 0,4—0,5 mm wide, dispersed or, rarely, approaching, slightly yellowish, farinose. — Cortex 25—35 µ thick, grayish opaque, hyphae mainly perpendicular in Pd but not distinct. Gonidia 7—10 µ, yellowish green, stratum about 50 µ, continuous, dense, surface less regular. Medulla grayish opaque, also in KOH, Pd, HNO_3, and in H_2SO_4 without crystals of gypsum. No distinct hyphae or cells seen in either of these reagents. Both medulla and cortex I+ dark blue. Cortex and gonidial stratum KOH+ yellow (with mist), cortical hyphae 4—5,5 µ thick, irregular. Medulla KOH—.

Apothecia soon constricted at the base, 0,4—0,7 mm high, 0,5—1,2 mm broad, a few apothecia devided into 2—4 contiguous discs, each separately marginated. — Apothecial margin 50—120 µ thick, black, contiguous with the concolorous, up to at least 250 µ thick hypothecium, in KOH dark brown with a yellowish shade. Thecium about 100 µ high, colourless with 25—30 µ transitional, gradually brown zone at base, I+ blackish blue; upper 25 µ pale sordid yellowish granular, KOH+ intensely yellow while the granules dissolve. Paraphyses ± contiguous, 1,7 µ thick, in ± gelatin, at apices much and intricately branched with unthickened apices. Asci about 65—70 × 16—20 µ, clavate. Spores 20 × 6,5—7 µ, simple, thin-walled, oblong or subfusiform.

Tennessee: Great Smoky Mts., near Alum Cave, on a shady rock about 1500 m. 1939 G. DEGELIUS.

The relatively small group among the *Eulecideas* with thallus I+ blue and KOH+ yellow includes no European species with as large spores, and among the four or five species outside Europe there is none with white thallus or soredia. It seems to have an isolated position. Noticeable is the rich branching of the apices of the paraphyses, of rare occurrence and usually overlooked, but recorded by me concerning *Lecidea coarctata*, *Wallrothii*, *Brujeriana* and *Lecanora gelida* (in Bot. Not. 1932 p. 422).«

4. **L. deminutula** H. MAGN. n. sp.

»Thallus effusus, verruculoso-areolatus, flavescenti-glaucus vel viridescenti-cinerascens, areolis minutissimis, convexis, contiguis vel subdispersis; medulla CaCl aurantiaca; hypothallus indistinctus. Apothecia ± crebra, perminuta, sessilia, disco atro plano a margine concolore tenui mox excluso cincto. Excipulum pallidum, hypothecium incoloratum. Thecium superne subaeruginosum, paraphysibus subdiscretis. Sporae ellipsoideae.

Thallus covering an area of several square cm, the verruciform areolae 0,2—0,3 mm large, 0,15—0,25 mm thick, partly forming a continuous crust, partly dispersed. — Upper cortex 10—13 µ, gray, in KOH colourless with 3—4 µ, ± perpendicular lumina. Gonidia 8—10 µ, yellowish green; stratum 60—70 µ, continuous, upper surface even. Medulla gray to yellowish-gray without distinct granules, KOH ± yellowish,

hyphae mainly perpendicular, 3—3,5 µ, or somewhat intricate, thick-walled, lumina 1,5—2 µ, apparently globular, Pd—. Medulla CaCl + yellowish red, especially near the gonidial stratum.

Apothecia 0,2—0,4 mm wide, margin nitid as young, hardly prominent, smooth, apothecia at last convex, only slightly constricted at base, about 0,2 mm thick. — Exciple about 35 µ laterally, at the edge very narrower, sordid pale ± olive or pale bluish-green towards surface, hyphae radiating, 4—6 µ, with 1—1,5 µ cylindric lumina, apices in KOH 6—7 µ, bluish-green, discrete. There are a few gonidia seen a centre below the 35—40 µ colourless or sordid pale hypothecium. Thecium 70—75 µ, colourless; upper 10—15 µ sordid bluish-green, in KOH more greenish, in HNO_3 reddish-violet. Paraphyses partly free, 1,7(2) µ, simple, partly not very discrete, or contiguous even in KOH, apices swollen 3,5—4,5 µ (KOH). Asci about 50 × 12 µ, clavate, asci alone I+ dark sordid blue. Spores rarely developed, in KOH 10—12 × 6—7 µ.

Conidia 13—17 × 1 µ, arcuate.

Tennessee: Great Smoky Mts., near Laurel Falls on rocks at 760 m. 1939 G. DEGELIUS.

The new species belongs to sect. *Eulecidea* and to the *elaeochroma*-group on account of its long, arcuate conidia and ± discrete paraphyses. Although this group still needs a thoroughly investigation, it seems that the above specimen is well characterized by the very pale apothecial colours, especially in the exciple, the distinct positive CaCl-reaction and the minute granules in the thallus. Positive CaCl-reaction is known also from *Lecidea prasinula* B. DE LESD., *viridans* (FLOT.) LAMY and *alienata* NYL. (according to examined specimens), but the first two have lower hymenium (about 50 µ), and all three have a coloured, though rather pale hypothecium and darker exciples.»

5. **L. granulosa** (EHRH.) ACH.

N. C.: Forney Ridge, on earth in open situation, 1820 m.

6. **L. gyrodes** H. MAGN. n. sp.

»Thallus late expansus, effusus, cinereo-fuscus vel fuscus, verrucosus, verrucis applanatis vel globosis, subcontiguis, minutis, variaeformibus, reagentibus immutatis, hypothallo atrofusco tenui ± visibile. Apothecia sparsa, inter verrucas sedentia, basi saepe constricta, subminuta, disco atro plano a margine flexuoso elevato fuscoatro cincto vel a lineis marginalibus undulatis in partes valde irregulares diviso. Excipulum epitheciumque obscure fuscum, hypothecio incolore. Sporae minutae, fabaceae.

Thalius probably covering large areas, verrucae 0,3—0,6 mm wide and equally high, younger ones widely attached, convex to half globose, older ones constricted at the base, subglobose or even subpodicellate, at least 0,5 mm high, easily loosening, smooth, partly irregular; hypothallus visible at edge as a 0,6 mm broad, blackish-brown margin and also seen between younger areolae. — Thallus cortex 12—15 µ, gray, surface brownish, hyphae somewhat lax, 3,5—4,5 µ, short-celled, lumina indistinct, about 2 µ, upper limit indistinct; in KOH transparent with intricate hyphae. Gonidia 8—10 µ, yellowish green, stratum 85—100 µ, dense, upper limit diffuse. Medulla lax, obscured by air and a not granular stuff, hyphae 3,5—4,5 µ, moderately thin-walled, very intricate, long- or short-celled, CaCl—, Pd—.

Apothecia ± uniformly dispersed or a few approaching, when young often regularly orbicular, but often from the beginning flexuose gyrose with the disc reduced to a winding furrow, sometimes dividing into 2—3, very irregular parts, each with its prominent opaque margin, thus reaching 1—1,5 mm in diam. — One apothecium 0,8 × 0,4 mm. Its exciple 35—45 µ all round, dark brown, inner limit diffuse, hyphae 5—6 µ, radiating. Medulla 100—150 µ, very lax, filled with air, gray. Hypothecium about 35 µ, colourless, hyphae dense, perpendicular, with minute oil drops. Thecium 60—65 µ, lower limit indistinct, upper 25 µ very dark brown, in KOH brownish green. Paraphyses discrete, 2—2,5 µ, ± thin-walled, apices slowly widening, about 3,5 µ, upper 8—12 µ brown, in KOH very lax to free. Ripe asci and spores rare, asci about 38 × 12 µ, only asci I+ blue, uppermost part darker. Spores 8, about 10 × 5—6 µ, bean-shaped, colourless.

Pycnidia at the top of the verrucae, rare, little prominent, hardly darker. Wall pale brown. Sterigmata 7—8 × 1,7 µ, simple with apical conidia, 2—2,5 × 1 µ.

Tennessee: Great Smoky Mts., above Alum Cave, at 1520 m, on granitic rock. 1939 G. DEGELIUS.

The new species belongs to sect. *Biatora* and is closely related to *Lecidea cyathoides* (*rivulosa*), having very similar spores, but a characteristic appearance on account of the verrucose, more intensely brown thallus and the irregular, gyrose apothecia, occasionally occurring also in *L. cyathoides*. It might be considered a parallel-species to the European one.»

7. **L. helvola** (Körb.) Th. Fr.

N. C.: Clingman's Dome, 1970 m. *Tenn.:* Mt. Le Conte, Le Conte Lodge, 1940 m. — On twigs of Abies Fraseri in A. Fras. forests.

From U. S. A., this species has previously only been mentioned from Maine (Degelius 1940).

v. *longispora* Degel. n. v.

Differt a planta typica sporis longioribus, 14—22 × 3,5—4,5 µ. — Excipulum chondroideum, pallidum vel incoloratum; hymenium c. 48—56 µ crassum, flavescens, J+ fuscorubrum, epithecio fere nullo; paraphyses valde gelatinosae, non vel leviter incrassatae; sporae oblongae, simplices vel indistincte 1-septatae, rectae vel leviter curvatae; apothecium intus K—; algae fere protococcaceae sat sparsae in parte inferiore apothecii. — Typus ad truncum Abietis Fraseri ad Forney Ridge (*N. C.*), c. 1820 m s. m., lectus est.

I have collected this variety also in the following localities: *N. C.:* Clingman's Dome, on a trunk of Abies Fraseri in A. Fras. forest, 1820 m; *Tenn.:* near Alum Cave, on a trunk of Acer spicatum in deciduous forest, 1270 m; near Newfound Gap, on a trunk of Betula lutea, 1600 m.

This variety of *L. helvola* should not be confused with *L. vernalis* (L.) Ach. and *L. subduplex* Nyl., both of which have long spores also. These two species, however, have broader spores, *L. vernalis* larger apothecia as well. The spores of *L. subduplex* are often 1-septate.

8. **L. humosa** (Ehrh.) Nyl.

Tenn.: near Alum Cave, on earth among shrubs in open situation, 1520 m, together with *Cladonia incrassata*.

This species is closely related to *L. uliginosa* (Fr.) Nyl., from which it differs in the thin and very minutely granulose (not verrucose), often leprose and more pale brown thallus. Apothecia usually somewhat smaller (0,2—0,3, rarely up to 0,5 mm across) and less numerous (sometimes they are lacking). *L. fuliginea* Ach. belongs, at least in the main, to this type.

9. **L. latypea** Ach.

Tenn.: near The Chimneys, on a boulder in deciduous forest, 850 m, together with *Physcia melops*.

Here I refer the saxicolous types within the *L. olivacea*-group with dark hypothecium, ± emerald-green epithecium and a rather well developed, ± verrucose thallus. — According to Vainio (Lich. fenn., 4, 1934, p. 257) *L. latypea* Ach. should be a form near *L. plana* Lahm. However, the description by

Acharius (Meth., Suppl., p. 10) does not agree at all with that species.

10. **L. macrocarpa** (DC.) Steud.

Tenn.: above Alum Cave, on a moist rock, 1600 m (a form with rather small apothecia, up to 1 mm across, and small spores, usually 13—14 × 6,5—8,5 µ; hymenium about 86 µ thick; epithecium blackish green; thallus of small, scattered areolae); above Alum Cave, on a moist rock, 1710 m (a form with paraphyses coherent only at the apices and therefore resembling *L. katahdinensis* Degel. but it differs from that species in much larger apothecia, up to 2 mm across, thicker hymenium, 86—106 µ, and larger spores, 20—25 × 8,5—13 µ); Mt. Le Conte, Cliff Top, abundant on exposed rocks, 1970 m (a form with numerous, rather small apothecia, 0,5—0,8 mm across, and a rather thin, areolate thallus with partly discontinuous areolae; spores 16—23 × 8,5—9 µ).

V. *convexa* (Fr.) H. Magn. [syn. *L. musiva* (Körb.), *L. contigua* Nyl.] I have collected in *N. C.:* Forney Ridge, on a boulder in open situation, 1820 m.

11. **L. mollis** (Wg) Nyl.

Tenn.: near Alum Cave, on rocks, 1500 m.

With regard to the strongly pruinose apothecia the specimens approach v. *caesio-albescens* H. Magn., but the thallus is brownish gray, not gray or whitish. Evidently it comes near a form from Medelpad, Sweden (Magnusson 1925, p. 34). — V. *scrupulosa* (Eckf.) Degel. n. c. (syn. *Biatora scrupulosa* Eckf., *Lecidea scrupulosa* H. Magn.) differs in »paler exciple, more developed medullary stratum in the apothecia and a distinct KOH-reaction in the thallus as also in the apothecia (yellow mist)» (Magnusson 1936, p. 10). Through these characteristics this type is not well separated from *L. mollis*, a fact pointed out by Magnusson also. It is better to refer it as a variety to *L. mollis*.

12. **L. olivacea** (Hoffm.) Mass.

v. *inspersa* Degel. n. v.

Differt a planta typica hymenio granulis minutissimis valde insperso. — Prothallus niger. Thallus inaequalis vel granulosus, cinereoviridis, K+ leviter lutescens, C—. Apothecia nigra, ± nitida, plana, usque 1 mm lata (in speciminibus aliis usque 1,5 mm), margine persistente. Hypothecium fusconigrum vel fulvofuscum; hymenium 65—85 µ crassum, epithecio fusco vel fusconigro; paraphyses liberae, c. 2 µ crassae, vulgo non incrassatae; asci clavati, 52—58 × 13 µ, J+ caerulescentes

demum vinose rubescentes vel fuscescentes, membrana crassa; sporae octonae, 14—17 × 8,5—9 µ; apothecium intus K—. Pycnoconidia 15—20 × < 1 µ, curvata. — Typus ad truncum Celtidis occidentalis in silva frondea prope »The Chimneys» (*Tenn.*), c. 850 m s. m., lectus est.

All the specimens of *L. olivacea* collected in Smoky Mountains belong to this very peculiar variety. I collected it also at Forney Ridge (*N. C.*), on a trunk of Carpinus caroliniana in mixed forest, 1760 m, and near Laurel Falls (*Tenn.*), on a trunk of Quercus rubra, 760 m. I have not seen this type in the European population of the species. On the other hand, I have examined typical specimens of *L. olivacea*, i. e. with non-inspersed hymenium, from North America also.

13. L. subsimplex H. MAGN.

in Medd. fr. Göteborgs bot. trädg., 10, 1936, p. 29. DEGELIUS in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 24.

N. C.: Forney Ridge, on a boulder in open situation, 1820 m.

This species was previously known only from two localities on the whole, one in Ohio and one in Maine. — The spores in my specimens from Maine and the Smoky Mountains are somewhat larger [13—17(—19) × 6,5—7 µ] than those in the ones from Ohio (12—14 × 6—7 µ, according to MAGNUSSON l. c.).

14. L. subtilis DEGEL. n. sp.

Descriptio typi:

Prothallus distinctus, tenuis, niger. *Thallus* crustaceus, hypophloeodes, sat parvus (2,5 × 1 cm), tenuissimus, continuus, laevigatus vel leviter inaequalis, esorediatus, cinereoviridis, K+ sublutescens, C—, J—. *Apothecia* numerosa, minuta (vulgo c. 0,2 mm lata), tenuia, subgelatinosa, ± aggregata, rotundata vel mutua pressione angulata vel compressa, vulgo late adnata, plana vel concaviuscula, rufescentia vel pallida, demum saepe nigricantia, K—, nuda vel pruinosa, nitidula vel sat opaca, margine concolore vel pallidiore, modice incrassato vel sat tenui, integro, leviter elevato, ± persistente. *Pycnoconidangia* non certe visa.

Thallus ex algis fere protococcaceis, globosis vel subglobosis vel leviter oblongis, diam. 8,5—13 (—15) µ, membrana modice incrassata vel sat tenui, et hyphis c. 3 µ crassis, granulis minutissimis ± inspersis, membrana modice incrassata, formatus.

Excipulum (parathecium et hypothecium) gelatinosum, in parte exteriore parathecii fuscidulum, ceterum incoloratum vel pallidum, non plectenparenchymaticum, (in KOH) pro maxima parte ex hyphis tenuibus et crebre ramoso-connexis formatum.

Hymenium c. 40—70 µ crassum, non inspersum, epithecio colore variabili (saepe fulvo vel fuscescente), ceterum incoloratum vel pallidum, J+ caerulescens demum mox fuscescens vel vinose rubens. *Paraphyses* ± conglutinatae, simplices, c. 2 µ crassae, indistincte septatae, apice clavatae vel rotundatae (c. 3—5 µ) coloratae que. *Asci* subclavati, c. 50 × 13—16 µ, membrana sat tenui. *Sporae* octonae, vulgo monostichae, ovales, 8,5—10,5 × 5—7 µ, vel ± globosae, non septatae, incoloratae, membrana sat crassa. Apothecium intus K—.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains ad Cherokee Orchard, ad truncum Tiliae in silva frondea, copiose, 760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL.

A very peculiar species belonging to sect. *Biatora*. It is easily distinguished from other species, even macroscopically, by the very small, usually reddish apothecia, often clustered together in small groups, and furthermore by the distinct, black prothallus and the thin, at least in the beginning, hypophloeodal thallus. The species is somewhat variable. The thallus is sometimes thicker and becomes epiphloeodal, the apothecia larger (up to 0,3 mm across or more) and more scattered, in some specimens nearly all strongly pruinose.

The species seems to be rather common in the Smoky Mountains and is distributed over different levels. Besides the original locality (cf. above) I have collected it in the following localities: *N. C.:* Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m; *Tenn.:* near Laurel Falls, on Acer sp., 760 m; near The Chimneys, on Celtis occidentalis, 850 m; Mt. Kephart, Dry Sluice Gap, on Viburnum cassinoides, 1710 m; Mt. Le Conte, Le Conte Lodge, on Sorbus americana in Abies Fraseri forest, 1940 m, and Myrtle Point, on Sorbus amer., 1970 m. Usually on ± smooth bark.

15. L. symmicta ACH.

N. C.: Clingman's Dome, on Viburnum alnifolium in Abies Fraseri forest, 1970 m; Forney Ridge, on lignum of dry branches of Picea rubens, 1820 m. *Tenn.:* Mt. Le Conte, Cliff Top, on twigs of Menziesia pilosa and Rhododendron catawbiense, 1970 m.

Catillaria.

See by *Catinaria*.

Bacidia.

1. **B. chlorantha** (TUCK.) FINK.

N. C.: Mt. Kephart, on Abies Fraseri in A. Fras. forest, 1810 m; Forney Ridge, on Abies Fraseri in A. Fras. forest, 1820 m. *N. C.* and *Tenn.:* Clingman's Dome, on twigs of Abies Fraseri in A. Fras. forest, rather abundant, 1970 m. *Tenn.:* above Alum Cave, on Rhododendron catawbiense in open situation, 1640 m.

2. **B. endocyanea** (TUCK.) ZAHLBR.

(Syn. *Biatora endocyanea* TUCK.)

Tenn.: near Alum Cave, sparse on trunk of Picea rubens in P. rubens forest, 1575 m.

An interesting find. This characteristic species has been collected only once before on the whole: on holly near New Bedford, Mass. (WILLEY).

Short description of my specimens: thallus inconspicuous; apothecia small (up to about 0,5 mm across), black, soon strongly convex, margin soon disappearing; hymenium bluish, about 45—50 µ thick, K—, J+ blue and then brownish; epithecium and hypothecium dark; paraphyses gelatinous, strongly coherent; asci cylindrical, c. 42 × 8,5 µ, with a rather thick wall; spores 26—30 × 2—3 µ, acicular, often twisted, with several cells.

3. **B.** cfr **fuscorubella** (HOFFM.) BAUSCH.

Tenn.: near National Park Office, on a trunk of Juglans nigra, 455 m.

Differs from the species mentioned above in paler apothecia which are not K+ violet within (sometimes slightly rose-coloured).

4. **B. Schweinitzii** (TUCK.) SCHNEID.

N. C.: near Newfound Gap, on Fagus grandifolia, sparse, 1530 m; Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* Cherokee Orchard, on Quercus montana in deciduous forest, abundant, 760 m; between Grassy Patch and Alum Cave, on Carpinus caroliniana in deciduous forest, 1300 m.

5. **B. umbrina** (ACH.) BAUSCH.

Tenn.: near Laurel Falls, on rocks, 760 m.

Rhizocarpon.

1. **Rh. grande** (FLK.) ARN.

Tenn.: above Alum Cave, on a moist rock, 1600 m.

2. **Rh. intermedium** DEGEL. n. sp.

Descriptio typi:

Prothallus distinctus, niger. *Thallus* crustaceus, uniformis, tenuis vel modice incrassatus, cinereus vel fuscocinereus, areolatus, areolis contiguis vel sat discretis, planis angulosisque vel interdum sat convexis rotundatisque, saepe rimosis, laevigatis, opacis, epruinosis, esorediatis, diam. vulgo 0,5—1 mm; thallus supra K— (demum fuscoruber), C—, P+ flavescens, intus albus, K+ intense lutescens (demum saepe leviter rubescens), C+ rubescens, P+ rubescens (aurantiacus), J—. *Apothecia* numerosa, dispersa, raro aggregata confluentiaque, rotundata vel angulosa, diam. vulgo 0,8—1,5 mm, primum thallum haud superantia sed demum sedentia, basi leviter constricta, plana vel demum vulgo modice convexa, nigra, nuda, opaca vel nitidula, disco laevigato vel sublaevigato, margine modice incrassato, integro, vulgo non flexuoso, haud elevato, persistente vel demum in apotheciis valde convexis excluso. *Pycnoconidangia* non visa.

Stratum corticale (superius) thalli c. 20—30 µ crassum (incl. cuticula amorpha), pallidum, non bene limitatum, ex hyphis superficiei perpendicularibus, cellulis ± isodiametricis, diam. 3—6 µ, sat leptodermaticis, formatum. *Stratum algarum* crassum, ex algis fere pleurococcaceis, ± globosis, (8,5—) 10—15 (—19) µ crassis, et hyphis sat conglutinatis, crebre septatis, cellulis ± isodiametricis (diam. c. 3—4 µ) vel oblongis, formatum. *Stratum medullare* crassum, incoloratum, ex hyphis sat arcte conglutinatis, crebre septatis, cellulis fere ut in strato algarum, isodiametricis (diam. c. 4—8 µ) vel oblongis, membrana modice incrassata vel sat tenui, formatum.

Excipulum (parathecium et hypothecium) fuscum vel fusconigrum, K—, ex hyphis valde conglutinatis, crebre septatis, cellulis ± isodiametricis (diam. 4—8 µ), membrana vulgo modice incrassata vel sat tenui, formatum. *Subhymenium* fuscescens, K+ lutescens. *Hymenium* c. 130—150 µ crassum (incl. epithec.), pro maxima parte incoloratum vel fumosum, J+ caerulescens, epithecio 20—30 µ crasso, indistincte limitato, fusco, K—. *Paraphyses* arcte cohaerentes, gelatinosae, graciles, ramosae, ± articulatae, c. 1,5—2,5 µ crassae, apice incrassatae (3—5 µ) obscurataeque. *Asci* clavati, c. 90—120 × 36—38 µ, membrana crassa. *Sporae* octonae, distichae, oblongae vel ovoideo-oblongae,

rectae vel leviter curvatae, apicibus rotundatis, obscuratae, (20—) 26—36 (—39) × (8,5—) 10,5—15 µ, submurales, cellulis sat paucis vel sat numerosis (septis transversis 3—7, septis longitudinalibus 1—2), ad septa constrictae.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains ad Laurel Falls, ad saxum non calcareum, leviter inundatum, 760 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. Upsal., cotypus in herb. DEGEL.

The new species belongs to sect. *Eurhizocarpon* STIZ. and is closely related to *Rh. grande* (FLK.) ARN. The latter species differs macroscopically in differently coloured thallus (more reddish brown) and larger as well as less continuous areolae, smaller and less prominent apothecia, and microscopically in epithecium K+ violet. The also related *Rh. eupetraeum* (NYL.) ARN. differs in differently coloured thallus (more pure gray to whitish, without brown nuance) and larger as well as more convex areolae, further in thallus outside and inside K+ yellow and then red, medulla P+ yellow (not red). Concerning the last two species see DEGELIUS 1940, p. 26—27.

In its habitus *Rh. intermedium* is somewhat similar to certain forms of *Rh. geminatum* (FLOT.) KÖRB. The latter species differs inter alia in pruinose areolae, lack of reactions in the thallus and epithecium K+ violet, in having only two large spores in the asci (the spores are acc. to VAINIO 26—70 × 14—30 µ). *Rh. phalerosporum* VAIN. differs in the same characteristics, only the spores are smaller than in *Rh. geminatum* and 2—4—8 in the asci.

3. **Rh. plicatile** (LEIGHT.) SM.

(Syn. *Rh. rubescens* TH. FR.)

N. C.: Forney Ridge, on a boulder in open situation, 1820 m.

Previously known only from one locality in America (in Maine, see DEGELIUS 1940, p. 27).

4. **Rh. reductum** TH. FR.

Tenn.: near Laurel Falls, on rocks, 760 m. Possibly the same species sparsely mixed together with other lichens in some further samples.

Also this species I mentioned from Maine (one locality) as new to America (DEGELIUS 1940, p. 29).

Cladonia.

a) Cladina.

1. **Cl. impexa** HARM.

Tenn.: above Alum Cave, abundant on open and somewhat moist rocks, 1610 m. Sparsely c. ap.

More slender and less branched than the European types. Belongs according to SANDSTEDE to f. *laxiuscula* (DEL.) SANDST. The podetia are K— and P—.

2. **Cl. mitis** SANDST.

N. C.: Mt. Kephart, in Abies Fraseri forest, 1820 m. *Tenn.:* near Alum Cave, among shrubs in open situation, together with the following two species, 1520 m. — Sparsely c. ap. The podetia are P+ slightly reddish. Hardly a good species.

Reported by CAIN (1935, p. 575) from the top of Mt. Le Conte.

3. **Cl. rangiferina** (L.) WEB.

Tenn.: near Alum Cave, together with the preceding species. Sterile.

4. **Cl. tenuis** (FLK.) HARM.

Tenn.: near Alum Cave, together with the preceding two species. Sterile.

Belongs to subsp. *subtenuis* DES ABB. — *Cl. tenuis* f. *setigera* SANDST., from the top of Mt. Le Conte, in CAIN 1935 (p. 575) evidently is the same.

b) Cenomyce.

5. **Cl. bacillaris** NYL.

N. C.: Forney Ridge, on a stump in mixed forest, 1760 m. Sterile.

Belongs to f. *clavata* (ACH.) VAIN.

6. **Cl. botrytes** (HAG.) WILLD.

Tenn.: Mt. Kephart, on a stump in Abies Fraseri forest, 1800 m.

7. **Cl. caespiticia** (PERS.) FLK.

Tenn.: Mt. Kephart, abundant on a stump in Abies Fraseri forest, 1820 m.

8. **Cl. cfr caroliniana** (SCHWEIN.) TUCK.

Tenn.: above Alum Cave, on a rock in open and somewhat moist situation, 1610 m, together with *Cl. uncialis*. Very scarce material. Sterile.

9. **Cl. coccifera** (L.) WILLD.

N. C.: Forney Ridge, some localities on earth and lower parts of trees, 1760—1820 m. *Tenn.:* near Laurel Falls, on rocks, 760 m; near Alum Cave, on a tree-root, 1710 m; Mt. Kephart, on a stump in Abies Fraseri forest, 1820 m. — Only seen sterile. Usually rather sparse.

The commonest type is v. *pleurota* (FLK.) VAIN.

10. **Cl. cristatella** TUCK.

N. C.: Forney Ridge, on earth in open situation, 1820 m. *Tenn.:* near Laurel Falls, on a stump, 760 m; Mt. Kephart, on a stump in Abies Fraseri forest, 1820 m. — Only small specimens seen.

11. **Cl. delicata** (EHRH.) FLK.

N. C.: Forney Ridge, on a stump in mixed forest, 1760 m. *Tenn.:* Cherokee Orchard, on stump of Tsuga, 760 m.

Belongs to f. *squamosa* HARM.

12. **Cl. didyma** (FÉE) VAIN.

Tenn.: Cherokee Orchard, abundant on stumps of Tsuga and other trees in deciduous forest, also on rocks, 760 m.

13. **Cl. fimbriata** (L.) FR. em. SANDST.

[Syn. *Cl. fimbriata* v. *minor* (HAG.) H. MAGN.]

N. C.: Forney Ridge, on earth in mixed forest, 1870 m. *Tenn.:* Mt. Kephart, on Abies Fraseri in A. Fras. forest, 1800 m. — Only seen sterile.

14. **Cl. Flörkeana** (FR.) SOMMERF.

N. C.: Forney Ridge, some localities on earth and stumps in mixed forest, 1760—1870 m.

Most closely related to f. *carcata* (ACH.) NYL.

15. **Cl. furcata** (HUDS.) SCHRAD.

Rather common on high levels, especially in the Abies Fraseri belt. Collected on mossy tree-bases and on the ground

in Abies Fraseri and mixed forests as well as on rocks and among shrubs in open situation, from 1550 m upwards. C. ap. or sterile. — Reported from some localities by CAIN (1935, p. 575).

The commonest type is v. *pinnata* (FLK.) VAIN. but also v. *racemosa* (HOFFM.) FLK. is not rare. — The podetia in this species are P+ red. In *Cl. rangiformis* HOFFM. they are P+ intensely yellow (not P— as sometimes stated); I have studied many specimens inter alia in the exsiccate of SANDSTEDE (nris. 350, 687, 782, 1592, 1765).

16. **Cl. gracilis** (L.) WILLD.

N. C.: Forney Ridge, 1820 m. *Tenn.:* Mt. Kephart, some localities, 1800—1820 m; Mt. Le Conte, Le Conte Lodge, 1940 m. — On stumps and on the ground in Abies Fraseri and mixed forests.

All the specimens belong to v. *dilatata* (HOFFM.) VAIN. The same type reported by CAIN (1935, p. 575) from the top of Mt. Le Conte.

17. **Cl. incrassata** FLK.

(Syn. *Cl. cristatella* TUCK. v. *paludicola* TUCK., *Cl. paludicola* MERRILL.)

Tenn.: near Alum Cave, rather abundant among shrubs in open situation, 1520 m. — Small podetia with pycnoconidangia but without apothecia.

18. **Cl. macilenta** (HOFFM.) NYL.

N. C.: Forney Ridge, in one locality abundant, 1820 m. *Tenn.:* near Alum Cave, 1520 m; Mt. Le Conte, 1725 m; Mt. Kephart, 1820 m. — On stumps and on earth in open situation or in woods. Usually c. ap.

All the specimens belong to f. *styracella* (ACH.) VAIN.

19. **Cl. nemoxyna** (ACH.) COËM.

N. C.: Forney Ridge, on the ground in mixed forest, 1870 m. *Tenn.:* near Newfound Gap, on rock in Abies Fraseri forest, 1675 m. — The specimens from the former locality c. ap.

20. **Cl. ochrochlora** FLK.

Common on all levels. Collected in all the localities visited (from 455 to about 2000 m), on stumps and trunks of coniferous and broad-leaved trees and shrubs as well as on rocks. One of the most common species of this genus. Usually sterile but also seen c. ap.

Cl. coniocraea (from the top of Mt. Le Conte) in CAIN 1935 (p. 575) evidently is the same.

21. **Cl. pyxidata** (L.) FR.

Rather common on rocks, stumps and earth. Collected in many localities (*N. C., Tenn.*) from 760 to 1870 m. C. ap. or sterile. — Two types occur: v. *chlorophaea* FLK. and v. *neglecta* (FLK.) MASS.

22. **Cl. santensis** TUCK.

N. C.: Forney Ridge, rather abundant on trunk of Picea rubens in one locality, 1820 m. Only primary thallus developed. — Det. H. SANDSTEDE.

23. **Cl. squamosa** (SCOP.) HOFFM.

Common on all levels. Collected in all the localities visited (from 455 to about 2000 m), on stumps and trunks of coniferous and broad-leaved trees and shrubs as well as on rocks and earth. Perhaps the most common species of this genus. Sometimes sterile but usually c. ap. — Reported from some localities by CAIN (1935, p. 575).

The commonest form is v. *denticollis* (HOFFM.) FLK. (and its f. *squamosissima* FLK.). All specimens examined were K—.

24. **Cl. uncialis** (L.) WEB.

Tenn.: above Alum Cave, on exposed and somewhat moist rocks, 1610 m. Sterile.

Stereocaulon.

1. **St. pileatum** ACH.

N. C.: Forney Ridge, on boulder in open situation, 1820 m. Sterile.

2. **St. tennesseense** H. MAGN. n. sp.

»Podetia arcte adnata, erecta, caespitosa, dense congesta, valde et intricate ramosa, subteretia, pro maxima parte nuda, apices versus phyllocladiis coralloideis ± dense vestita, reagentibus immutata. Apothecia terminalia, majora, convexa, immarginata, irregularia, atrofusca. Sporae mediocres, oblongofusiformes, pauciseptatae. Cephalodia conspicua, olivaceofusca, algas stigonemoideas continentia.

Podetia 1,5—4 cm high, base 1—1,5 mm thick, blackish far upwards, lower branching ± dendroid with several branches

from one small space, upper part white, more divaricately branched, often ± compressed, sometimes anastomosing, main-axis indistinct, all podetia quite naked. Phyllocladia glaucous white, shortly coralloid and ± branched to lengthened verruciform, ± uniformly distributed in the uppermost part. — Longitudinal sections of podetia with generally naked surface, where the outer 40—50 µ are dark gray from granules and air with 5—7 µ very thickwalled, ± longitudinal hyphae. In parts a 50—70 µ thick gonidial stratum has been observed with a 25—35 µ pale cortex outside it, where hyphae are intricate, conglutinate and indistinct, also in Pd. The interior hyphae about 3 µ, dense, indistinct, parallel, KOH—, with 0,7—1 µ cylindric lumina.

Apothecia 1—2 mm across, often 2—4 together, each with a short foot; surface glebulose as if composed of 2—4 parts, thecium soon growing on to the lower side excluding the original margin very rapidly. — Part of a colourless exciple, 40 µ, seen on one side of the apothecium, central cone with radiating hyphae. Below the 35—50 µ thick, almost colourless hypothecium with intricate, indistinct hyphae lies a 100—200 µ stratum, either almost colourless or rather dark, sordid yellow brown from a flocculose stuff, dissolving in KOH. Thecium about 60 µ high, pale brownish yellow to colourless or ± yellowish brown, I+ dark blue like part of the hypothecium. Paraphyses about 1 µ, firmly coherent, indistinct. Asci rare, 40—45 × 14—16 µ, clavate. Spores hardly ripe, in KOH 23—27 × 3—3,5 µ, 5—6-septate with blunt apices, or one apex narrower.

Pycnidia like pale brown, minute, crowded verrucae, 100—200 µ diam. Conidia 5—6 × 0,8 µ, straight.

Tennessee: Great Smoky Mts., near Alum Cave, on moist rock at 1515 m. 1939 G. DEGELIUS.

The new species has no obvious appearance and resembles most European *St. coralloides* but is lighter, has large, conspicuous cephalodia, longer conidia and negative K-reaction in the medulla. Its podetia are usually naked and ± compressed in upper part.«

Umbilicaria.

1. **U. Dillenii** TUCK.

N. C.: Forney Ridge, 1820 m. *Tenn.:* near Laurel Falls, 760 m; above Cherokee Orchard, 900 m. — On rocks. Usually sparse. Only sterile specimens seen.

According to SHARP (1930), this species is collected also on Mt. Le Conte (HESLER).

2. **U. papulosa** (ACH.) NYL.

N. C.: Forney Ridge, on rock in mixed forest, 1820 m. *Tenn.:* near Laurel Falls, abundant on open and somewhat moist rocks, 760 m.

In another locality — *N. C.:* Forney Ridge, rather abundant on a moist rock, 1900 m — I collected a different form of this species, a parallel to *U. pustulata* (L.) HOFFM. f. *lacerata* (SCHAER.) ZAHLBR., i. e. with the margin of the thallus and also the surface at wounded parts lacerate. The apothecia are poorly developed. I shall call this form *U. papulosa* f. *lacerata* DEGEL. n. f. (differt a planta typica margine thalli lacerato).

Sarcogyne.

1. **S. simplex** (DAV.) NYL.

Tenn.: above Alum Cave, on a moist rock, sparse, 1600 m.

Acarospora.

1. **A. fuscata** (NYL.) ARN.

N. C.: Forney Ridge, on boulder in open situation, 1820 m. *Tenn.:* near Laurel Falls, sparse on rock, 760 m. — Confirm. A. H. MAGNUSSON.

Pertusaria.

1. **P. amara** (ACH.) NYL.

Tenn.: Mt. Le Conte, Myrtle Point, on branch of Picea rubens, 1940 m. Sterile.

2. **P. laevigata** (NYL.) ARN.

Common, together with a similar species with thicker thallus and larger soredia, on trunks and twigs of Sorbus americana and Abies Fraseri in the Abies Fraseri belt. Collected on Clingman's Dome, Forney Ridge, Mt. Kephart and Mt. Le Conte on levels from 1760 to 1970 m.

3. **P. leioterella** ERICHS.

Tenn.: near Laurel Falls, on twig of Acer sp., sparse, 760 m. — A form with somewhat smaller apothecia (<1 mm across) and spores (in those apothecia which I have examined 70—110 × 30—40 µ). Confirm. C. F. E. ERICHSEN.

4. **P. multipuncta** (TURN.) NYL.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* near Alum Cave, on Acer spicatum in deciduous forest, 1270 m; Newfound Gap, on Betula lutea, 1600 m.

5. **P. pertusa** (L.) TUCK.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, some localities, 1760 m. *Tenn.:* Cherokee Orchard, on Quercus montana in deciduous forest, 760 m; near The Chimneys, on Celtis occidentalis in deciduous forest, 850 m; Newfound Gap, on Betula lutea, 1600 m; Mt. Kephart, on Fagus grandifolia, 1790 m; Mt. Le Conte, Le Conte Lodge, on Sorbus americana in Abies Fraseri forest, 1940 m. — Evidently rather common. Some specimens verified by ERICHSEN.

6. **P. velata** (TURN.) NYL.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* Cherokee Orchard, on Quercus montana in deciduous forest, 760 m; Mt. Kephart, on Fagus grandifolia, 1790 m.

Besides these species I have collected several other species which Mr. ERICHSEN (Hamburg) now has for revision together with other collections of *Pertusaria* from North America.

Lecanora.

a) Aspicilia.

1. **L. lacustris** (WITH.) NYL.

N. C.: Forney Ridge, sparse on a boulder in open situation, 1820 m. *Tenn.:* above Alum Cave, rather abundant on moist rocks, 1710 m.

2. **L. olivaceopallida** H. MAGN. n. sp.

»Thallus continuus, effusus, olivaceo-pallidus, tenuis, indistincte et irregulariter rimulosus, ambitu subareolatus vel subsquamulosus, reagentibus immutatus. Apothecia dispersa, immersa, disco olivaceo cinereo vel subpallido, concavo, minuto a margine crasso thallino prominente cincto. Thecium altum, jodo olivaceo-flavens. Paraphyses superne moniliformes. Sporae raro evolutae, mediocres.

Thallus in the specimens seen up to at least 4 × 2 cm, uniform in thickness, about 0,2(0,4) mm with pale sordid grayish

green colour. Circumference not definite but dissolved into 0,5 mm broad, ± scattered, thin but uneven areolae, partly with free and crenulate edges, squamula-like, KOH−, 1−. The surface on the whole uneven with low protuberances between the irregularly arranged fissures. No hypothallus observed. — Upper cortex 20—25 µ, colourless with yellowish olive surface, partly filled with air, cellular, cells 3,5—5(7) µ, often angular, very thin-walled. Gonidia 10—20 µ large, bright yellowish green, thin-walled, stratum 50—80 µ thick. Medulla colourless and with much air, cellular, cells 4—7,5 µ, thin-walled, partly filled with oil, especially below apothecia.

Apothecial disc 0,3—0,5 mm wide, usually regular, the margin prominent above thallus surface, wall-like. — Apothecia 150—200 µ deep. Hypothecium colourless, about 35 µ, rather distinctly cellular, cells 1,7—2,5(3) µ, angular. Thecium 110—135 µ high, limit to hypothecium indistinct, I+ greenish yellow; upper 30—35 µ olivaceous to greenish. Paraphyses dense, 1,7 µ, thin-walled, apices 4—5 µ thick, moniliform, cells subglobular, distinct in KOH, bright green in HCl. Asci 85—100 × 25 µ, broadly clavate. Spores 8, 15—17 × 10—12 µ, broadly ellipsoid, very rare.

Pycnidia 85—100 µ diam., wall pale. Conidia 12—14 × 0,8 µ, straight.

Tennessee: Great Smoky Mts., above National Park Office, on boulder in deciduous forest, about 700 m (typus); Cherokee Orchard, on rock near the stream, 760 m. On granitic rock. 1939 G. DEGELIUS.

L. olivaceopallida belongs to sect. *Aspicilia* and resembles a very pale *L. laevata* but is distinguished by the negative KOH-reaction, the shorter conidia, the paler apothecial margin, the absent exciple etc.»

b) Eulecanora.

3. L. conizaea (ACH.) NYL.

N. C.: Forney Ridge, on lignum of dry Picea rubens, 1820 m. *Tenn.:* near National Park Office, on twigs of Carya glabra, 455 m; Cherokee Orchard, on trunk of Tilia sp. in deciduous forest, 760 m; near Laurel Falls, on twig of Acer sp., 760 m; near The Chimneys, on Tsuga canadensis, 850 m.

Thallus thin, whitish or yellowish, not or only a little leprose, K+ slightly yellowish or K−, C−. Apothecia up to 0,7 mm across, thin and plane with a thin and ± sorediate margin. Spores oblong or slightly elliptical, 10,5—15 × 3,5—4,5 µ. — At Dry Sluice Gap (*Tenn.*), on twigs of Viburnum

cassinoides, 1710 m, and at Cliff Top (*Tenn.*), on twigs of Menziesia pilosa and Rhododendron catawbiense, 1970 m, I have collected some similar but separate species.

4. L. hypoptoides NYL.

N. C.: Forney Ridge, on branches of dry Picea rubens, 1820 m.

The specimens completely agree with the description by HEDLUND (1892).

5. L. insignis DEGEL. n. sp.

Descriptio typi:

Prothallus distinctus, niger. *Thallus* crustaceus, uniformis, epiphloeodes, tenuis, minute granulosus (granulis diam. usque 0,1 mm), cinereoviridis, opacus, epruinosus, esorediatus, ± continuus, K+ leviter lutescens, C−, P−, J−. *Apothecia* sat numerosa, dispersa vel aggregata, rotundata, tenuia (0,2—0,3 mm crassa), c. 0,5 mm lata (cfr infra), ± late adnata, disco plano vel leviter convexo, rufofusco, opaco, laevigato, epruinoso, margine crasso, leviter elevato, crenulato, saepe non continuo sed interrupto. *Pycnoconidangia* non visa.

Thallus ex algis fere cystococcaceis, ± globosis, diam. vulgo 10—15 µ, membrana modice incrassata (c. 2 µ), et hyphis crassis (vulgo 4,5—6,5 µ), sat pachydermaticis, granulis minutissimis saepe inspersis, formatus, cuticula amorpha sat tenui.

Amphithecium strato corticali distincto, ± gelatinoso, incolorato vel pallido, sat bene limitato, ad latera vulgo 17—21 µ crasso, in parte superiore ex hyphis sat crassis et distinctis (in KOH), ceterum ex hyphis ± indistinctis formato; strato centrali cum algis sat numerosis et crystallis in globis paucis sed magnis. *Parathecium* tenue, incoloratum, ex hyphis tenuibus, suberectis, indistincte septatis formatum. *Hypothecium* sat tenue, incoloratum vel leviter fulvescens, ex hyphis crebre septatis, cellulis ± isodiametricis (diam. 2—4 µ), ± pachydermaticis, formatum. *Hymenium* c. 70—90 µ crassum (incl. epithec.), J+ caerulescens mox vinose rubens, epithecio c. 8,5—13 µ crasso, non bene limitato, olivaceo- vel fulvofusco vel rufescente, granulis minutis valde insperso (etiam in KOH), P+ aurantiaco-rubescente. *Paraphyses* ± gelatinosae, vulgo simplices, non articulatae, indistincte septatae, apice non incrassatae, incoloratae, c. 2 µ crassae. *Asci* clavati, c. 43—56 × 17—23 µ, membrana crassa (saltem usque 6 µ). *Sporae* octonae, distichae, vulgo late ovales — late ellipticae, apicibus obtusis vel subobtusis (interdum rotundatis), (13—) 17—20 × 8,5—13 µ, non

septatae, incoloratae, membrana sat crassa (usque 2 μ). Apothecium intus KOH haud reagens.

Habitatio typi: America septentrionalis, Carolina septentrionalis, in montibus Great Smoky Mountains, in monte Kephart ad truncum Abietis Fraseri, 1810 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL.

The new species belongs to the *subfusca*-group. The main distinguishing features are: thallus thin or moderately thick, usually minutely granulose; apothecia thin or moderately thick (cf. below), broadly adnate, with reddish-brown disc and a rather thick, crenulate, often discontinuous margin (on account of the discontinuous margin the disc often seems bordered by a few large warts); amphithecium with a distinct, moderately thick, gelatinous cortex; epithecium strongly inspersed with very small granules (also in KOH), P+ orange-red (as are also the adjoining parts of the margin) by small acicular crystals; medulla of the amphithecium with few but large lumps of crystals. The species is somewhat variable. The type specimen is rather small and young, but it was selected because of its well developed spores which are often lacking in other specimens. The apothecia are often larger than in the type specimen (up to at least 1,5 mm across) and thicker (up to 0,4 mm) as well as darker reddish-brown. The thickness of the hymenium reaches 110 μ. The thallus is sometimes thicker and more uneven than in the type specimen.

L. insignis is in its habitus somewhat similar to *L. subrugosa* NYL., especially with regard to the crenulate margin and the redbrown disc of the apothecia, and further, microscopically, in the large lumps of crystals in the apothecia. The latter species is, however, very well separated from *L. insignis* by thicker thallus and apothecia as well as by non-inspersed epithecium, which is also P−. — In many respects it is related also to the North American species *L. cinereofusca* H. MAGN. (cf. MAGNUSSON 1932, p. 86) which has a rather similar habitus and the same epithecium-type (epith. inspersed and, according to my own investigation on apothecia, kindly supplied by Dr. MAGNUSSON, P+ orange-red). However, the latter species differs, microscopically, from *L. insignis* in some details: the cortex of the amphithecium is thinner, crystals are lacking (they are very conspicuous in all the apothecia examined of *L. insignis*) and the spores are somewhat smaller (according to MAGNUSSON, 12 × 7 μ; I have myself found spores up to 15 × 10,5 μ).

L. insignis seems to be the most common species of the

subfusca-group in the Smoky Mountains. I have collected it, often abundant, in many localities besides the original one: *N. C.:* Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m, and on Abies Fraseri in A. Fras. forest, 1820 m; *Tenn.:* Cherokee Orchard, on Quercus montana in deciduous forest, 760 m; near Laurel Falls, on Quercus rubra, 760 m; near The Chimneys, on Magnolia Fraseri in deciduous forest, 850 m; near Grassy Patch, on Betula lutea in deciduous forest, 1210 m; near Newfound Gap, on Betula lutea, 1600 m; Mt. Le Conte, Le Conte Lodge, on Sorbus americana in Abies Fraseri forest, 1940 m, and Cliff Top, on twigs of Rhododendron catawbiense in open situation, 1970 m. — On smooth as well as on rough bark.

6. **L. pinastri** (SCHAER.) H. MAGN.

N. C.: Forney Ridge, on dry Picea rubens, 1820 m.

From North America this species was previously only reported from Maine (see DEGELIUS 1940, p. 42).

7. **L. cfr piniperda** (KÖRB.) HEDL.

N. C.: Forney Ridge, on lignum of dry Picea rubens, 1820 m.

Scanty material. Differs from the typical *L. piniperda* in paler (yellowish) apothecia. Anatomically it agrees with that species.

8. **L. polytropa** (EHRH.) RABENH.

N. C.: Forney Ridge, on boulder in open situation, 1820 m.

A form with sparingly developed thallus and apothecia with distinct margin.

L. subfusca (L.) ACH.

Among the »small species», I have collected *L. insignis*, *L. pinastri* and *L. subfuscata* (see under these species) as well as several undetermined species (usually scanty material).

9. **L. subfuscata** H. MAGN.

in Medd. fr. Göteborgs bot. trädg., 7, 1932, p. 79.

Tenn.: near The Chimneys, on trunk of Celtis occidentalis in deciduous forest, 850 m.

The specimens completely agree with European ones.

Ochrolechia.

1. **O. pallescens** (L.) MASS.

Tenn.: below Alum Cave, on Acer spicatum in deciduous forest, 1270 m; Mt. Le Conte, Myrtle Point, on twig of Picea rubens, 1940 m.

2. **O. Yasudae** VAIN.

in The Bot. Mag., Tokyo, 32, 1918, p. 2, et 35, 1921, p. 54.

Tenn.: Cherokee Orchard, abundant on rocks in various situations near the stream, 760 m; near Laurel Falls, on rocks and trunks of Quercus montana, 760 m.

New to America, previously known only from Japan. I have compared my specimens with specimens in Herb. VAINIO, which are small but otherwise very similar to mine. The most important features are: thallus gray, K—, C— (in the specimens from the Smoky Mountains often C+ red), rather thin, rough, without soredia but with numerous, style-formed, non-branched or only slightly branched isidia of the same colour as the thallus, about 0,1 mm thick and up to 0,5 mm long; apothecia up to at least 2,2 mm across with pale yellowish-brown, non-pruinose disc and thick, smooth or in other specimens rough (sometimes almost verrucose) margin; spores usually 8, in my specimens 40—43 × 26 µ. On my specimens a white prothalius often is visible.

Lecania.

1. **L. cfr erysibe** (ACH.) MUDD.

Tenn.: near Laurel Falls, on rocks, 760 m.

Scanty material which is very similar to certain forms of the mentioned species but differs in having free (incoherent) paraphyses.

Haematomma.

1. **H. cismonicum** BELTRAM.

N. C.: Forney Ridge, on Abies Fraseri in A. Fras. forest, 1820 m.

2. **H. ochrophaeum** (TUCK.) MASS.

Common in the Abies Fraseri belt. Collected on Clingman's Dome, Forney Ridge, Mt. Kephart and Mt. Le Conte, on trunks and twigs of Abies Fraseri and Picea rubens on levels from 1760 m upwards. Often abundant.

Parmeliopsis.

1. **P. aleurites** (ACH.) NYL.

N. C.: Forney Ridge, on Abies Fraseri in mixed forest, 1760 m. *N. C.* and *Tenn.:* Clingman's Dome, on twigs of Abies Fraseri in A. Fras. forest, 1970 m. *Tenn.:* near Newfound Gap, on twig of Picea rubens, 1540 m; above Alum Cave, on Rhododendron catawbiense, 1640 m; Mt. Le Conte, Cliff Top, on Menziesia pilosa and Rhododendron catawbiense, 1970 m. — Usually sparse. Only seen sterile.

Parmelia.

a) Hypogymnia.

1. **P. enteromorpha** ACH.

Common on high levels, especially in the Abies Fraseri belt. Collected on Clingman's Dome, Forney Ridge, Mt. Kephart, Mt. Le Conte, etc., on Abies Fraseri and Picea rubens (especially on branches and twigs), further on Menziesia pilosa, Rhododendron spp. and other shrubs, on levels from 1540 m upwards. Often abundant.

Rather polymorphous. Accidentally and rarely monstrose soredia are developed at the apices of the lobes (however, not typical labriform soredia as in *P. physodes* and *P. vittata*).

2. **P. physodes** (L.) ACH.

Rather common but not abundant on high levels. Together with *P. enteromorpha* (always more sparse than that species). Only seen sterile.

3. **P. tubulosa** (HAG.) BITTER.

N. C.: Forney Ridge, on twigs of Picea rubens, 1820 m. *Tenn.:* Mt. Le Conte, Cliff Top, on Menziesia pilosa and Rhododendron catawbiense in open situation, 1970 m. — Usually sparse. Sterile.

4. **P. vittata** (Ach.) NYL.

Common on high levels, especially in the Abies Fraseri belt. On trunks and twigs of Abies Fraseri and Picea rubens, also on broad-leaved trees and shrubs (Betula, Sorbus, Menziesia, Rhododendron, etc.) as well as on mossy rocks (usually in somewhat shady places), on levels from 1550 m upwards. Only seen sterile.

b) Menegazzia.

5. **P. pertusa** (SCHRANK) SCHAER.

Common and often abundant on high levels, especially in the Abies Fraseri belt. Collected in all the localities visited in that belt and also in some localities below it, on trunks (and sometimes on branches) of Abies Fraseri and broad-leaved trees and shrubs (Betula, Sorbus, Fagus, Rhododendron, etc.), especially in somewhat shady situation, on levels from 1200 m upwards. Only seen sterile.

c) Euparmelia.

6. **P. Arnoldii** DR.

N. C.: Mt. Kephart, on Fagus grandifolia, 1790 m. *Tenn.:* above Alum Cave, on Rhododendron catawbiense in open situation, 1640 m. — Very sparse and sterile. In the latter locality together with *P. cetrarioides*.

From America this species has previously only been reported from Argentina, California and Maine (cf. DEGELIUS 1940, p. 45).

7. **P. aurulenta** TUCK.

Common on rocks and boulders in deciduous forests. Collected in nearly all the localities visited in the belt of these forests (Cherokee Orchard, near Laurel Falls, near The Chimneys, etc.), on levels from 700 to 850 m. Often in very shady situation. Only seen sterile.

v. *silvestris* DEGEL. n. c.

(Syn. *P. silvestris* DEGEL. in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 47.)

Tenn.: near National Park Office, on trunk of Juglans nigra, 455 m. Sterile.

From the rich material of this and the preceding type which I collected in the Smoky Mountains, I am led to regard *P. silvestris* as a variety to *P. aurulenta*, in spite of their extreme forms being very different (in my original description of *P. silvestris* I did not even compare the two types). The difference refers especially to the soredia which in the variety are well limited, ± globose and farinose, in the main type less strictly limited, being usually dissolved and scattered (not globose) and also not farinose but granulose. One can, however, find both types of soredia in the same specimen, but this rarely occurs. Chemically the two types also agree (the

reaction with paraphenylendiamine is not always distinct). The colour of the medulla varies from white to sulphureous. Ecologically speaking, the variety is usually corticolous, the main type saxicolous.

8. **P. caperata** (L.) ACH.

Collected in nearly all the localities visited from 760 to 1890 m but usually sparse, common only in the neighbourhood of Laurel Falls (760 m). On trunks and twigs of coniferous trees (Abies, Picea, Tsuga) as well as on broad-leaved trees and shrubs (Betula, Quercus, Viburnum, etc.) and on rocks, especially in ± open situations. Only seen sterile.

9. **P. cetrarioides** DEL., em. DR.

Common on high levels, especially in the Abies Fraseri belt where it is very abundant and dominant on the trunks of A. Fraseri in the forests of that tree (the principal lichen in these forests). Also collected in localities below this belt, at least down to 760 m (Cherokee Orchard, on rock in deciduous forest). In addition to Abies it grows also on Picea, Betula, Carpinus, Fagus, Sorbus, Rhododendron, etc. and on rocks. Usually sterile but in some localities in the belt of Abies richly c. ap.

Two types with regard to the reaction with $CaCl_2O_2$ in the medulla: v. *typica* DR. (med. C—) and v. *rubescens* (TH. FR.) DR. (syn. *P. olivetorum* NYL., *P. olivaria* HUE, cfr DU RIETZ 1924, p. 75) (med. C+ red). Both types are common and both are found c. ap. (v. *rubescens* most richly). No difference with regard to distribution (the specimens from Cherokee Orchard belong to v. *typica*). — Some specimens from Clingman's Dome have sorediate pseudocyphellae.

In the flora of FINK (1935) this species is reported only from Massachusetts. Evidently it has a wide distribution. In Maine I collected it in several localities (cf. DEGELIUS 1940, p. 45).

10. **P. Cladonia** (TUCK.) DR.

Common in the coniferous forest belt. Abundant particularly on twigs of Abies Fraseri and Picea rubens, grows also on Menziesia pilosa and others. Collected in all the localities visited in this belt, on levels from 1540 m upwards. Usually sterile but also found c. ap.

11. **P. conspersa** (EHRH.) ACH.

N. C.: Forney Ridge, on boulder in open situation, 1820 m. *Tenn.:* above National Park Office, on boulder in deciduous

forest, 700 m; near Laurel Falls, on rocks in rather open situation, 760 m. — Sparse or rather sparse in all the localities. Medulla K+ yellow and then usually orange.

12. **P. crinita** ACH.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, several localities, in some abundant, 1760 m; Mt. Kephart, on Fagus grandifolia, 1790 m. *Tenn.:* near Laurel Falls, on Quercus montana, 760 m; near The Chimneys, on Quercus rubra in deciduous forest, 850 m; near Newfound Gap, on Betula lutea, 1600 m. — Only sterile. In all specimens the medulla is K+ constantly yellow.

13. **P. dissecta** NYL.

N. C.: Forney Ridge, on trunk of Picea rubens in mixed forest, 1760 m; Mt. Kephart, on trunk of Abies Fraseri in A. Fras. forest, 1810 m. *Tenn.:* Cherokee Orchard, on trunk of Tsuga canadensis and on rock in deciduous forest, 760 m; near The Chimneys, on trunk of Tsuga canad. in deciduous forest, 850 m; below Alum Cave, on trunk of Acer spicatum in deciduous forest, 1270 m. — Sparse and sterile.

An oceanic species, previously only known from the southwestern parts of Europe and from Macaronesia. It is a small lichen, related to *P. revoluta* but without soredia, having instead small, style-formed isidia, often ciliated as in *P. crinita*. Medulla K—, C— or C+ distinctly red but often transient (in the European population I have found the same variation).

14. **P. dubia** (WULF.) SCHAER.

[Syn. *P. Borreri* (SM.) TURN.]

N. C.: Mt. Kephart, on Abies Fraseri in A. Fras. forest, 1800 m; Forney Ridge, on trunk of Picea rubens, together with *P. rudecta*, 1820 m. — Sterile. Medulla K—, C+ red. The specimens from Mt. Kephart belong to f. *marginata* (STEIN) HILLM. (soredia only in the margin of the lobes).

15. **P. frondifera** MERRILL.

Tenn.: near The Chimneys, on a boulder in deciduous forest, together with *P. aurulenta*, 850 m. — Sterile.

Evidently a rare species. Apart from the original locality in Canada it was, according to FINK (1935), collected in the State of New York, North Carolina and Florida. In the herbarium of G. E. DU RIETZ (Upsala) I found undetermined specimens from South Carolina: Rocky Spur, on oaks (1928 ALEXANDER W. EVANS).

16. **P. furfuracea** (L.) ACH.

Tenn.: Two localities in the neighbourhood of Alum Cave, on Picea rubens in P. rubens forest (together with *P. Cladonia*) and on Rhododendron catawbiense in open situation, 1575—1600 m. — Sparse and sterile.

All the specimens belong to v. *olivetorina* (ZOPF) ZAHLBR. (medulla C+ red). The specimens on Rhododendron are richly isidiiferous (but without isidangia), the only small specimen on Picea has but few isidia.

17. **P. laevigata** ACH.

v. *typica* DEGEL.

in Göteborgs K. Vet.- och Vitt.-Samh.:s Handl., VI: B: 1: 7, 1941, p. 32.

Common on high levels, especially in the Abies Fraseri belt. Collected in all the localities visited there, and also in some places below it, on Abies, Picea, Carpinus, Fagus, Sorbus and Menziesia, on levels from 1540 m upwards. — Only sterile.

All the specimens belong to f. *roscorcagens* DEGEL. (l. c.) with medulla C+ red (usually a more vivid red than in the European population). The other form, f. *luteorcagens* DEGEL. with med. C+ yellow, I have not found here.[1] Both have white medulla, K—.

v. *comparata* (NYL.) BOIST.

(Syn. *P. comparata* NYL.)

Tenn.: Mt. Le Conte, near Myrtle Point, on trunks of Abies Fraseri, some localities, 1940 m, and near Le Conte Lodge, on Sorbus americana in Abies Fraseri forest, 1940 m, on Rhododendron carolinianum in open situation, 1970 m. Together with *P. lobulifera* and the preceding type or alone. Sterile. — Medulla white, K+ yellow, C—.

18. **P. lobulifera** DEGEL. n. sp.

(Syn.? *P. laevigata* ACH. v. *ceratina* MÜLL. ARG. in Flora, 1880, p. 267.)

Descriptio typi:

Thallus foliaceus, membranaceus, majusculus (9 × 6 cm), sat tenuis (vulgo 0,15—0,20 mm crassus), ± adpressus, albidus, opacus vel nitidulus, laevigatus, epruinosus, nec sorediis nec pseudocyphellis ornatus, laciniatus, laciniis elongatis, ± dis-

[1] At Myrtle Point, on Picea rubens, 1940 m, I collected, together with f. *roscorcagens*, a lichen with medulla C+ yellow, closely related to *P. laevigata* but with a smaller thallus without soredia (and isidia); one small apothecium.

cretis et planis, 3—6 mm latis, dichotome vel pinnate ramosis, lacinulis ± linearibus, axillis rotundatis vel angulosis, vulgo patentibus, separatis, isidiis superficialibus numerosis (praecipue in partibus interioribus thalli), marginalibus sparsis, crebris, teretibus vel etiam leviter applanatis lobulatisque, ± ramosis, albidis sed apice vulgo obscuris, usque 1 mm longis vel longioribus, vulgo 0,05—0,10 mm crassis vel tenuioribus ornatus; thallus *subtus* niger, ambitum versus anguste castaneus, laevigatus, nitidus, usque ad marginem rhizinosus, rhizinis numerosis, longis, nigris, crebre ramosis. Thallus supra K et K(C)+ lutescens, C—, P— vel pro parte lutescens, intus albus, K—, C+ intense lutescens, P—, J—. *Apothecia* et *pycnoconidangia* desunt.

Stratum corticale superius thalli c. 20—34 µ crassum, incoloratum vel pallidum, ex hyphis superficiei perpendicularibus, arcte conglutinatis, pachydermaticis (luminibus minutis), breviter ramosis, crassis (c. 8,5 µ), ± crebre septatis, cellulis isodiametricis vel oblongis, formatum. *Stratum algarum* c. 20—40 µ crassum, algis fere protococcaceis, globosis, diam. vulgo 10,5—13 µ, membrana modice incrassata (usque 2 µ). *Stratum medullare* ex hyphis sat laxe intricatis, in omnes partes currentibus, sat crassis (3—5 µ), increbre septatis, interdum granulis minutissimis inspersis, membrana modice incrassata vel sat crassa, formatum. *Stratum corticale inferius* c. 70—90 µ crassum, fusconigrum, ceterum strato cort. super. simile.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains, in monte Le Conte ad Myrtle Point ad truncum Sorbi americanae, c. 1970 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL.

The new species belongs to the *Sublinearis*-group of sect. *Hypotrachyna* VAIN. and is closely related to *P. laevigata* ACH. (and especially to its v. *typica* DEGEL.). The latter species has, however, soredia and not isidia or lobuli. The isidia of *P. lobulifera* are superficial and also marginal, style-formed or sometimes flattened, branched and often ciliate. Often small, flattened lobuli are developed, particularly in the margin of the laciniae (the morphological limit between these lobuli and the isidia is not sharp). In some specimens the typical superficial isidia are more prominent (as in the type-specimen), in other less; they are best developed in old specimens and especially on the older parts of the laciniae. In other specimens the marginal lobuli are predominant and in some specimens very numerous; in the richly isidiiferous specimens they are sparse but usually present. The species is also somewhat

variable regarding size of thallus as well as thickness and breadth of laciniae (often thinner than in the type-specimen). As in *P. laevigata* the chemical conditions are variable: in most of the specimens the medulla is C+ blood-red but in some (e. g. the type specimen) it is C+ yellow, in one specimen C—. At first I thought that there were two different species: one with superficial isidia and medulla C+ yellow and one with lobuli and medulla C+ red. Owing to the very rich material, I collected, I can, however, establish that there is only one, although somewhat variable, species. The only really constant variations are to be found in the chemical reactions. With regard to the reaction with $CaCl_2O_2$ three types (races) of *P. lobulifera* may be distinguished:

1. v. *luteoreagens* DEGEL. n. v.: medulla C+ lutescens (est f. typica);

2. v. *sanguineoreagens* DEGEL. n. v.: medulla C+ sanguinea;

3. v. *insensitiva* DEGEL. n. v.: medulla C—.

The species is rather common in the Abies Fraseri belt and especially on trunks of the same tree. Often it grows together with *P. laevigata*. I have collected it in the following localities:

v. *luteoreagens: Tenn.:* Mt. Le Conte, near Le Conte Lodge, on Abies Fraseri in A. Fras. forest, 1940 m; Myrtle Point (original locality, see above);

v. *sanguineoreagens: N. C.:* Mt.Kephart, on Abies Fraseri in A. Fras. forest, 1820 m, in one locality rather abundant; Forney Ridge, on Picea rubens in coniferous forest, 1820 m; *Tenn.:* Mt. Le Conte, rather common on Abies Fraseri in A. Fras. forests, at Cliff Top also on Rhododendron catawbiense, 1940—1970 m;

v. *insensitiva: N. C.:* Forney Ridge, on Picea rubens in coniferous forest, 1820 m (only one specimen).

Whether *P. laevigata* v. *ceratina* MÜLL. ARG., which, according to the description in Flora 1880 (p. 267), has isidia, is the same as my *P. lobulifera* is impossible to ascertain without examining the type specimen. In any case, the combination *Parmelia ceratina* for this lichen is impossible as this combination has already been used for another lichen (*Parmelia ceratina* SPRENG. = *Usnea ceratina* ACH.). MÜLLER says later (in Hedwigia 1891, p. 229) that his variety must be the same as *P. exsecta* TAYL. from Nepal. The description of the latter species (TAYLOR 1847, p. 166—167), however, states, that it bears soredia. Therefore, it hardly can be a synonym to *P. laevigata* v. *ceratina*. Some years before MÜLLER

(in Flora 1888, p. 198) had identified *P. exsecta* with *P. laevigata* (»excepta magnitudine multo majore sporarum»).

See plate 1 a.

19. **P. olivacea** (L.) ACH., em. NYL.

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, some localities, 1760 m, and on Picea rubens, 1820 m; Mt. Kephart, on Abies Fraseri in A. Fras. forest, 1810 m. *Tenn.:* near Newfound Gap, on Betula lutea, 1575 m; Mt. Le Conte, near Le Conte Lodge, on Sorbus americana in Abies Fras. forest, 1940 m, and Myrtle Point, on the same tree, together with *P. subaurifera*, 1970 m. — Usually rather sparse. C. ap. or sterile.

20. **P. reticulata** TAYL.

Tenn.: near National Park Office, on deciduous trees, 455 m; near Laurel Falls, on Quercus montana, 760 m; Cherokee Orchard, sparse on rock in deciduous forest, 760 m; below Alum Cave, sparse on Carpinus caroliniana in deciduous forest, 1300 m; Mt. Le Conte, on Picea rubens in Abies Fraseri forest, in one locality abundant, 1890 m. — Sterile.

Near The Chimneys, on Tsuga canadensis in deciduous forest 850 m, I collected a species closely related to *P. reticulata* but differing in its lack of soredia and possession of isidia (style-formed, branched or non-branched); medulla K+ yellow and then red. The material is very scarce (only one small specimen). Possibly a new species.

21. **P. revoluta** FLK.

N. C.: Mt. Kephart, one specimen on Fagus grandifolia, 1760 m; Forney Ridge, on Abies Fraseri in mixed forest, rather abundant in one locality, 1850 m, and sparse on a somewhat moist rock together with *Alectoria bicolor* and *Parm. cetrarioides*, 1900 m. *Tenn.:* below Alum Cave, sparse on Acer spicatum in deciduous forest, 1270 m; near Newfound Gap, rather abundant on a Betula lutea, 1600 m. — In this part of the world evidently quite frequently with apothecia. In two of the localities mentioned, I collected the species c. ap. (Mt. Kephart; Forney Ridge on rock).

From North America this species was previously known only from a single locality in Maine (DEGELIUS 1940, p. 46); the material from that locality is very scarce.

22. **P. rudecta** ACH.

N. C.: Forney Ridge, on Carpinus caroliniana and Picea rubens in mixed forest, 1760—1820 m. *N. C.* and *Tenn.:* Mt. Kephart, on Fagus grandifolia, 1760 m. *Tenn.:* near Laurel Falls, on Quercus rubra, 760 m; near The Chimneys, on Tsuga canadensis and on boulder in deciduous forest, 850 m; Mt. Le Conte, Myrtle Point, on Picea rubens, 1940 m. — C. ap. only in one locality, on Mt. Kephart. Medulla C+ red.

23. **P. saxatilis** (L.) ACH.

Rather common but not abundant on high levels, especially in the Abies Fraseri belt. Collected in most of the localities visited in that belt, on trunks of Sorbus americana (principally), Carpinus caroliniana, Fagus grandifolia, Betula lutea and Abies Fraseri, on levels from 1650 m upwards. Also near The Chimneys, on trees in deciduous forest, 850 m. — C. ap. or sterile.

Often (as in Maine) it appears in a form, which is in its habitus similar to *P. sulcata* (more linear and whitish lobes than in the typical form) but it bears small isidia. Chemically the two species agree; medulla is in both K+ yellow and then reddish brown, C—, P+ testaceous.

24. **P. sorocheila** VAIN.

in Hedwigia 38, 1899, p. (123).

v. *catawbiensis* DEGEL. n. v.

Differt a planta typica medulla K—. — Typus in monte Le Conte ad Cliff Top (*Tenn.*), ad corticem Rhododendri catawbiensis, c. 1970 m s. m., lectus est.

Collected also in the following localities: *N. C.:* Forney Ridge, some localities on twigs of Picea rubens, 1820 m; Clingman's Dome, on twigs of Abies Fraseri in Abies Fras. forest, 1970 m. *Tenn.:* Mt. Le Conte, near Le Conte Lodge, on Rhododendron carolinianum in open situation, 1970 m. — Usually sparse. Sterile.

An interesting find. This species has hitherto been collected only a few times: at Bogota in South America and on Luzon among the Philippines. It belongs to the variable collective species *P. camtschadalis* and its soredia-bearing types. From the other sorediate species, *P. columbiensis* ZAHLBR. (syn. *P. granulosa* VAIN.), it differs principally in the soredia which in *P. sorocheila* are limited to the margins and apices of the lobes (in *P. columbiensis* they are uniformly distributed over the thallus). However, the North American specimens of

P. sorocheila differ from others of the same species (and from all other species within this group) in the reaction of the medulla with KOH (K−, not K+ yellow and then reddish).

The collective species *P. camtschadalis* is new to North America.

25. **P. subaurifera** NYL.

Tenn.: Mt. Le Conte, Myrtle Point, on trunk of Sorbus americana together with *P. olivacea*, 1970 m. Sparse and sterile.

Concerning the distribution of this species in North America see DEGELIUS 1940 (p. 48).

26. **P. subquercifolia** HUE.

Tenn.: near National Park Office, on deciduous trees, 455 m; near Laurel Falls, on Quercus rubra, 760 m.

27. **P. trichotera** HUE, em. DR.

Tenn.: near National Park Office, on Juglans nigra, 455 m. Sparse and sterile.

Belongs to v. *typica* DR. (medulla K+ yellow) which seems to be new to North America.

Anzia.

1. **A. colpodes** (ACH.) STIZ.

N. C. and *Tenn.:* Mt. Kephart, on Fagus grandifolia, 1790 m.

Cetraria.

1. **C. atlantica** (TUCK.) DR.

Common on Clingman's Dome and Mt. Le Conte, also collected on Forney Ridge, near Newfound Gap and above Alum Cave, on trunks and twigs of Abies, Picea, Sorbus and Rhododendron catawbiense, on levels from 1540 m upwards. Usually c. ap. but some specimens sterile.

2. **C. ciliaris** ACH.

Common in the coniferous forest belt, at least in certain areas (e. g. on Clingman's Dome and Forney Ridge). Collected in most of the localities visited in this belt, on levels from 1540 m upwards, on twigs of Abies, Picea and Rhododendron catawbiense. Sometimes rather abundant but often sparse

3. **C. glauca** (L.) ACH.

N. C. and *Tenn.:* Mt. Kephart, on Abies Fraseri, in one locality rather abundant, 1790 m. *Tenn.:* above Alum Cave, on Picea rubens and Rhododendron catawbiense, 1600—1640 m; Mt. Le Conte, several localities (Le Conte Lodge, Cliff Top, Myrtle Point, etc.), on Abies Fraseri, Menziesia pilosa and Rhododendron catawbiense, 1940—1970 m. — Particularly on branches and twigs. Usually sparse. Sterile.

4. **C. oakesiana** TUCK.

Common on high levels, especially in the Abies Fraseri belt. Collected in all the localities visited in that belt but also in several localities below it (e. g. at Cherokee Orchard, on Tsuga canadensis and deciduous trees in deciduous forest, 760 m). On high levels on trunks and twigs of Abies Fraseri and Picea rubens as well as on broad-leaved trees and shrubs (Betula, Carpinus, Sorbus, Menziesia, Viburnum alnifolium, etc.). The main form only seen sterile.

V. spinulosa MERRILL (in Bryologist, 13, 1910, p. 25) I have collected in some localities on Mt. Le Conte (*Tenn.*): on trunk of Abies Fraseri and on twigs of Menziesia pilosa, Rhododendron carolinianum and Rh. catawbiense, at Cliff Top and near Le Conte Lodge, 1940—1970 m. Small specimens but ± richly c. ap. It differs from the main form in the long-stalked pycnoconidangia, resembling spinules, at the margin of the lobes. Soredia sparse. This type, previously only known from a single locality on the whole (W. Virginia: Pocahontas County), is similar to the European and Asiatic species *C. Laureri* KREMPELH. (syn. *C. complicata* LAUR.) but obviously it is not the same.

Alectoria.

1. **A. altaica** (GYEL.) RÄS.

N. C.: Mt. Kephart, on Abies Fraseri in A. Fras. forest, 1810 m. *Tenn.:* above Alum Cave, on Picea rubens in P. rubens forest, 1600 m; Mt. Le Conte, Myrtle Point, on Abies Fraseri in A. Fras. forest, 1940 m. — Sparse and sterile. K+ yellow.

With regard to North America previously known only from Maine (DEGELIUS 1940, p. 51). Concerning the taxonomy and distribution of this lichen see AHLNER 1940.

2. **A. bicolor** (EHRH.) NYL.

Common on high levels, especially in the Abies Fraseri belt. Collected in all the localities visited in that belt and also somewhat below it, on levels from 1540 m upwards, particularly on trunks and twigs of Abies Fraseri in the forests of that tree, also on Fagus grandifolia, Menziesia pilosa and Rhododendron catawbiense as well as on mossy and somewhat moist rocks. In some localities rather abundant but often sparse. Sterile.

3. **A. nidulifera** NORRL.

Tenn.: Mt. Le Conte, near Le Conte Lodge, rather abundant in some localities on trunks of Abies Fraseri in A. Fras. forest, 1940 m. Sterile. — Small, densely branched specimens, pale brown in colour, often darker towards the base. In habitus somewhat different from the form in Maine and Europe.

4. **A. sarmentosa** ACH.

N. C.: Mt. Kephart. *N. C.* and *Tenn.:* Clingman's Dome, several localities. *Tenn.:* near Alum Cave; Mt. Le Conte, several localities. — In the coniferous forest belt, on trunks and twigs of Abies and Picea, also on Rhododendron catawbiense. Collected on levels from 1575 to about 2000 m. Hardly common. Sterile.

Besides the above mentioned species of *Alectoria* I have collected some others (on Abies Fraseri and Picea rubens). This material is, however, very scanty. One form is closely related to *A. jubata* (L.) ACH. v. *prolixa* (ACH.), one resembles a very slender *A. nitidula* (TH. FR.) VAIN.

Ramalina.

1. **R.** sp.

Tenn.: Mt. Le Conte, Myrtle Point, on Sorbus americana, 1970 m.

Very scanty material, only some small (1—1,5 cm high) specimens with few young apothecia. The laciniae bear on the under surface, and also in the margin, small, rounded or oblong, whitish pseudocyphellae. Obviously it belongs to the *fastigiata*-group.

Usnea.

1. **U. cavernosa** TUCK.

Rather common but usually not abundant in the coniferous forest belt. Collected in most of the localities visited in this belt, from 1550 m upwards, on Abies and Picea, also on Rhododendron catawbiense. Only seen sterile.

I have also several undetermined species, belonging to different groups, collected in all belts but especially on high levels. The *Usnea*-flora and -vegetation is, however, hardly rich in the Smoky Mountains.

Caloplaca.

1. **C.** sp.

Tenn.: near The Chimneys, on Celtis occidentalis in deciduous forest, 850 m.

Only some small apothecia, impossible to determine with certainty.

Buellia.

1. **B. dialyta** (NYL.) TUCK.

Tenn.: near The Chimneys, on Tsuga canadensis in deciduous forest, 850 m.

2. **B. disciformis** (FR.) MUDD.

N. C.: Clingman's Dome, on Abies Fraseri, 1820 m. *Tenn.:* near National Park Office, on Acer sp., Betula lutea and Carya glabra, 455 m; Cherokee Orchard, some localities on Acer rubrum and Quercus montana in deciduous forest, 760 m; near Laurel Falls, on Quercus rubra and twig of Acer sp., 760 m; near The Chimneys, on Celtis occidentalis in deciduous forest, 850 m; below Alum Cave, on Betula lutea in deciduous forest, 1210 m. — Evidently common in the deciduous forest belt. Usually a form with small spores (10—17 × 6,5—7 µ).

3. **B. punctiformis** (HOFFM.) MASS.

Tenn.: near Laurel Falls, on a somewhat shady rock, 760 m.

Rinodina.

1. **R. ascociscana** TUCK.

Tenn.: below Alum Cave, on Carpinus caroliniana in deciduous forest, 1300 m; Mt. Le Conte, Myrtle Point, scarce on Sorbus americana, 1970 m.

2. **R. chrysomelaena** TUCK.

Tenn.: Cherokee Orchard, rather abundant on rocks in deciduous forest, 760 m.

3. **R. confragosa** (ACH.) KÖRB.

Tenn.: near The Chimneys, on boulder in deciduous forest, sparse, 850 m.

4. **R. exigua** (ACH.) S. GRAY.

Tenn.: near National Park Office, on Juglans nigra, 455 m; below Alum Cave, on Acer spicatum in deciduous forest, 1270 m.

5. **R. laevigata** (ACH.) MALME.

N. C.: Forney Ridge, on twig of Picea rubens, 1820 m.
The material is too scanty to conclude whether *R. archaea* (ACH.) VAIN. or *R. laevigata* (s. str.) is present.

6. **R. tephraspis** (TUCK.) HERRE.

Tenn.: above National Park Office, 700 m; Cherokee Orchard, rather abundant, 760 m. — On rocks and boulders in deciduous forests.

Pyxine.

1. **P. sorediata** (ACH.) FR.

Rather common but not abundant on deciduous trees (Carpinus, Fagus, Juglans, Quercus, Tilia, etc.) on levels from 455 to at least 1800 m, also collected on rocks. C. ap. or sterile.

Physcia.

1. **Ph. aipolia** (EHRH.) HAMPE.

Tenn.: Mt. Le Conte, Myrtle Point, sparse on Sorbus americana, 1970 m. — A small form with narrow, rather short and ± separated lobes; medulla K+ yellow.

2. **Ph. ciliata** (HOFFM.) DR.

[Syn. *Ph. obscura* (EHRH.) HAMPE.]

Tenn.: near The Chimneys, on Celtis occidentalis in deciduous forest, sparse, 850 m. A small form with lobes only 0,2—0,3 mm broad; medulla white.

v. *erythrocardia* (TUCK.) DEGEL. n. c.

[Syn. *Ph. obscura* v. *erythrocardia* TUCK. in Proc. Amer. Acad. Arts and Sc., 4, 1860, p. 399 (excl. form. sored.), ?*Ph. endochrysea* KREMPELH. in Flora 1878, p. 480.]

Tenn.: near The Chimneys, on boulder in deciduous forest, 850 m, together with *Ph. orbicularis* and its v. *rubropulchra*.

This variety differs from the main form in its red medulla (usually orange- or saffron-red), K+ violet (also the rhizinae of the apothecia are often reddish). It is a parallel form to *Ph. orbicularis* v. *rubropulchra*.

Rather numerous formae or varieties with red or yellowish medulla are described in this group of the genus. Some of them should be referred to *Ph. lithotodes* NYL. v. *endococcina* (KÖRB.) DEGEL., some are doubtful. Very often the sorediate types have not been separated from the non-sorediate. TUCKERMAN's v. *erythrocardia* comprises the forms with reddish medulla of both *Ph. ciliata* and *Ph. orbicularis* and perhaps also *Ph. lithotodes* v. *endococcina*. I have earlier (DEGELIUS 1940, p. 58) described this form of *Ph. orbicularis* under the name of *Ph. orbicularis* f. *rubropulchra* and, therefore, I shall refer TUCKERMAN's variety to the corresponding type of *Ph. ciliata*. — These two types are widely distributed in North America. It is doubtful whether they occur in Europe.

The specimens of v. *erythrocardia* from the neighbourhood of The Chimneys have a pale thallus and also differ somewhat in habitus, possibly because of their growing on moss and stone. With regard to the anatomic structure of the margin (cf. LYNGE in RABENHORST's flora 1935) they agree with *Ph. ciliata*.

3. **Ph. melops** DUF.

Tenn.: near The Chimneys, abundant on boulders in deciduous forest, 850 m. Rather small specimens (usually 1,5—2 cm across).
New to U. S. A.

4. **Ph. orbicularis** (NECK.) DR.

Tenn.: near The Chimneys, abundant on rather shady boulders in deciduous forest, 850 m.

v. *rubropulchra* DEGEL.

in Ark. f. bot., utg. av K. Svenska Vet.-Akad., 30 A: 1, 1940, p. 58.

Tenn.: Cherokee Orchard, on Quercus rubra in deciduous forest, abundant in one locality, 760 m; near Laurel Falls, sparse on a rock, 760 m; near The Chimneys, together with the main form, sparse on boulder, also on deciduous trees; below Alum Cave, on Acer spicatum in deciduous forest, 1270 m. — Usually sterile. See under *Ph. ciliata*.

5. **Ph. picta** (Sw.) Nyl.

[Syn. *Ph. Frostii* (Tuck.) Zahlbr.]

Tenn.: near Laurel Falls, rather abundant on a shady rock, 760 m. Sterile.

The specimens agree very well with the description of *Pyxine Frostii* Tuck., which was originally referred to *Squamaria* until, later, it was found c. ap. From *Ph. picta* this type differs only in the more crustaceous thallus. The intermediate links are, however, numerous. Anatomically and chemically it does not differ from *Ph. picta*. The latter species is, even without considering *Ph. Frostii*, very variable in size, the breadth of the laciniae, etc.

6. **Ph. stellaris** (L.) Nyl.

Tenn.: Dry Sluice Gap, on twigs of Viburnum cassinoides, 1710 m.

7. **Ph. subtilis** Degel. n. sp.

Descriptio typi:

Thallus foliaceus, orbicularis, minutus, tenuis (c. 0,1 mm crassus vel tenuior), arcte adnatus, albidus vel cinereo-viridis, humidus magis viridis, laciniatus, laciniis discretis, elongatis, sublinearibus, multifidis, iteratim furcatis vel pinnatis, crenatis vel sat integerrimis, c. 0,1 mm latis, planis vel leviter convexis, eciliatis, laevigatis, epruinosis, granulis sorediorum numerosis, minutissimis, diam. vulgo c. 0,05 mm, apicalibus vel etiam marginalibus vel superficialibus, thallo concoloribus ornatis; thallus *subtus* pallidus, sparse rhizinosus. Thallus supra K+ distincte lutescens, C—, P—, intus K plus minusque lutescens, C—, P—, J—. *Apothecia* sparsa, sessilia, minuta, usque 0,5 mm lata, disco fusco vel fusconigro, epruinoso, opaco, laevigato, margine thallino sat crasso, thallo concolore, integerrimo vel leviter granuloso. *Pycnoconidangia* non visa (cfr infra).

Thallus totus plectenparenchymaticus, cellulis ± isodiametricis, diam. c. 4,5—8,5 µ, membrana modice incrassata; stratum algarum c. 25—45 µ crassum, algis sat numerosis, fere protococcaceis, globosis (diam. vulgo 10,5—15 µ) vel leviter oblongis, membrana modice incrassata.

Amphithecium crassum, structura ut in thallo. *Hypothecium* ± incoloratum, ex hyphis tenuibus, conglutinatis, crebre septatis formatum. *Hymenium* c. 65 µ crassum, (praeter epithecium) incoloratum, J+ constanter caerulescens, epithecio fusco, non insperso. *Paraphyses* ± liberae, vulgo simplices, c. 2—3 µ crassae, apice rotundato obscuratoque (3—4,5 µ crasso), ±

crebre septatae, apicem versus saepe articulatae, membrana sat crassa. *Asci* clavati, c. 40—45 × 10,5—15 µ, apice incrassati. *Sporae* octonae, distichae, obscuratae, 1-septatae, oblongae vel late oblongae, apicibus rotundatis vel obtusis, medio saepe constrictae, rectae vel leviter curvatae, 8,5—13 × 6,5 µ, episporio inaequaliter incrassato.

Habitatio typi: America septentrionalis, Tennessee, in montibus Great Smoky Mountains prope »National Park Office», ad saxum gneissaceum in silva frondea, c. 700 m s. m. Leg. 1939 G. Degelius.

Typus in herb. Degel. — Tab. nostra 2.

To the description of the type-specimen, which is actually composed of several small united specimens, I should like to add some details. In other specimens the lobes can reach 0,2 mm in breadth, they can be somewhat more convex and very minutely pruinose. In some specimens the granules are more concentrated, often to the apices of the lobes, forming there nearly labriform soredia. The apothecia are rare; I have found them only in the type-specimen. Pycnoconidangia I have not seen in the type-specimen but sparsely in other specimens; they are very minute, superficial, immersed with the visible part black; pycnoconidia bacillar, straight, c. 3—4 × < 1 µ.

The new species is one of the most minute species in this genus. With regard to its size and the occurrence of small granules on the thallus, it calls to mind the European species *Ph. nigricans* (Flk.) Stiz., em. DR. and, because of the linear, rather richly branched and ± adnate lobes, especially the latter's variety *tremulicola* (Nyl.) Lynge (see Lynge in Rabenhorst's flora, 1935). *Ph. nigricans* is, however, well separated by the colour of its thallus (always ± brown, usually dark brown and sometimes nearly black), by lack of reaction with KOH, by broader paraphyses (according to Lynge up to 8 µ in KOH), and larger spores (15—24 × 6,5—10 µ). Furthermore, the granules in *Ph. nigricans* are principally developed in the margin and at the apex of the lobes, in *Ph. subtilis* also on the upper surface. Ecologically speaking *Ph. subtilis* is not a nitrophilous species like *Ph. nigricans*. — Possibly, *Ph. subtilis* is most closely related to the *dubia*-group. The species of that group are also gray in colour. Some specimens of *Ph. subtilis* are somewhat similar to a very dwarfed *Ph. teretiuscula* (Ach.) Lynge; from that species it is, however, well separated. With regard to the soredia-type, there is a certain resemblance to *Ph. millegrana* Degel., a North American species (see Degelius 1940, p. 56); the latter species is, however, much larger.

I collected *Ph. subtilis* also near Laurel Falls (*Tenn.*), on

rocks, 760 m (somewhat larger specimens). Possibly this species has a wider distribution in North America. Because of its small size it is, evidently, overlooked.

8. **Ph. Wainioi** Räs.

[Syn. *Ph. caesiella* (B. de Lesd.) Suza.]

Tenn.: near Laurel Falls, on rock and passing over to moss, 760 m. Sterile.

The sample, which is very scanty, must belong to the above species. It is new to America. It differs, even macroscopically, from the closely related species *Ph. caesia* (Hoffm.) Hampe in the soredia which in *Ph. Wainioi* are ± lip-shaped (labriform), marginal or apical or superficial (in *Ph. caesia* they are semiglobose and superficial). See further Dahl 1938 (p. 133).

Anaptychia.

1. **A. corallophora** (Tayl.) Lynge.

Tenn.: Cherokee Orchard, on a rock in deciduous forest, 760 m. Sparse and sterile.

New to North America. According to the literature widely distributed in the tropics.

2. **A. hypoleuca** (Mühl.) Vain., em. DR. et Lynge.

Tenn.: near The Chimneys, on Quercus rubra in deciduous forest, sparse, 850 m.

3. **A. leucomelaena** Vain.

N. C.: Forney Ridge, 1760 m. *Tenn.:* below Alum Cave, 1300 m. — On mossy trunks of Carpinus caroliniana both in mixed and in deciduous forest. Sparse and sterile.

4. **A. palmatula** (Michx.) Vain.

[Syn. *A. detonsa* (Fr.) Jatta.]

N. C.: Forney Ridge, on Carpinus caroliniana in mixed forest, 1760 m. *Tenn.:* Cherokee Orchard, on rock in deciduous forest, 760 m; near Laurel Falls, on rock, 760 m; near The Chimneys, on Quercus rubra and on boulder in deciduous forest, 850 m.

5. **A. sorediifera** (Müll. Arg.) DR. et Lynge.

N. C.: near Newfound Gap, on Fagus grandifolia, 1530 m; Forney Ridge, some localities, on Carpinus caroliniana in mixed

forest and on a somewhat moist rock, 1760—1910 m; Mt. Kephart, on Fagus grandifolia, 1790 m. *Tenn.:* near Laurel Falls, on rock and Quercus montana, 760 m; below Alum Cave, on Carpinus caroliniana in deciduous forest, 1300 m; Mt. Le Conte, Myrtle Point, on Sorbus americana, 1970 m. — Often together with the following two species. Usually rather sparse but well developed. Only sterile. — See under *A. speciosa*.

6. **A. speciosa** (Wulf.) Mass., em. DR. et Lynge.

Like *A. sorediifera* fairly common. Collected in all belts, on levels from 760 to 1970 m, often together with the preceding and the following species. On high levels on trunks (especially of Carpinus caroliniana and Sorbus americana, also on Fagus grandifolia), in the deciduous forest belt particularly on rocks and boulders. Only seen sterile.

A. sorediifera and *A. speciosa* are often confused. In the former species, there is usually no, or hardly any, cortex on the under surface of the thallus, in the latter species it is well developed, at least on older parts of the lobes (these facts may easily be seen macroscopically). It should, however, be observed that in *A. speciosa* the younger parts of the lobes often are without cortex. Incorrect determinations have often been caused by overlooking this fact. I myself as well as Lynge (according to determinations in the herb. of Upsala) have sometimes failed to pay regard to it. The specimens from Togue Ponds in Maine, called by me (Degelius 1940, p. 59) *A. sorediifera*, must, considering this fact, be referred to *A. speciosa*, which is also more plausible with regard to plant geographical conditions (*A. sorediifera* is evidently a more or less tropical species; I have, however, seen specimens of *A. sorediifera* from Illinois: Athens, 1898 E. Hall, in Herb. Holm. s. n. *Physcia speciosa* v. *granulifera*). Another good distinguishing feature is the colour of the under surface, especially on older parts of the thallus: in *A. sorediifera* it is dark grayish, bluish gray or nearly blackish, in *A. speciosa* because of the cortex usually yellowish or whitish and often somewhat nitidous. The two species however differ in their general habitus as well. With regard to the breadth and lobation of the lobes, *A. speciosa* is rather variable, but as a rule its lobes are smaller, more incised and with paler cilia than those of *A. sorediifera*. The latter species is usually larger and, on the whole, varies little. Different types of *A. speciosa* may, on the contrary, be met with even in the same locality. In the Smoky Mountains I had an opportunity to study the two species together in nature, and then for the first time I completely understood them.

7. **A. squamulosa** DEGEL. n. sp.

Descriptio typi:

Thallus foliaceus, membranaceo-cartilagineus, mediocris (5 × 2,5 cm), tenuis (c. 0,15 mm crassus), adpressus, albidus, humidus virescens, opacus vel nitidulus, laciniatus, laciniis discretis vel imbricatis, elongatis, sublinearibus, c. 1—1,5 mm latis, multifidis, iteratim furcatis vel pinnatis (apicibus dilatatis), ± planis, laevigatis, epruinosis, esorediatis, margine ciliatis (ciliis obscuratis vel pallidis, simplicibus vel vulgo valde ramosis, rigidiusculis, usque 2 mm longis), margine et praecipue apice lacinularum isidiato-laceratis [isidiis sat numerosis, applanatis et pr. p. squamiformibus, elongatis (et tum saepe lobulatis et incisis) vel abbreviatis rotundatisque, thallo concoloribus, subtus decorticatis]; thallus *subtus* decorticatus, albidus, centrum versus obscure cinereus vel cyanescenti-cinereus. Thallus supra K+ lutescens, C—, P—, intus albus, K+ lutescens, C—, P—, J—. *Apothecia* sparsa, superficialia, sessilia, usque 4 mm lata, disco concavo, fusco, epruinoso, opaco, laevigato, margine et receptaculo toto valde isidiato (lobulato), etiam in apotheciis juvenilibus. *Pycnoconidangia* sat sparsa, superficialia, immersa, vertice leviter prominente, nigro, 0,1 mm lato vel minore.

Stratum corticale superius thalli c. 26—34 µ crassum, chondroideum, pallidum, non plectenparenchymaticum, ex hyphis tenuibus, superficiei ± parallelibus formatum. *Stratum algarum* c. 30—45 µ crassum; algae fere protococcaceae, ± globosae vel leviter oblongae, diam. 8,5—13 µ, membrana modice incrassata (usque 2 µ). *Stratum medullare* sat laxum, ex hyphis intricatis, in omnes partes currentibus, sat pachydermaticis, 3—4,5 µ crassis, haud crebre septatis, in parte inferiore fuligineis et superficiei magis parallelibus formatum.

Amphithecium crassum, strato corticali bene evoluto, 43—86 µ crasso, chondroideo, incolorato vel pallido, ex hyphis tenuibus, in omnes partes currentibus formato; strato algarum etiam bene evoluto, praecipue in margine. *Hypothecium* modice incrassatum, incoloratum vel pallidum, ex hyphis intricatis, conglutinatis, c. 4,5—6,5 µ crassis, ± pachydermaticis formatum. *Hymenium* c. 100—130 µ crassum, (praeter epithecium) incoloratum, J+ valde caerulescens demum saltem pr. p. vinose rubens, epithecio gelatinoso, fulvo vel fuscescente, non insperso. *Paraphyses* liberae, vulgo simplices, graciles, apice clavato-incrassatae (3—6 µ crassae) fulvaeque, ceterum c. 2 µ crassae incoloratae, ± crebre (sed saepe etiam in KOH indistincte) septatae, non (nisi apice) articulatae. *Asci* clavati, vulgo c. 90—110 × 23—26 µ, membrana ± crassa. *Sporae* vulgo octonae, irregulariter distichae vel interdum fere (imbricatim) monostichae, obscuratae, 1-septatae, late oblongae vel ellipticae, apicibus rotundatis vel obtusis vel interdum sat acutis, medio saepe leviter constrictae, rectae, 32—43 × 15—21 µ, episporio sat inaequaliter incrassato (loculis in sporis maturis ± globosis). Apothecium intus K—.

Pycnoconidangia subglobosa vel pyriformia, pallide fulvofuscescentia, saltem usque 150 µ lata. *Pycnoconidia* sparse evoluta, bacillaria, recta vel subrecta, 4 × < 1 µ.

Habitatio typi: America septentrionalis, Carolina septentrionalis, in montibus Great Smoky Mountains ad Newfound Gap, ad truncum Fagi grandifoliae, c. 1540 m s. m. Leg. 1939 G. DEGELIUS.

Typus in herb. DEGEL. — Fig. nostra 7, tab. nostra 1 b.

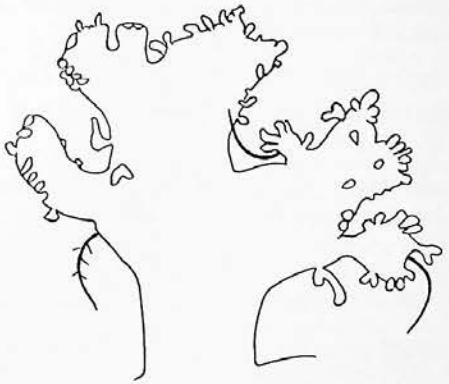

Fig. 7. *Anaptychia squamulosa* DEGEL. Part of thallus (magnified).

The new species is closely related to *A. hypoleuca* (MÜHL.) VAIN., em. DR. et LYNGE and *A. sorediifera* (MÜLL. ARG.) DR. et LYNGE. From these species it is distinguished by the presence of numerous squamiform, often incised or branched isidia or »lobuli» in the margin and at the apices of the lobes (i. e. in the same places as the soredia in *A. sorediifera*). Soredia and usually also apothecia are lacking (e. ap. I have found specimens also on Mt. Kephart). The apothecia are richly isidiiferous (lobuliferous), even the very young ones.

It is possible that this species is synonymous to some one of the varieties or formae described in this group, but I have not been able to refer it with certainty to any of them.

A. squamulosa occurs often together with *A. sorediifera* and *A. speciosa*. It seems to be rather common in the Smoky Mountains. In addition to the original locality I collected it in the following places: *N. C.*: Forney Ridge, on Carpinus caro-

liniana in mixed forest, 1760 m; Mt. Kephart, on Fagus grandifolia, some localities, 1760—1790 m. *Tenn.:* near The Chimneys, on Quercus rubra and boulders in deciduous forest, 850 m; below Alum Cave, on Carpinus caroliniana in deciduous forest, 1300 m.

Lepraria.

1. **L. candelaris** (L.) FR.

[Syn. *L. flava* (SCHREB.) ACH.]

Tenn.: near Laurel Falls, on overhanging rocks, 760 m. Like all the *Leprariae* sterile.

This lichen is mainly corticolous. My specimens agree, however, macroscopically as well as microscopically entirely with European specimens on bark.

2. **L. chlorina** ACH.

Tenn.: near Alum Cave, on overhanging and other shady rocks, 1515 m.

Institute of Plant Ecology (Växtbiologiska Institutionen), The Royal University of Uppsala, Sweden, May 1941.

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Index of Genera.

Additions and corrections to "Contributions to the Lichen Flora of North America. I. Lichens from Maine":

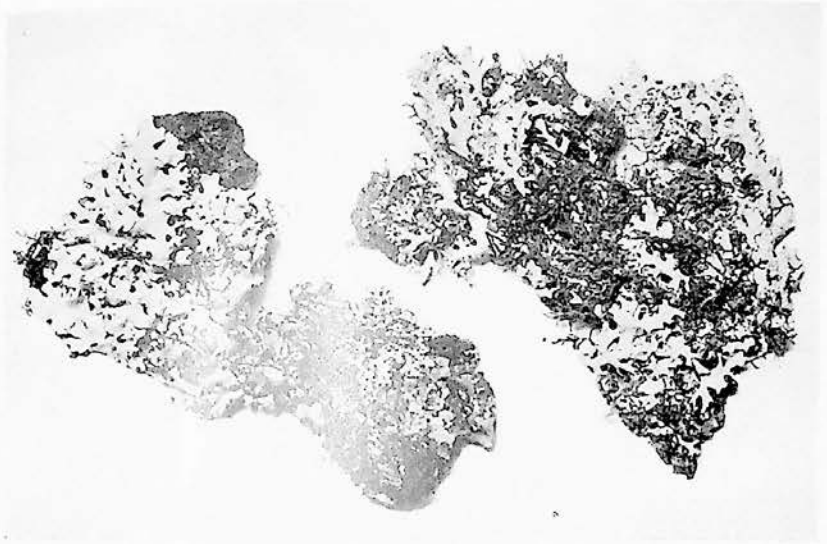
p. 13: under *Arthopyrenia* add:

5. **A. sublitoralis** (LEIGHT.) ARN.
Wood Island, on Balanus.

p. 59: *Anaptychia »sorediifera»* is *A. speciosa* (see p. 75 in the present paper).

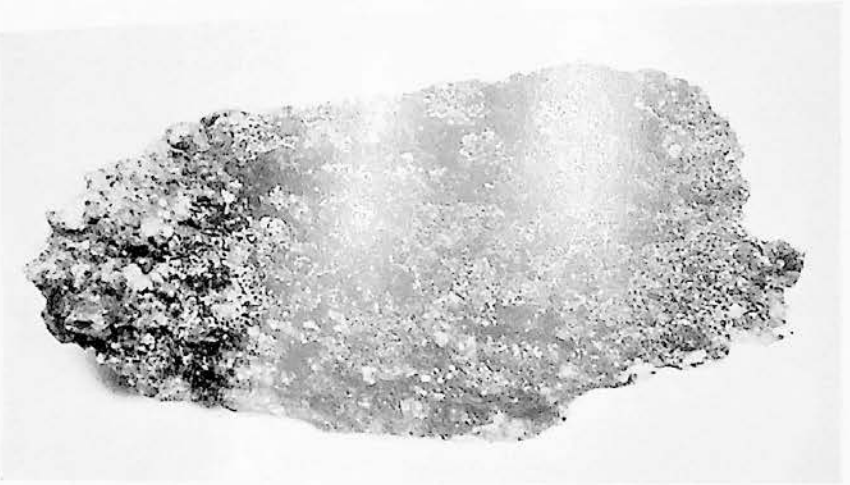
Tryckt den 31 december 1941.

Uppsala 1941. Almqvist & Wiksells Boktryckeri-A.-B.



a. *Parmelia lobulifera* DEGEL. v. *sanguinoreagens* DEGEL. — 0,75 ×.

b. *Anaptychia squamulosa* DEGEL. Typus. — 1,5 ×.



Physcia subtilis DEGEL. Typus. — About 3 ×.